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Are intangible assets favoured in effective corporate taxation?

Je nehmotný majetok zvýhodnený pri efektívnom zdaňovaní právnických osôb?

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Abstract: In the context of efficient taxation, the effective tax rate acts as an indicator to help prospective investors choose to which nation locate their investment. This raises the question of which type of assets is more tax-efficient for such investments. This paper aims to assess whether intangible assets are tax-advantaged compared to tangible assets. The analysis focuses on intangible assets, while tangible assets are represented by machinery and industrial buildings. It is conducted using average effective tax rates for the year 2022, with countries categorized into old (EU-15) and new (EU-12) Member States. The EU countries are categorized in the following cluster analysis based on how the average effective tax rate affects Slovakia's share of equity participation in FDI. Conclusion evaluates those investors from 12 old EU Member States and 2 new EU Member States would find it more tax efficient to invest in intangible assets in Slovakia than in their home country.

Key words: *Intangible assets. Tax burden. Effective taxation. Average effective tax rate.*

JEL Classification: A10. B20.

Introduction

Corporate taxation is among the crucial factors that influence investors' decisions regarding the placement of their business activities. Corporate tax constitutes a significant component of the tax systems of individual European countries. From an economic efficiency standpoint, tax systems should ideally be neutral, meaning that the allocation of investments in various

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countries within the European Union should not face varying tax effects. However, due to globalization and digitization, there have been significant changes in recent times, leading to increased geographic mobility of taxation. Even though the business environment has become more globalized, changes in corporate taxation still remain within the competence of individual EU countries. To ensure transparent acquisition of taxation information, a methodology for calculating the effective tax rate has been proposed, which thoroughly examines the tax base construction and, most importantly, the type of assets for which the tax rate is being observed. The primary objective of this contribution is to compare and evaluate the advantage of intangible assets as a whole in contrast to tangible assets. This analysis has been carried out utilizing the average effective tax rates applicable for the year 2022, with countries divided into two groups: old and new Member States within the European Union.

1 Literature review

Calculating the effective tax rate involves multiple methods, and it is impossible to determine which one is the most suitable because each indicator has different explanatory power and objectives. It is essential to note that there is no universal effective tax rate since its value depends on the chosen calculation method and the types of assets considered - tangible and intangible (Giannini, Maggiulli, 2002). Devereux and Griffith (1999, 2003) and Kubátová and Říhová (2012) divided effective tax rates in their analyses into fictional (microeconomic effective tax rates EATR and EMTR) and real rates. De Laet and Wöhlbier (2008) also evaluated that using statutory tax rates for measuring and comparing the tax burden in different countries is inaccurate and misleading. To select the right method, it is first necessary to define the calculation's purpose and then specify the subject to which the calculation applies. Secondly, the division of effective tax rate methods focuses on the time frame of the tax burden. Within this framework, the following methods are distinguished: Retrospective methods – the backward macro perspective method and the backward micro perspective method. Prospective methods – the prospective micro perspective method (Szarowská, 2011). The prospective micro perspective method uses theoretical data and is suitable for analysing the impact of future taxation on corporate investment behaviour. In this area, the most well-known method is the approach by King and Fullerton from 1984, which is based on their famous study "Taxation of Income from Capital," and the OECD method from 1991. These methods were expanded in 1998 by Devereux and Griffith. Their revaluation focused on specific assets, various sources of financing, and the derivation of implicit taxation, specifically the effective marginal tax rate (EMTR) and the effective average tax rate (EATR), also known as tax wedges (Egger and Raff,

2015). Numerous empirical studies by McKenzie et al. (1997), Devereux and Griffith (1999, 2003), Kubátová and Říhová (2012), Devereux, Griffith, and Klemm (2004) have examined the effects of effective corporate tax rates on a company's economic behaviour, including its location, investment choices, and profit and strategy transfers. Meanwhile, other researchers like Schwellnuss and Arnold (2008), Johansson et al. (2008), Vartia (2008), Gordon and Slemrod (1998) use these rates to address issues of tax competition among the legislatures.

2 Material and methods

The purpose of this paper is to compare and evaluate the overall preference for intangible assets over tangible assets (machinery and industrial buildings). The analysis was conducted using average effective tax rates for the year 2022, with countries divided into old (EU-15) and new (EU-12) Member States of the European Union. Subsequently, through cluster analysis, we tracked the categorization of EU countries, evaluating the impact of the average effective tax rate on the inflow of equity participation in foreign direct investments from EU member countries to Slovakia in the year 2022.

$$EATR = \frac{R^* - R}{R*} \tag{1}$$

The drawback of this approach is that it does not define the EATR for investment projects where the economic rent without taxation, R^*, equals 0. Therefore, Devereux and Griffith (1998) proposed a different method. They incorporate the difference between R^* and R into a ratio with the net present value of pre-tax investment returns $\frac{p}{(1+r)}$. Simultaneously, they account for the impact of marginal personal effective tax rates, as defined by King and Fullerton (1984), on the capital returns received by investors from this investment, which reduces the economic rent after taxation. This equation takes the form:

$$EATR = \frac{R^* - R}{\frac{p}{(1+r)'}} \tag{2}$$

R^* represents the economic rent derived from a project without taxation and interprets the difference between the required pre-tax rate of return and the real interest rate from an alternative investment. To obtain the present value of profit from the project, it is necessary to discount it using the real interest rate.

$$R^* = \frac{p - r}{1 + r} \tag{3}$$

Since our evaluation focuses on intangible assets and, in the case of tangible assets, specifically machinery and industrial buildings, we adjusted the equations to account for changes in individual indicators, whether they decrease or increase.

For intangible assets and machinery, the equation in its basic form is as follows:

$$R_{1-2} = \frac{\gamma}{1 + \rho} * \{[(p + \delta) * (1 + \pi) * (1 - \tau)] - [\rho + \delta * (1 + \pi) - \pi] * (1 - A)\} \tag{4}$$

For industrial buildings, the equation (4) is adjusted to account for the reduction e, a property tax (on buildings, calculated as: tax rate + (number of floors * floor surcharge) * building area), as this tax is a direct cost that occurs with this type of asset.

$$R_3 = \frac{\gamma}{1 + \rho} * \{[(p + \delta) * (1 + \pi) * (1 - \tau)] - [\rho + \delta * (1 + \pi) - \pi] * (1 - A)\} - \mathrm{e} \tag{5}$$

In the calculation of the effective average tax rate (EATR), three methods of financing were used. In the absence of personal taxes γ =1, the last indicator is always zero, and the capital costs for investments funded by new capital and investments funded from retained earnings are equal. Differences arise only in the case of debt financing. As mentioned earlier, corporate tax is a cost of financing equity, and often, this cost exceeds other expenses that reduce the taxable base in the form of a so-called tax shield. Therefore, the economic rent of a taxed project needs to be increased by the ratio of the discounted value of the shareholder's discount rate and the nominal interest rate, as well as the interest tax shield. It is essential to consider the effective property tax rate paid during the direct investment activity period $(1 + e)$. The equation for debt financing takes the form:

$$F^{DE} = \frac{\gamma * (1 + e) * (\rho - i + i * \tau)}{1 + \rho} \tag{6}$$

The equation for financing through new capital injection is as follows:

$$F^{NE} = -\frac{\rho(1 - \gamma)(1 + e)}{1 + \rho} \tag{7}$$

For the purposes of categorization in this work, the Ward clustering method was used. This method falls under hierarchical agglomerative methods. It is associated with the Euclidean distance, whose calculation is based on the Pythagorean theorem (Gregorová and Žák, 2008). The Euclidean distance is defined as:

$$d_E(x_k, x_l) = \sqrt{\sum_{j=1}^{p} (x_k - x_l)^2} \tag{8}$$

Cluster analysis was conducted based on:

The total values of EATR (2022) for individual EU countries in the case of investment in Slovakia, obtained by averaging the calculated EATR values for different types of assets and financing methods. Data on the inflow of equity participation (FDI) from EU member countries to Slovakia, obtained from the NBS database (2022).

The analysis considered data from only 22 EU Member States, as the analysis excluded the Czech Republic due to extreme values in the inflow of equity participation (FDI) amounting to 239,231 thousand EUR. Ireland was also excluded due to extreme values of EATR, reaching 14.97%. Furthermore, Finland, Malta, and Sweden were excluded from the analysis because data on the inflow of FDI to Slovakia from these states were defined as "confidential data" in the NBS database (2022).

3 Results and discussion

As mentioned earlier, European Union Member States are divided into old Member States, which joined the EU before 2004, and new Member States, which became EU members after 2004. For the individual EATR values in Table 1 for intangible assets and tangible assets (machinery and industrial buildings), we distinguish three methods of investment financing, which are:

- Financing with retained earnings (RE)
- Financing with new capital injection (NC)
- Financing with debt (D)

Analysis and Evaluation of EATR in EU Member States

For investors from the given EU countries, the Slovak EATR would be more favourable than the EATR applicable if they were to invest in their home country. Based on this, we can

see in Table 1 that when investing in Slovakia, it would be worthwhile for investors to primarily utilize their own financing sources. Furthermore, Table 1 also indicates that investors from the old EU Member States would find it more advantageous to invest in Slovakia than investors from the new EU Member States.

Table 1 EATR Values (2022) for EU Member States (27) for Domestic Investment in %

Country	**Intangible assets**			**Industrial buildings**			**Machinery**		
	RE	**NC**	**D**	**RE**	**NC**	**D**	**RE**	**NC**	**D**
Old EU Member States									
Belgium	21.0	21.0	11.8	33.1	33.1	23.8	26.9	26.9	17.7
Denmark	18.0	18.0	10.3	25.4	25.4	17.7	22.0	22.0	14.3
Finland	21.1	21.1	14.2	25.2	25.2	18.2	20.0	20.0	13.0
France	33.1	33.1	21.1	46.7	46.7	34.4	33.4	33.4	21.4
Greece	29.6	29.6	19.8	30.1	30.1	20.3	30.5	30.5	20.7
Netherlands	23.4	23.4	14.7	26.6	26.6	17.9	25.3	25.3	16.6
Ireland	13.2	13.2	8.9	13.0	13.0	8.7	13.0	13.0	8.6
Luxembourg	23.3	23.3	14.7	27.1	27.1	18.4	21.7	21.7	13.0
Germany	29.6	29.6	19.9	33.5	33.5	23.8	32.0	32.0	22.4
Portugal	22.5	22.5	22.3	20.0	20.0	19.8	18.7	18.7	18.5
Austria	26.4	26.4	17.7	26.5	26.5	17.8	25.3	25.3	16.6
United Kingdom	20.1	20.1	13.5	30.6	30.6	23.8	20.3	20.3	13.7
Spain	37.8	37.8	29.1	32.4	32.4	23.7	29.9	29.9	21.2
Sweden	20.2	20.2	12.8	22.3	22.3	14.8	20.7	20.7	13.2
Italy	24.1	24.8	16.4	30.3	31.0	22.5	28.9	29.6	21.2
New EU Member States									
Bulgaria	9.8	9.8	6.3	10.8	10.8	7.3	9.1	9.1	5.6
Cyprus	10.0	10.0	8.9	8.9	8.9	7.8	10.4	10.4	9.3
Czech Republic	18.3	18.3	11.7	18.4	18.4	11.8	17.4	17.4	10.8
Estonia	13.3	19.4	13.3	13.3	19.4	13.3	13.3	19.4	13.3
Croatia	15.3	15.3	9.0	15.7	15.7	9.4	15.5	15.5	9.2
Lithuania	12.7	12.7	7.5	14.8	14.8	9.6	13.8	13.8	8.6
Latvia	15.0	22.0	15.0	20.0	27.1	20.0	15.0	22.0	15.0
Hungary	11.3	11.3	8.2	16.6	16.6	13.4	11.7	11.7	8.5
Malta	26.2	26.2	24.8	24.5	24.5	23.1	22.7	22.7	21.2
Poland	16.4	16.4	11.2	19.3	19.3	14.1	19.3	19.3	14.1
Romania	15.2	15.2	9.6	19.7	19.7	14.1	14.9	14.9	9.4
Slovenia	20.1	20.1	13.5	19.0	19.0	12.4	18.1	18.1	11.5

Source: Own elaboration by ZEW (2022)

For comparing the tax burden on intangible assets, we will use Figure 1, which displays the difference in EATR values that apply when an investor places their investment in their home country compared to placing it in Slovakia. Negative values indicate that the Slovak EATR is higher than the EATR in the EU Member State from which the investor comes. In such cases, it would be more advantageous for the investor to invest in their home country rather than in Slovakia. However, when the values on the graph are positive, the Slovak EATR is lower, making Slovakia a more attractive destination for the investor to place their investment compared to their home country in the EU.

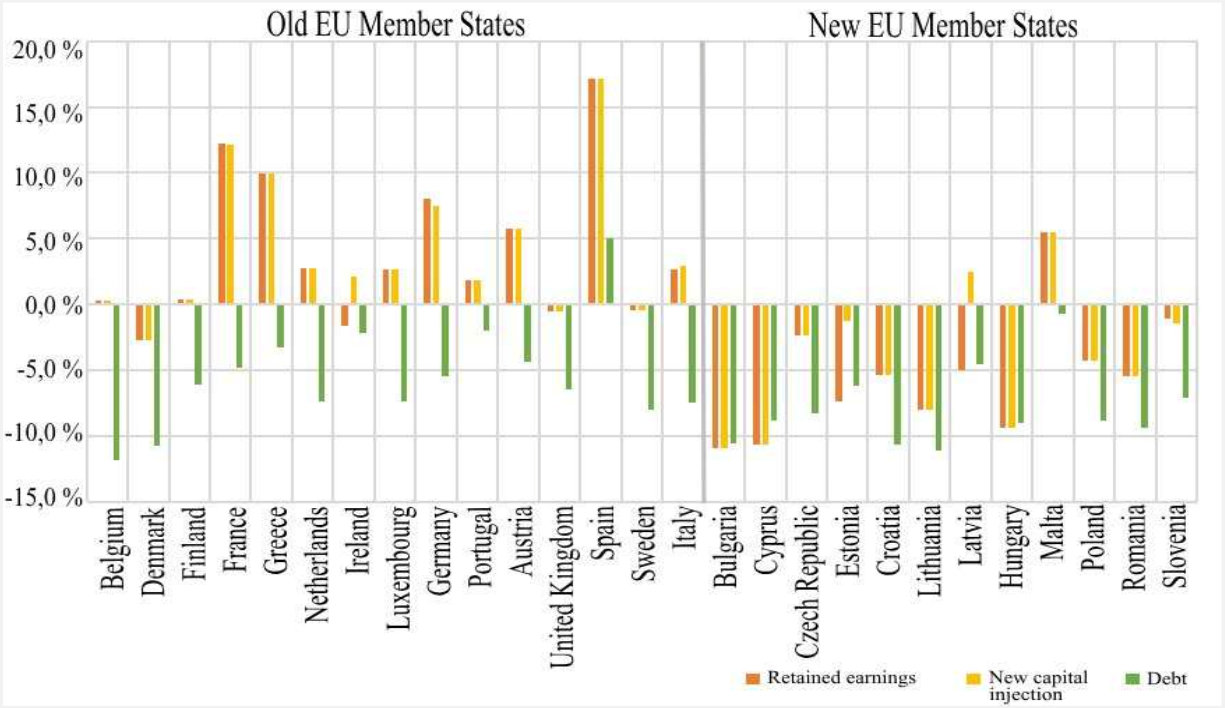

Figure 1 The Difference in Slovak EATR (2022) and EATR (2022) in selected EU Member States for Intangible Asset Investment in %
Source: Own elaboration

First, we compared which investors from EU Member States would find it more advantageous to invest in intangible assets in Slovakia than in their home country. When looking at Figure 1, it is evident that the Slovak EATR is lower in 12 out of the 15 old EU Member States. These countries include:

- Belgium (financing through retained earnings or new capital injection),
- Finland (financing through retained earnings or new capital injection),
- France (financing through retained earnings or new capital injection),
- Greece (financing through retained earnings or new capital injection),
- Netherlands (financing through retained earnings or new capital injection),

- Ireland (financing through new capital injection),
- Luxembourg (financing through retained earnings or new capital injection),
- Germany (financing through retained earnings or new capital injection),
- Portugal (financing through retained earnings or new capital injection),
- Austria (financing through retained earnings or new capital injection),
- Spain (financing through retained earnings, new capital injection, or debt),
- Italy (financing through retained earnings or new capital injection).

Conversely, among the group of 12 new EU Member States, investing in Slovakia is more advantageous for intangible assets only in the case of these two countries:

- Latvia (financing through new capital injection),
- Malta (financing through retained earnings or new capital injection).

Based on the above, if a Slovak entrepreneur were looking for a suitable investor for intangible assets, they should choose an investor from the list of 14 EU Member States provided. The most advantageous investment in intangible assets in Slovakia would be for investors from Spain, where Slovak EATR is lower by 17.1% in the case of self-financing. However, it would also be worthwhile for Spain, as the only EU Member State, to use debt financing, as Slovakia's EATR is also lower for them.

Cluster analysis of EU member countries based on EATR and FDI in Slovakia

The next analysis we conducted focused on the categorization of EU Member States using cluster analysis. In cluster analysis, objects within the same cluster have the most similar characteristics, while different clusters should be as different from each other as possible. It is important that the number of observed objects is greater than the number of clusters. Additionally, the independence of variables and the standardization of variable values must be met. As previously mentioned, we used data from 22 EU Member States. After removing inappropriate data, we confirmed the non-correlation of the input data using Bartlett's test. The p-value was lower than 0.001, which is less than the significance level of 0.05. This led us to reject the null hypothesis (H0) that the correlation matrix is an identity matrix in favour of the alternative hypothesis (H1) that the correlation matrix is not an identity matrix. Subsequently, we standardized the data and calculated the Euclidean distance between them. Cluster analysis was performed using R Studio, and the results are presented in the dendrogram in Figure 2.

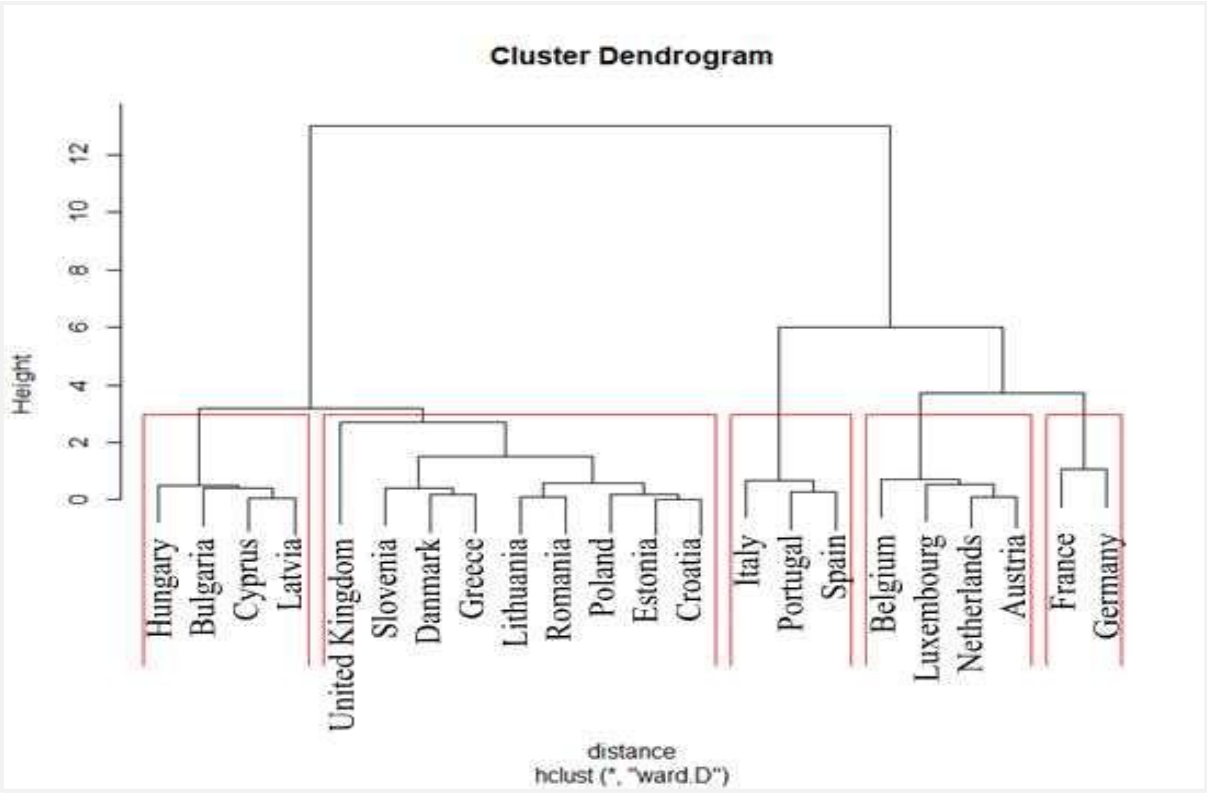

Figure 2 Dendrogram of Cluster Analysis
Source: Own elaboration

Based on the output of the cluster analysis, we decided to categorize the EU Member States into five clusters. The classification of individual countries into clusters and the average variable values for the year 2022 are displayed in Table 2.

Table 2 Average Indicator Values in Respective Clusters for the Year 2022

Classification	**CLUSTER 1**	**CLUSTER 2**	**CLUSTER 3**	**CLUSTER 4**	**CLUSTER 5**
Country	HU, BG, CY, LV	UK, SI, DK, EL, LT, RO, PL, EE, HR	IT, PT, ES	BE, LU, NL, AT	FR, DE
EATR (%)	21.97	22.84	24.41	23.66	25.02
FDI (thous. EUR)	2,780	170	0	35,725	61,246

Source: Own elaboration

The first cluster comprises four EU Member States: Hungary, Bulgaria, Cyprus, and Lithuania. Within this cluster, the EATR values range from 21.78% to 22.11%, resulting in a mere 0.33% difference between the lowest and highest EATR values. The average EATR value for this cluster is 21.97%, the lowest among all clusters. The average FDI inflow for Cluster 1 amounts to 2,780,000 EUR, ranking it third in terms of the highest FDI inflow. **The second cluster** encompasses as many as nine EU Member States, including the United Kingdom, Slovenia, Denmark, Greece, Lithuania, Romania, Poland, Estonia, and Croatia. In this cluster, the EATR values range from 22.36% to 23.46%, indicating a difference of over 1% between

the highest and lowest EATR values. The average EATR value for this cluster is the second lowest among the specified clusters, standing at 22.84%. The average FDI inflow for this cluster amounts to 170,000 EUR. **The third cluster** comprises countries located on the European peninsulas, specifically Spain, Portugal, and Italy. EATR values in this cluster range from 24.18% to 24.76%, with an average value of 24.41%, representing the second highest EATR value among the specified clusters. However, the average FDI inflow for this cluster is zero, indicating that no investors from these countries have invested in Slovakia. **The fourth cluster** is composed of Belgium, Luxembourg, the Netherlands, and Austria. EATR values in this cluster fall in the range of 23.52% to 24.06%, with a difference of 0.54% between the highest and lowest EATR values. The average EATR value is 23.66%. Investors from these countries have contributed an average of 35,725,000 EUR to Slovakia, making it the second-highest average FDI inflow among the specified clusters. **The fifth cluster** consists of only two countries, France, and Germany. EATR values in this cluster reach the highest levels, ranging from 24.71% to 25.34%, with an average EATR value of 25.02%. This cluster also leads in terms of FDI inflow, with an average value of 61,246,000 EUR.

Figure 3 Division of EU Member States into Clusters
Source: Own elaboration

From the analysis, it is evident that countries in the fifth cluster invest more in Slovakia compared to other countries, even though their Slovak EATR values are the highest. Based on this, we can conclude that lower EATR values are not associated with higher inflows of foreign direct investment from EU Member States into Slovakia. Therefore, we arrive at the conclusion

that tax burden is not the determining factor for investors from strong and large states like France and Germany (see Figure 3) when selecting a destination for their investment.

Conclusion

The tax rate is a crucial component of corporate taxation. It plays a central role in the allocation of investments and in determining the level of investments that will generate profits in the future. The professional community has discussions about competition and the so-called "competition for taxable income" among Member States. Based on the comparison of individual EATR values, we have concluded that, from a tax perspective, it would be advantageous for investors from 12 old EU Member States (Belgium, Finland, France, Greece, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Austria, Spain, and Italy) and two new EU Member States (Latvia and Malta) to invest more in intangible assets in Slovakia than in their home countries. This is due to the lower value of Slovakia's EATR compared to the EATR in their home country. Overall, it can be summarized that investments in intangible assets, according to the EATR calculation, are favoured over investments in tangible assets. Another important analysis involved the categorization of EU countries using cluster analysis, which was performed based on the total values of Slovakia's EATR for the year 2022 and data on the inflow of property participation from EU member countries to Slovakia, also for the year 2022. By conducting this analysis, we found that countries with higher EATR values correspond to higher values of property participation inflow. From this, it can be concluded that the tax burden is not the determining factor for investors from EU member countries when deciding to place their investments in Slovakia.

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