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## Comparative research in the area of corporate income tax

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### Abstract

The comparison is a concept which mainly represents a method of comparing any entities. Due to the fact that in literature are used various concepts in various situations, in this paper are firstly clarified some concepts concerning comparison. Secondly is described a mathematical model which can help investors in their decision making process. The model shows one of the methods of comparative economics which is quite young scientific discipline and developing such models and methods seems to be a big challenge in the future. The aim of this article is to suggest unification of using the concepts which are connected with comparison and demonstrate using methodological apparatus of the comparative economics in order to participate in discussion concerning decision making which is connected with foreign direct investments.

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### 1. Introduction

There are some basic principles on which economic science stands. It is particularly the principle of comparing the benefits and costs and the principle of scarcity of resources. It is quite evident that these two principles are relevant in the present, which is the reason why economics as a science has maintained its position and important. However, development has shown that the examined phenomenon can be viewed from multiple angles. For this reason there are a number of examples where one can observe the inconsistency and lack of uniformity of views of various economists. Historical developments, however, forced the classification of economics by subject of study. In

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this case, we distinguish for example econometrics (economic hypotheses testing), history of economic theories (it describes and analyses the development of current of thought), empirical economics (examines the evolution of economic processes which have occurred over time in selected countries), the theory of economic policy (which addresses institutional issues and the role of the state), public finance (which focuses on the functioning of the public sector), but also comparative economics (analyzes and compares economic systems, processes occurring within these systems, the results of which are linked to these processes connected). The comparative economics is relatively young discipline. The development of world trade and interdependence of countries has brought new issues – issues that the international and global economics deal with. The birth of the global economy as an open socio-economic system which interacts with the environment brought some significant changes. Responding to this fact was the birth of several disciplines-international political economy, international business and comparative economics. At the beginning the comparative economics dealt with comparison economic systems – capitalism and socialism (Djankov, 2003). But till now there is no consensus how to define the systems in the most appropriate way (Owen, 2007). By the time socialism collapsed in Eastern Europe the question under what circumstances either the plan or the market delivers greater economic efficiency lost of its appeal. At the end of 20th century many countries transformed and tended to the capitalism. It indicated that comparative economics could be death. But in fact this now we can identify several models of capitalism which can be compared (Žák, 2006). There is not an only single and pure type of capitalism (Amable, 2003). In fact we can identify several types – the Continental European model, the social-democratic model, market based model, the Mediterranean model and the Asian model of capitalism. Comparing various types of capitalism is the main concern of the new comparative economics. It shows that institutional aspects have something common with economic performance. Doubtless, institutions are an important driver of long-term economic progress, but policies matter as well, and it behooves us to attempt to learn where policies come from and what effects they have in the long run (Brada, 2013). Therefore, the next chapters are focused on tax policy as one of the most important part of fiscal policy and its impact on foreign direct investments which are usually taken as an important factor which can influence economic growth.

#### The comparative research

The comparative research is a concept which is not in a scientific literature conclusively defined. As a result of this is that there are various concepts e.g. comparative design, comparative method, method of comparative analysis etc. and in fact it all means the same thing. Various authors use various concepts for the same content and on the contrary, one concept can be understood in various meanings. For example the term comparative method we use when we use several methods and all of them are different from each other – when we compare we can use several different methods of data collecting. Therefore, the comparative method is a very universal, general concept but sometimes it could have a specific meaning. The comparative method as a term is defined by Ch. Ragin where it is connected with a macro-social analysis based on hard facts and it assumes that consequently are used also statistical methods. Ragin focuses on quantitative comparative analysis (QCA) which uses formal logic technique. This method was innovated in time, but today it can be understand as a set of specific tools or even as a specific research strategy (Rihoux, 2003). It can be comfortably used in case that we examine a small number of entities and concurrently it allows generalization.

The research design means a plan of some research project – choosing methods by which should be collected and analysed data. Then, the comparative design means neither an approach which represents a specific kind of case study (comparative case study), or using comparison in social science as a replacement of experiment. Generally, there is no uniform comparative method because it is specific case-by-case. The aim of comparison can be description, evaluation, explanation or prediction of any phenomenon. Some another aims of comparison can be also:

- macrocausal analysis (reveals connections between variables)
- simultaneous theory interpretation (examples of various countries can be used for supporting some theory)
- contrast of contexts (identification of specific characteristics of monitored phenomena based on empirical observation)

## 2. Comparative research with aim to explain

Interpretive approach is closer to the approach of natural sciences. They are set hypothesis and in search for regularity and causality. Purpose is to find variables that would be able to explain the differences and similarities between compared units in general. In the case of explanatory research can be methodologically advantageous using an experiment, but in the social sciences, (i.e. in economics), this option is significantly reduced or it is even completely impossible. Classic experiment requires the fulfilment of three main assumptions:

- The value of the dependent variable in the experimental case measured after exposure to the stimulus is compared to the same variable in the control case,
- Division of subjects into experimental and control groups is random,
- Application or manipulation of the stimulus is controlled by the researcher.

Due to the fact that in the social sciences it is very difficult to meet all the requirements, alternatively it is possible to use quasi-experimental design, which is often used in a comparative study. Quasi-experimental design is a comparison of multiple units (states, countries), which is replaced by a repeat attempt, which took place in the framework of classical experimentation and different external conditions under which the experiment takes place in quasi-experimental research which is simulated using different characteristics examined in several different companies (but the researchers do not set conditions themselves, because it is impossible for researchers to control operating variables. This is a significant limitation of this method). Comparing units, which includes some economic intervention (e.g. in the form of fiscal policy measures), with units in which this intervention has taken place can then be seen as analogy of experiment in social sciences. Observational research using experimental logic is denoted by the term controlled comparison. Controlled comparison is characterized by a selection of cases on the basis of variations in the values of the independent variable. If the values of the independent variable are different, this fact can be the basis for the finding of a causal effect. A variation of the independent variable can be attained from the spatial (synchronous) and temporal (diachronic) perspectives. In a controlled comparison is then possible to identify four types:

- Spatial comparison – cases are compared at the same moment, but geographically distinct. But using an experiment faces some problems because phenomena that social sciences are investigating are often at such a high level of aggregation that any experimental manipulation of their values is virtually impossible.
- Longitudinal comparison – cases are not defined geographically but chronologically (diachronic). The cases are divided on the basis of time units in which there was a change that had an impact on the value of the independent variable. Such a change may be e.g. implementation of any legal action, etc. The researcher then compares the value of the dependent variable in the first case (i.e., the expected impact of changes) to the value of the variable in the following time point (i.e., in another case). The change in the value of the independent variable cannot be affected by the researcher. The aim of this comparison is to determine whether the measure has brought the expected results.
- Counterfactual comparison – independent variable does not show any variation. With the thought experiment researcher creates a counterfactual case characterized by the variation of the values of the independent variable. This is a case which empirically does not occur but it could occur if the variable changes its value. The very absence of such a case is the reason for the use of counterfactual comparison. Arguments using counter facts do not provide definitive evidence to confirm hypotheses and often lead to discussion. This type of comparative research requests fulfilment of causal proximity criterion, under which it is recommended to take into account cases where are independent and dependent variables separated by the shortest possible period of time with the lowest number of intervening variables. It is true that the longer period of time separates the values of independent and dependent variables, the less certain they are causal judgments obtained such research. In addition, there is the requirement to meet the criterion of theoretical consistency, which requires a theoretical justification of the original case. Presence of an explicit theory is required because the counterfactual case follows the factual event.

- Dynamic comparison – it is exactly a classic experiment in observational research which is unfortunately hardly usable in social science.

In principle, there are two approaches to perform a comparative analysis – qualitative and quantitative. In qualitative research is a comparison of not too many cases most frequently used tool to search for causation. According to Jackman (1985) it is the main task of comparison to reveal and evaluate any possible useful causality. Uncovering the concept of causality is possible in the case of qualitative research and it can look to the counterfactual approach mentioned above. It seeks to estimate the causal effect of one variable to another variable. Such a comparison is called a controlled comparison, because it is possible to control the effects of key variables.

Generally speaking the comparison method can use the classical statistical apparatus. "The comparison especially means that it is compared a set of indicators concerning various countries or average values concerning countries all together. It can be also analysed the proportion of compared countries to the indicators characterizing the analysed phenomenon. By Nezval (2004) methods of analysis are based on classical statistical apparatus.

### 3. Comparing investment options

One of methods that can be used in comparative economics is mathematical modelling. Haufler and Wooton (1999) focused on foreign direct investment in a region in which the population is asymmetrically distributed between countries and there are some remaining barriers to intra-regional trade. In the following text is shown how to use the method of modelling on the example of comparison of corporate income tax. The reality is that the tax rate on corporate income declined in recent years in most developed countries. As the most frequently mentioned are two reasons – supporting domestic economy and the pursuit of foreign investments. Sedmihradský (2002) notes that effect of taxes is often overestimated. Effective tax rates do not seem to be a determinant of investment directed to high quality economies (Fatica, 2009). But corporate income tax is from the perspective of the state a major source of state revenues. On the other hand, comparing income tax by foreign investors may affect the inflow of foreign investment and employment. Therefore we have to answer the question what is the highest income tax rate in order to have an investor decided to invest in the country.

The mathematical model described below can determine the tax rate on corporate income in country A in relation to country B so that the country A is attractive for foreign investors and at the same time the country A did not sacrifice more tax revenue than necessary.

This tax rate can be thought as an equilibrium rate because it measures the attractiveness of the country. Then you can also use this model as well as investment decision tool in the matter about which country is the best to place your investments.

Country A and B have symmetric demand curves. In the country A is the demand n-times larger than in country B. The company has to pay a transaction costs per unit when exports. The distribution of goods within only one country means that there are no transaction costs.

The company has four options:

1. import to countries A and B from their home country
2. manufacture in countries A and B
3. place the production to country A
4. place the production to country B

Most interesting is deciding between options 3 and 4. Option 1 is not suitable due to the fact that in this case the transaction costs will be rather high. Option 2 leads to high fixed costs, compared to the transaction costs when producing in country A or country B and importing to the other country. Therefore the company decides whether to place production in country A or B and assuming symmetric transaction costs rather decide for a larger country because in that way the company will serve a larger market. That is the reason why the model also includes the corporate income tax. Sufficiently high taxes on corporate income can lead to decision that company would rather establish a production in a small country. It is necessary to take into account the size of country A which is n-times larger than country B and the existence of transaction costs when importing products from country A to country B.

(Assuming symmetric transaction costs means that the transaction costs of importing products from country B to country A are the same when importing from country A to B). Production function is linear and contains labor as variable factor ( $w$ ) and a capital as fixed factor ( $K$ ). The amount of wages is different in both countries so that in country A is  $k$ -times higher than in country B ( $w_A = k * w_B$ ). Net profit ( $\Pi$ ) is the profit after taxation (corporate income tax,  $CIT \in [0;1]$ ).

The consumer demand function:

$$Q_i = \frac{\alpha - p}{\beta} \quad (1)$$

where:

$Q$  = quantity,

$p$  = price,

$\alpha$  and  $\beta$  = parameters determining the elasticity of demand function.

If we got into account that country A is  $n$ -times larger than country B we would have:

$$Q_a = \frac{n(\alpha - p)}{\beta} \quad (2)$$

The demand function concerning the country B:

$$Q_b = \frac{\alpha - p}{\beta} \quad (3)$$

In case that firm decides to produce in country A and export to country B it means that price for consumer in country B will be:

$$P_B = P_A + Tr \quad (4)$$

where:  $Tr$  = transaction costs of exporting goods to country B. The transaction costs are symmetric – when exporting from country B to country A, the transaction costs will be again high as  $Tr$ .

The function of production is linear and contains variable factor – labour ( $w$ ) and fixed factor – capital ( $K$ ). We assume that wages are different in country A – it is  $k$ -times larger than in country B:

$$w_A = k * w_B \quad (5)$$

The net profit ( $\Pi$  – profit after taxation by corporate income tax which is linear tax rate in interval  $[0;1]$ ) can be expressed as follows:

$$\Pi_A = \{[(P_A - w_A) (Q_A(P_A) + Q_B(P_B))] - K\} \{1 - CIT_A\} \quad (6)$$

When we insert the demand functions, the fact that in country A is demand  $n$ -times larger than in country B and the fact, that in country A are wages  $k$ -times larger than in country B to this general profit function, we obtain:

$$\Pi_A = \left[ \frac{n+1}{\beta} (P_A - kw_B) \left( \alpha - P_A - \frac{Tr}{n+1} \right) - K \right] [1 - CIT_A] \quad (7)$$

Since the firm can change the price, chooses the price which leads to profit maximizing. Therefore, by deriving the previous equation by price we get:

$$\frac{d\Pi}{dP} = \frac{n+1}{\beta} \left( \alpha - 2P_A + kw_B - \frac{Tr}{n+1} \right) (1 - CIT_A) \quad (8)$$

In condition that the first derivation is equal to zero (in order to maximize the profit) we get:

$$P_A = \frac{1}{2} \left( \alpha + kw_B - \frac{Tr}{n+1} \right) \quad (9)$$

which is expression of price which leads to profit maximizing. The profit function containing this price is in following form:

$$\Pi_A = \left[ \frac{[(n+1)(\alpha - kw_B) - Tr]^2}{4\beta(n+1)} - K \right] [1 - CIT_A] \quad (10)$$

Situation which was described above as alternative nr.4 (placing the production to country B and importing to the country A) means that price for final consumer in country A is:

$$P_A = P_B + Tr \quad (11)$$

and price for final consumer in country B is:

$$P_B = P_B \quad (12)$$

Net profit after taxation ( $\Pi$ ) by corporate income tax (which is a linear tax rate in interval  $CIT \in [0;1]$ ) can be expressed as follows:

$$\Pi_B = \{ [P_B \cdot w_B] (Q_A(P_A) + Q_B(P_B)) - K \} \{ 1 - CIT_B \} \quad (13)$$

By inserting demand functions to this function we get:

$$\Pi_B = \left[ \frac{n+1}{\beta} (P_B - w_B) \left( \alpha - P_B - \frac{nTr}{n+1} \right) - K \right] [1 - CIT_B] \quad (14)$$

Since the firm can change the price, chooses the price which leads to profit maximizing. Therefore, by deriving the previous equation by price we get:

$$\frac{d\Pi}{dP} = \frac{n+1}{\beta} \left( \alpha - 2P_B + w_B - \frac{nTr}{n+1} \right) (1 - CIT_B) \quad (15)$$

In condition that the first derivation is equal to zero (in order to maximize the profit) we get:

$$P_B = \frac{1}{2} \left( \alpha + w_B - \frac{nTr}{n+1} \right) \quad (16)$$

which is expression of price which leads to profit maximizing. The profit function containing this price is in following form:

$$\Pi_B = \left[ \frac{[(n+1)(\alpha - w_B) - nTr]^2}{4\beta(n+1)} - K \right] [1 - CIT_B] \tag{17}$$

Finally, we express the corporate income tax in country B (the smaller country) in order to attract investors in comparison with the other country (country A). It means that in our case must be equal the profit in country A and B ( $\Pi_A = \Pi_B$ ):

$$\left[ \frac{[(n+1)(\alpha - kw_B) - Tr]^2}{4\beta(n+1)} - K \right] [1 - CIT_A] = \left[ \frac{[(n+1)(\alpha - w_B) - nTr]^2}{4\beta(n+1)} - K \right] [1 - CIT_B] \tag{18}$$

When we express from the above formula corporate income tax in case of the smaller country (CIT<sub>B</sub>), we get:

$$CIT_B = 1 - \frac{\left\{ \frac{[(n+1)(\alpha - kw_B) - Tr]^2}{4\beta(n+1)} - K \right\}}{\left\{ \frac{[(n+1)(\alpha - w_B) - nTr]^2}{4\beta(n+1)} - K \right\}} [1 - CIT_A] \tag{19}$$

where:

CIT<sub>B</sub> = recommended tax rate on corporation income tax in country B (at a level that country B can be attractive to investors)

$n$  = how many times is country A larger than country B

$k$  = how many times are wages higher in country A than in country B

$K$  = amount of invested capital

$\alpha, \beta$  = parameters to the demand function

$Tr$  = transaction costs of product import

It is obvious that the greatest impact has the tax rate on corporate income in country A (CITA), while the other parameters (especially  $\alpha, \beta, w$  and  $K$ ) are present in both the numerator and the denominator.

It also shows that the country B can afford a higher corporate income tax when wages in this country (compared to country A) are lower and when corporate income tax in country A is higher.

When we insert all the necessary data † concerning selected European countries we obtain following results – corporate income tax rate recommended by model for Lithuania in comparison with the other countries:

Table 1. Recommended corporate income tax rate (%)

	2007	2008	2009	2010	2011
Lithuania vs Estonia	17.01607	16.76089	16.53412	16.12917	16.00996
Lithuania vs Hungary	13.56307	14.32933	14.4764	16.8056	16.85691
Lithuania vs Poland	18.2814	18.90058	19.96818	18.60219	18.63557
Lithuania vs Slovakia	18.52911	18.35422	16.97167	16.42827	16.39511
Lithuania vs Slovenia	12.54729	13.30084	11.37979	9.859132	10.10725
<i>Corporate income tax in Lithuania</i>	<i>15</i>	<i>15</i>	<i>20</i>	<i>15</i>	<i>15</i>

† Data were obtained from public accessible databases of Eurostat and OECD (see appendix A). This is the tax rate on corporate income (in%), population (in millions inhabitants) and information about the amount of annual average net earnings. Another data were set as follows: the investor considering an investment ( $K$ ) of 1 billion, -monetary unit. Labor costs ( $w$ ) to produce one unit of output are 20 monetary units and any transaction costs ( $Tr$ ) associated with the production transport from the country of production to another country is 10 monetary units per unit of production. The demand curve for production has decreasing elasticity -0.2 (the demand function parameters are  $\alpha = 100$  and  $\beta = 5$ ).

The results provide information about how high should be corporate income tax rate in Lithuania in order to attract foreign investors. When we look closer to individual comparisons with each country we can see that the corporate income tax rate recommended by the model is in most recent years higher than it is in reality. This means that Lithuania should be for foreign investors attractive country, assumed that the investors take into account corporate income tax rate as a important criterion.

If an investor had decided about investment between Lithuania and Estonia, than probably would have chosen Lithuania because the corporate income tax in Lithuania could be even 16% instead 15% (in 2011) and still the country should be able to attract investors. But if an investor had decided about investment between Lithuania and Slovenia, than probably would have chosen Slovenia because the corporate income tax in Lithuania should be 10.1% instead 15% (in 2011).

It can be seen that the tax rates are quite similar. This phenomenon is typical all over the Europe. The approximation of tax rates trend is known as tax competition. Theoretical platform which deals with tax burden and tax competition is very extensive and it is possible to find two mainstream of tax competition and its impact on capital flows, economic activity and tax base. The first group prefers tax competition and „tax game“because of positive effects on public expenditure, reducing of non effective activities. The second stream judges the impact of tax competition in a negative way and prefers tax harmonization and puts stress on negative influence of capital mobility on capital tax rates and level on public expenditure (Szarowská, 2009).

#### **4. Conclusion**

There is not only one reason why we can find inequality in economic growth in various countries. The effects of the global economic crisis, which began in 2008 are significant deterioration in the expectations of firms and households, deepening the problems related to the financing of business activities, decline of investment activities, decline in production and foreign trade, firing employees and declining consumption. It is logical that these facts were reflected in different countries with different intensity and caused further differentiation in the economic level of individual countries.

From the above it is clear that comparative economics focuses rather on comparing the results. With the development of computerization and information technologies can be statistical and mathematical methods increasingly applied and comparative economics can use not only qualitative but also quantitative analysis. The model presented in the article was to demonstrate using such methods. However, it is obvious that every model is simplified portrait of reality and therefore we have to understand its limitations. In the case of comparing corporate income tax it means that the tax rate is not the only factor which affects decision making of investors. Considering more factors would surely provide more reliable results.

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## Appendix A. Data

	2007	2008	2009	2010	2011
<b>Estonia</b>					
n	0.0	0.4	0.4	0.4	0.4
k	1.4	1.4	1.4	1.5	1.5
CIT	22	21	21	21	21
<b>Hungary</b>					
n	3.0	3.0	3.0	3.0	3.3
k	1.4	1.3	1.3	1.3	1.3
CIT	16	16	16	19	19
<b>Poland</b>					
n	11.3	11.3	11.4	11.5	12.6
k	1.2	1.1	1.0	1.2	1.2
CIT	19	19	19	19	19
<b>Slovakia</b>					
n	1.6	1.6	1.6	1.6	1.8
k	1.1	1.1	1.3	1.3	1.3
CIT	19	19	19	19	19
<b>Slovenia</b>					
n	0.6	0.6	0.6	0.6	0.7
k	2.0	1.9	2.1	2.2	2.2
CIT	23	22	21	20	20

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