

THE INFLUENCE OF ALLOCATION FORMULA ON GENERATION OF PROFIT IN DIFFERENT ECONOMY SECTORS

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Abstract

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The mechanism for the distribution of the Common Consolidated Corporate Tax Base will be based on three macroeconomics factors which are considered to be the main indicators of generated profit/loss. The paper analyzes the explanatory power of proposed allocation formula for the distribution of the Common Consolidated Corporate Tax Base with respect to the sector of economic activity from the perspective of the Czech independent enterprises. The research is based on the comparison of the coefficients of determination indicating the proportion of explained variability of proposed multiple regression models. The paper concludes that the proportion of explained profitability by the allocation formula factors as are defined by the Common Consolidated Corporate Tax Base Draft Directive may differ up to 34% with regard to the sector of economic activity classified by NACE classification.

Keywords: allocation formula, tax harmonization, common consolidated corporate tax base, corporate income tax, profit/loss, coefficients of determination, enterprises

INTRODUCTION

The Common Consolidated Corporate Tax Base (CCCTB) should constitute general and unambiguous rules for the determination of corporate tax base with the main goal to simplify tax systems of the EU Member States and to ensure their greater transparency.

In the terms of the strategy Europe 2020 is the main objective of the CCCTB system to remove the needs for transfer pricing rules, to eliminate any possibilities for double taxation due to incurring of tax liabilities in the different EU Member States and also the reduction of tax compliance costs (Spengel *et al.*, 2012).

As the main contribution of the CCCTB system is considered the completion of the Single Internal Market, the improvement of the economic growth and the employment as well as the strengthening of the competitiveness of the European enterprises in the line with the revised Lisbon strategy. The arguments against the CCCTB system are mainly

associated with the increase of business uncertainty and its costly implementation. According to Mintz (2007), the implementation of the CCCTB system may cause new types of distortions of the tax systems, therefore is the system sometimes called as a white elephant.

The mechanism for the distribution of the Common Consolidated Corporate Tax Base, i.e. formula apportionment (FA), will be based on the computation of the share of a respective member of a company group on the overall volume of three macroeconomics factors, i.e. volume of tangible fixed assets, volume of labour compensation (indicated by payroll costs accompanied by number of employees) and volume of sales revenues. These factors are considered to have the largest impact on the generated profit of a company and therefore are able to explain the highest proportion of its variability.

The paper analyses the power of allocation formula factors to explain the variability in

generation of profit/loss of single enterprises from the perspective of the Czech Republic with focusing on the explanatory ability of allocation formula factors on generation of profit/loss of companies operating in different economic sectors classified by NACE classification of the European industrial activity.

Theoretical Background

The CCCTB system considers a tool for the harmonization of tax bases within the EU Member States and does not assume the harmonization of tax rates. Although, based on the proposed amendment of the European Parliament on the CCCTB Draft Directive from 12 April 2012 is impossible to achieve the equality in corporate taxation without introduction of minimum level of corporate tax rates.

The CCCTB system will not distort the national accounting principles of the EU Member States, despite to the fact that the allover implementation of the International Financial Reporting Standards (IFRS) was initially considered as the possible starting point for the introduction of the CCCTB system.

The proposal for the CCCTB Directive, as the result of more than 7 years long extensive work of the European Commission Working Group (WG), was published on 16 March 2011. The CCCTB Draft Directive introduces the mechanism for the determination and computation of tax base, its consolidation and subsequent distribution among single members of a company group.

The CCCTB system is addressed to a group of companies operating on the territory of the EU. These groups of companies have to fulfill the criterion of ownership with the threshold of > 75% share on capital, criterion of control with the requirement of > 50% proportion on voting rights and last criterion of > 75% share on rights giving the entitlement to profit. Based on the voting of the European Parliament from 19 April 2012 will be the CCCTB system after five years long transition period compulsory for all group of companies fulfilling the above mentioned criterions with the exception of small and medium size enterprises.

The mechanism for the distribution of the CCCTB, i.e. formula apportionment, is stated by article 86 of the CCCTB Draft Directive. The formula apportionment should be based on three factors: volume of tangible fixed assets, volume of sales revenues and labour compensation. As eligible tangible fixed asset is considered assets with valuation of more than 1,000 EUR, which is capable of participating on the revenues generation of a respective company for the period longer of 1 year. The tangible fixed assets will be attributed to its economic owner; the leased assets will be assign to both of lessor and lessee. The labour compensation factor is constituted as a combination of payroll costs and number of employees working for a respective company. These are equally weighted in this factor.

The definition of an employee will be based on the national legislation of a Member State on which territory the respective employee performs her/his activity. Payroll costs will include all payments that are deductible as expense, including employee's benefits and social contributions. The sales factor will include revenues from sales of goods and services decreased by warranty claims and rebates. The revenues will be attributed to the state of dispatch or transport of goods, i.e. based on destination principle. In case of services sales revenues will be attributed to the state on which territory the services are carried out.

The introduction of the CCCTB system as the main objective of the European Commission in the tax harmonization process also initiated extensive scientific work of many researchers. In addition to the group of literature analyzing the impact of the introduction of the CCCTB system on the volume of tax revenues (Fuest *et al.*, 2007; Devereux and Loretz, 2007; Cline, Neubig *et al.*, 2010; van der Horst, 2007 or Bettendorf, 2009), there is also group of papers researching the introduction of the CCCTB system from a different perspective; Devereux and Loretz (2008) analyzed the impact of the CCCTB system on the market efficiency, Becker and Runkel (2012) examined the influence of the CCCTB system on the company decision about possible acquisition or merger with other existing company, while Schindler and Schjelderup (2007) considered the stability of cartel agreements in the situation of tax harmonization.

At present, some researches are focusing on the evaluation of the mechanism for the distribution of the consolidated tax base and the examination of the ability of allocation formula factors to explain statistically significant proportion of variability in generation of profit/loss. Rogemann *et al.* (2012) empirically analyzed the design of the EU apportionment formula with regard to profit generation. Based on the data from Amadeus database for single enterprises operating in manufacturing and service sector (based on first two digits indication of NACE code Manufacturing sector was represented by NACE codes: 15–36 and Services sector was represented by NACE codes 50–74 and 92) they concluded that the best performing formula is the three factors formula incorporating sales, tangible fixed assets and labour costs. These three factors are able to significantly explain 28% of the variation in profit/loss of considered companies. Pethig and Wagener (2003) compared different designs of formula apportionment with respect to their allocative features and strategic incentives. They concluded that in terms of equilibrium tax rates tax competition tends to be most relaxed under formula apportionment with sales as a single formula factor. Hines (2008) estimated the ability of formula factors (i.e. volume of sales, property, plant and equipment, payroll costs and number of employees) to predict the variation in corporate income on the data of large American

corporations. His results suggested that the equally weighted three-factor formula may be considered as the reasonable predictor of market capitalization.

More recent study of Cobham and Loretz (2014) researched the impact of the distribution of corporate tax base based on a number of different apportionment factors on the volume of tax revenues. They concluded that the distribution of the overall tax base according to the number of employees dramatically redistribute tax revenues to lower income countries, while using payroll costs will do the opposite. They also concluded that the identification of the main winners and losers from the implementation of the CCCTB system mainly depends on exact definition of the apportionment factors.

MATERIAL AND METHODOLOGY

The paper researches the ability of the allocation formula factors to explain the variability in generation of profit/loss of a enterprise from the perspective of the Czech Republic with the objective to verify whether the allocation formula with three-equally weighted factors as is designed by the CCCTB Draft Directive is able to explain statistically significant proportion of variability in generated profit/loss of a respective company. The following equation (1) indicates the structure of the allocation formula for the distribution of the CCCTB as is stated in Art 86 of the CCCTB Draft Directive:

Share_X =

$$= \left(\frac{1}{3} \frac{\text{Sales}^x}{\text{Sales}_{\text{group}}} + \frac{1}{3} \left(\frac{1}{2} \frac{\text{Payroll}^x}{\text{Payroll}_{\text{group}}} + \frac{1}{2} \frac{\text{No_of_employees}^x}{\text{No_of_employees}_{\text{group}}} \right) + \frac{1}{3} \frac{\text{Assets}^x}{\text{Assets}_{\text{group}}} \right) \times$$

$$\times \text{Con'd_Tax_Base}, \quad (1)$$

where the share a group company member X on the common consolidated corporate tax base is computed as its share on the overall volume of sales, tangible fixed assets and labour compensation constituted as a combination of payroll costs and number of employees.

The paper employed the firm-level data of active unconsolidated companies registered in the Czech Republic with published value of profit/loss before taxation for taxable year 2012 from Amadeus database (Amadeus update number 234, date of updated 13.03.2014).

For the research were collected information about volume of tangible fixed assets (TFA), operating turnover (OPT), number of employees (NoE), payroll costs (CoE) and volume of profit/loss before taxation (PL). With regard to the objective of the paper to analyze the ability of the allocation formula factors to explain the variation in profit of enterprises operating in different economy sectors, also the information about NACE codes were collected. The operating turnover is considered as a proxy of sales formula factor, since based on its definition comprises the total output of a company from economic activity carried out in a respective period, and is usually measured by the overall volume of revenues on sales of goods and services reduced by rebates and warranty claims.

The initially collected sample of data for 111,295 unconsolidated companies was adjusted for the further research. All companies with missing information about NACE code as well as with negative value of tangible fixed assets or payroll costs were excluded from the sample. Also all companies with extreme value of any variable below 1st percentile and above 99th percentile were eliminated. The final data sample covers 65,376 companies.

I: Descriptive statistics, all variables in thousands EUR, except for number of employees, active unconsolidated companies in the Czech Republic with published value of profit/loss before tax for 2012

Name of variable	Abbreviation	Mean value	Standard Deviation	Min. value	Max. value
Sales	OPT	1,579.74	4,402.00	0.00	63,844.42
Profit/loss before taxes	PL	53.69	225.44	-526.90	3,015.65
Tangible fixed assets	TFA	417.25	1,373.47	0.00	19,351.05
Number of employees	NoE	18	41	3	357
Cost of employees	CoE	226.56	569.05	1.27	7,282.04

Source: own adaption in STATA

II: Correlation matrix for adjusted sample of companies, n=65,376; 5% both sides critical value 0.0077

PL	OPT	NoE	CoE	TFA	
1.0000	0.5395	0.4209	0.5196	0.3811	PL
	1.0000	0.6113	0.6938	0.4565	OPT
		1.0000	0.8873	0.4997	NoE
				0.5056	CoE
				1.0000	TFA

Source: own adaption in STATA

Tab. I provides descriptive statistics of all variables in the year 2012, Tab. II presents correlation matrix which indicates that all observed variables are correlated in positive significant way at significance level of 5%.

The analysis of explanation power of formula factors is based on the examination of coefficients of determination of multiple regression models analyzed by Ordinary Least Squares method. As was already mentioned the paper researches the ability of allocation formula factors to explain the variation in profit/loss generation of a company with focusing on different sectors of economic activity classified by NACE codes, therefore the data sample was divided into subsamples according to NACE codes. The positive linear links between dependent and independent variables were considered. The proposed multiple regression model was as follows:

$$PL_n = \beta_0 + \beta_1 CoE_n + \beta_2 NoE_n + \beta_3 TFA_n + \beta_4 OPT_n, \quad (2)$$

where the PL_n considers profit/loss before taxes as the dependent variable which is explained by four independent variables, i.e. payroll costs (CoE), volume of tangible fixed assets (TFA) and volume of operating turnover (OPT) or number of employees (NoE).

The parameters of proposed regression models were estimated by unrestricted as well as restricted regression where the parameters are considered to be equal.

RESULTS AND DISCUSSION

The main objective of the paper is to analyze the ability of the allocation formula factors to explain statistically significant proportion of variability in generation of profit/loss with focusing on the sector of economic activity in which a particular company operates.

The dependent variable profit/loss before taxation (PL) is supposed to be statistically significantly explained by four independent variables, namely by number of employees (NoE), volume of payroll costs (CoE), volume of operating turnover (OPT) and amount of tangible fixed assets (TFA). These four independent variables are those which are involved in the allocation mechanism for the distribution of the CCCTB. The Ordinary Least Square method is used for the estimation of the parameters of proposed multiple regression models. There are assumed positive linear links between dependent and independent variables.

In addition to the unrestricted regression models also the restricted regression models are designed for the analysis. The parameters of the restricted regression model are supposed to be equally-weighted, therefore this model is considered to have better explanation ability on the generation of profit/loss with regard to the structure of allocation mechanism for the CCCTB.

The analysis is based on the comparison of the values of adjusted coefficient of determination indicating the proportion of explained variability of the model. The Tab. III presents the results of the analysis for both of unrestricted and restricted regression models. The obtained values of adjusted coefficient of determination were analyzed by statistical significance test for the coefficients of determination. Furthermore, all proposed regression models were verified by the statistical significance test for the regression model, i.e. by F-test, checking out if the variables in the model are correctly chosen. The below stated table (Tab. III) reports the values of unadjusted as well as adjusted coefficients of determination. However that the proposed multiple regression models are supposed to be explained by the same number of independent variables, the further comments are reported to the values of adjusted coefficient of determination, which is able to eliminate any possible distortion caused by the different number of independent variables. As was already mentioned, the paper researched the ability of the allocation formula to explain variability in profit/loss generation in different economy sectors, the results are reported for single economy sectors indicated by NACE code. For the detailed description of NACE sectors see Tab. IV.

From the above stated table is obvious that the NACE sectors T and U as well as O were excluded from further analysis due to missing or low volume of observation. The table shows that the volume of explained variability in generation of profit/loss differs with regard to the sector of economic activity indicated by NACE sectors. The proportion of explained variability for the Czech independent enterprises operating in all industry sectors is 34.89%, respectively 32.54% in case of restricted model. The proportion of explained variability in profit/loss is even by almost 8.00% higher for companies operating in Human health and social work activities (i.e. NACE code Q) and in Water supply and waste management activities (i.e. E NACE code) in case of unrestricted model and also almost by 8.00% for companies operating in Manufacturing sector (i.e. C NACE code) in case of restricted model.

These four allocation formula factors (CoE, NoE, TFA and OPT) are able to explain the highest proportion of variability in C, E, Q and M NACE sectors, whereas the lowest volume of variability is explained for I, K and S NACE sectors in case of unrestricted regression models as well as in case of restricted regression models.

The formula factors incorporated in the allocation mechanism for the distribution of the CCCTB based on the Art 86 of the CCCTB Draft Directive are able to statistically significantly explain the variability for companies operating in Financial and Insurance activities and Other services activities (i.e. K and S NACE sectors) based on the results of analysis of unrestricted regression models, however

III: Explanation power of proposed allocation formula factors on profit/loss generation in different sectors of economic activity indicated by NACE codes. Dependent variable Profit/loss before taxes

	Number of observation	Unrestricted regression			Restricted regression		
		R2	adj R2	F-statistics	R2	adj R2	F-statistics
All NACES	65,376	0.3490	0.3489	8,759.61	0.3254	0.3254	3,1531.28
A	2,316	0.3883	0.3872	366.72	0.3703	0.3700	1,360.76
B	88	0.3911	0.3617** ¹	13.33	0.3202	0.3123	40.50
C	10,471	0.4248	0.4246	1,932.60	0.4052	0.4052	7,132.30
D	448	0.3496	0.3437	59.54	0.2861	0.2845	178.70
E	661	0.4299	0.4264	123.65	0.4064	0.4055	451.12
F	7,007	0.3740	0.3736	1,045.73	0.3671	0.3670	4,062.30
G	17,968	0.3035	0.3033	1,956.64	0.2634	0.2633	6,423.71
H	2,216	0.3412	0.3400	286.27	0.3297	0.3294	1,088.89
I	2,803	0.1339	0.1327	108.15	0.0767	0.0763	232.56
J	2,268	0.3828	0.3817	350.86	0.3781	0.3778	1,377.51
K	100	0.1431	0.1070	3.97	0.1198	0.1108	13.34
L	5,720	0.1861	0.1855	326.59	0.1223	0.1221	796.54
M	7,944	0.3928	0.3925	1,284.01	0.3858	0.3857	4,988.73
N	1,827	0.3337	0.3323	228.15	0.3210	0.3206	862.62
O	7						
P	692	0.1613	0.1564	33.03	0.1145	0.1132	89.20
Q	1,747	0.4264	0.4251	323.73	0.3771	0.3767	1,056.23
R	564	0.2906	0.2856	57.26	0.1547	0.1532	102.87
S	529	0.0910	0.0841	13.12	0.0810	0.0792	46.44
T	0						
U	0						

Source: own adaption in STATA

the proportion of explained variability in profit is very low. The results for restricted regression models indicate that allocation formula with four independent variables is able to explain even lower variability in profit/loss in case of Other service activities sector (i.e. S NACE sector), i.e. 7.92%, as well as for Financial and Insurance activities (i.e. K NACE sector) where the proportion of explained variability reaches up to 11.08%.

With regard to the results obtained for unrestricted and restricted regression model has to be mentioned that the results may differ up to 13.00%; in general it can be concluded that the proportion of explained variability is lower for the unrestricted regression models.

In the line with the study of Anand and Sansing (2000), who concluded that the choice of allocation formula factors will be influenced by the principal industry sector in a respective country, can be generalized that the proportion of explained variability by the allocation formula

factors for the companies operating on the territory of the Czech Republic reaches up to 30.33%, respectively up to 26.33% based on the results of restricted regression model. With regard to Rogemann *et al.* (2012) study it is possible to conclude that the average proportion of explained variability in profit generation for the Czech unconsolidated companies operating in manufacturing and services sector reach up to 30.20%, respectively up to 26.51%.

The question for the further research may be considering of the explanatory ability of allocation formula factors in the variety of their combination with focusing on the comparison of the allocation formulas which are commonly used in the United States or in Canada, or the considering of possible different definition of allocation formula factors for that types of economic sectors where the allocation formula as is defined by the Art 86 of the CCCTB Draft Directive is able to explain very low proportion of variability in generation of profit/loss.

1 ** indicates the statistical significance level of 5 %, all other values are statistically significant on 1% significance level.

IV: List of NACE codes

NACE code	Description	Details (first two digits)
A	AGRICULTURE, FORESTRY AND FISHING	01–03
B	MINING AND QUARRYING	05–09
C	MANUFACTURING	10–33
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	35
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	36–39
F	CONSTRUCTION	41–43
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	45–47
H	TRANSPORTATION AND STORAGE	49–53
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	55–56
J	INFORMATION AND COMMUNICATION	58–63
K	FINANCIAL AND INSURANCE ACTIVITIES	64–66
L	REAL ESTATE ACTIVITIES	68
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	69–75
N	ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	77–82
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	84
P	EDUCATION	85
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	86–88
R	ARTS, ENTERTAINMENT AND RECREATION	90–93
S	OTHER SERVICE ACTIVITIES	94–96
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	97–98
U	ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES	99

Source: Statistical Classification of Economic Activities in the European Community, Rev. 2 (2008) available on Eurostat website

CONCLUSION

The paper analyzed the ability of allocation formula factors to statistically significantly explain the variability in generation of profit/loss of the Czech unconsolidated enterprises with focusing on the proportion of explained variability for companies operating in different sectors of economic activity.

The research was based on the estimation of unrestricted as well as restricted regression models via Ordinary Least Squares method and subsequent evaluation of the values of the adjusted coefficients of determination indicating the proportion of explained variability by the proposed independent variables.

The obtained results in the paper indicate that the allocation formula factors are able to statistically significantly explain the variability in the generation of profit/loss for companies operating in all of 18 considered NACE sectors, however the proportion of explained variability may differ up to 34% with regard to sector of economic activity classified by NACE codes.

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