

Common Consolidated Corporate Tax Base System Re-launching: Simulation of the Impact on the Slovak Budget Revenues¹

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Abstract

European Commission re-launches the common consolidated corporate tax base (CCCTB) in Europe within the efforts to fight with tax evasion and tax fraud via two step procedure. Firstly, only a common corporate tax base (CCTB) would be implemented with the possibility of cross-border loss offsetting CCCTB. Common consolidated corporate tax base should be introduced only in the second step. The aim of the paper is to research the impact of both implementation steps on the amount of the tax bases allocated in the Slovak Republic. The results show, that the first implementation step would results into the decrease of allocated tax bases by 0.27% in the Slovak Republic. The second implementation step would result in to the increase of the tax bases allocated in the Slovak Republic by 3.02%.

Keywords: CCCTB, CCTB, group, tax base, tax revenue, Slovak Republic, corporate tax

JEL Classification: H25, K22

Introduction

Current situation in the area of corporate taxation in the European Union, where companies are facing 28 different corporate taxation systems has two very important impacts. Firstly, the loopholes between the national corporate taxation systems are often used by the multinational groups (hereinafter as MNEs) for aggressive tax planning leading to the base erosion and profit shifting in the European Union. Secondly, they are increasing the compliance costs of taxation for

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both, tax administration and companies themselves. The complexity of current taxation systems hinders the expansion of small and medium sized enterprises (hereinafter as SMEs) on the foreign markets as mentioned by Chen, Lee and Mintz (2002), Solilová and Nerudová (2016) or David and Nerudová (2008). Taking into account the fact that SMEs represent over 99% of all companies and are creating two thirds of total employment (Eurostat, 2016), European Commission had always the effort to structurally harmonize the area of corporate taxation, which was not very successful so far.

The first efforts in modern history of EU to create common rules for tax base construction can be found in 2001, when the debate on the Internal Market without obstacles was initiated. As a result, the European Commission has established a working group on common consolidated corporate tax base (hereinafter as CCCTB), which after more than 7 years of work completed the draft of the directive published as (European Commission, 2011) on 16th March 2011. Proposal of CCCTB was considered as unique for it comprised the basic framework of CCCTB functioning in the European Union. However, it raised huge discussion, especially the consolidation regime and the rules for the allocation of the group tax bases due to its budgetary impacts on individual EU Member States. As a result of this, nine Member States were against the proposal.

However, base erosion and profit shifting which majority of Member States are currently facing, led European Commission to reconsider the proposal and to relaunch the project again. (European Commission, 2015) has published the Action plan for fair and efficient corporate tax systems in the European Union, in which the CCCTB is understood as a tool for fight against tax evasion and tax fraud. The design of the re-launching process is influenced by the previous experiences with the draft proposal. Being aware of the fact that the most discussed and explosive issue represents the consolidation regime and mechanism for sharing of the tax base, the Commission suggests implementing the system in two steps.

Firstly, to implement only the common rules for corporate tax base (hereinafter CCTB) construction and only in second step the full CCCTB. Having in mind that the most attractive part of the project represented by the consolidation scheme is missing in the first step, Commission is suggesting as temporary solution the introduction of possibility of cross-border loss offsetting.

Following the above mentioned Action plan (European Commission, 2016a; 2016b) has published in October 2016 two directive proposals – Proposal on Council Directive on a Common Corporate Tax Base (hereinafter as CCTB directive) and Proposal on Council Directive on a Common Consolidated Corporate Tax Base (hereinafter as CCCTB directive). Both of the above mentioned

directives are mandatory for all multinational groups with consolidated revenue of EUR 750 million. The CCTB directive proposal contains common rules to calculate and determine the tax base in each EU Member State, thus limiting planning opportunities for multinational groups. The main elements of the common set of rules represent super deduction for R&D expenses, allowance for growth and investment, temporary cross-border loss relieve with recapture, interest limitation rules based on EBITDA and rules for hybrid mismatches. Under the CCCTB directive, the profits of multinational groups in the EU will be consolidated for corporate tax purposes. Consequently, profits of multinational groups will be allocated to the EU Member States in which the group is active by means of a formulary apportionment, replacing the current transfer pricing rules.

The subsidiarity deadline for national parliaments to submit comments on the proposals was 3 January 2017, and the parliaments of 19 countries scrutinised them. Seven reasoned opinions were issued, by the Parliaments of Denmark, Ireland, Luxembourg, Malta, Sweden, and the Netherlands (submitting two opinions, one from each chamber). In the European Parliament, the proposal has been assigned to the Economic & Monetary Affairs Committee, with an opinion expected from the Legal Affairs Committee. The Internal Market and Consumer Protection Committee decided not to give an opinion. A draft report is expected in May, with a vote in committee in November. The vote in plenary is planned for January 2018 followed by the vote of the Council. If approved, the CCTB would enter into force on January 1, 2019 and the CCCTB directive would enter into force as per January 1, 2021.

Ministry of Finance (2017) of Slovak Republic has formulated its position towards those two proposals on 31st January 2017. According to it, it is necessary to pay the attention the factors in allocation formula with the aim to ensure the elimination of the potential negative impact of the SK budget. The opinion further states that the aim of the Slovak Republic will be to ensure the gradual transformation from the first step (i.e. CCTB) towards the adoption of the common consolidated corporate tax base (i. e. CCCTB). Due to the fact that the suggested directives would represent the fundamental change in the system of corporate taxation in the Slovak Republic, the Ministry of Finance indicated that it is necessary to elaborate detailed impact assessment measuring the impacts on the Slovak Republic, based on which the opinion will be updated in the future and submitted to the National Council of the Slovak Republic.

The aim of the paper is to research the impacts of introduction of cross-border loss offsetting within the first implementation step and the impacts of consolidation regime and the mechanism for the sharing of the tax base on the corporate tax bases allocated in the Slovak Republic.

1. Theoretical Background

Existing literature on CCCTB can be categorized on four main streams. First stream of the research on CCCTB is concentrating on the on the concept of CCCTB in general and researches the impact of its implementation into the national tax systems. The authors are highlighting the necessity of the different national corporate tax rates in CCCTB system, as for example Bettendorf et al. (2009) or Riedel and Runkel (2007) who recommend the implementation of uniform tax rate. Mintz (2008) in contrary suggest different national tax rates to avoid disruption of the fiscal sovereignty.

Second stream of the research on CCCTB is focusing mainly on the research of allocation formula factors with respect to the prediction of the corporate income. Mintz (2008) sees as the most easily measured allocation-formula factor as employees' costs. Eberhartinger and Petutschnig (2014) add to this research that based on the number of employees, the payroll formula factor can be used to analyse the impacts of different levels of employees' costs on the allocation of consolidated corporate tax profit. Another authors within this stream of the research concentrate on the research explanatory power of the allocation formula factors with respect to corporate tax profit. Roggeman et al. (2012) concluded that allocation formula suggested by the European Commission explains the corporate tax profit by 28%. Similar results were reached by Krchnivá and Nerudová (2015). According to the authors, the proposed CCCTB allocation formula factors are able to explain almost 35% of the variability in profitability of the Czech Companies. In contrast to Hines (2008), who concluded that allocation formula factors in the U.S. (i.e. sales, assets and payroll) are able to explain almost 50% of the variability in profitability. The study by Cobham and Loretz (2014) is bringing into the research on CCCTB allocation formula factors slightly different perspective than previous studies. According to them the allocation of corporate tax profits based on tangible assets and number of employees is beneficial for low-income countries, while sales and payroll represent the more beneficial factors for high-income countries.

Third stream of the research on CCCTB represents the studies on the impacts of the introduction of the CCCTB on the tax revenues of the EU Member States. First study in this field was performed by Fuest, Hemmelgam and Ramb (2007). The authors were researching the share by which German parents and its subsidiaries are contributing to the creation of the European (EU-15) tax base in the period of 2006 – 2001. Even though the fact that only German companies were researched, they expect that the dataset has sufficient explanatory power due to the fact German foreign direct investments create 14% of European direct investment. The results showed that the possibility of loss-offsetting within the

group would lead to the decrease in the overall European corporate tax base by 20% (in EU-15). Devereux and Loretz (2008) concentrated on the impact on the tax revenues. They indicated that the overall tax revenues in the European Union could decrease by 1% after CCCTB implementation. Some of the member states as Hungary, Czech Republic or Slovak Republic might gain additional tax revenues as results of tax sharing mechanism in the form of allocation formula. However, the biggest decrease of the tax bases would face according to the results Germany. On the contrary to Fuest, Hemmelgam and Ramb (2007) the research was based on European companies fulfilling the rule of more than 50% of share in other company in the period of 2000 – 2004.

Within this stream of the research, there can be studies, in which the authors employed simulation models to simulate the impact on the tax revenues. Van der Horst, Bettendorf and Rojas-Romagosa (2007) applied CORTAX model, which represents the general equilibrium model capturing the behaviour of companies, households and governments on fully functioning market. Covering EU-17, the authors conclude that countries with the broad corporate tax bases might benefit from the system, while countries with narrow corporate tax base might lose. The authors also highlighted that only obligatory CCCTB implementation would allow benefiting fully all the interested parties. Bettendorf et al (2009) simulated the impact with the application of Computable General Equilibrium Model. Based on the results they concluded that tax harmonization in connection with consolidation of tax bases would not lead to the significant economic growth. According to the authors, the higher tax revenues could be reached by the implementation of CCCTB accompanied by the harmonization of corporate tax rate. Contrary, Brochner et al. (2007) focused on the impact of the harmonization of tax base without the harmonization of tax rate on the amount of GDP, welfare and the tax revenues. They concluded that the harmonization might increase GDP and the welfare. However, they indicated slightly negative impact on the tax revenues. The model did not reflect the possibility of consolidation and allocation formula, which can be considered as the limitation of the study.

Further, within the same stream of the research, there are studies, which are covering nearly whole EU economy. Oestreicher and Koch (2007) were researching the impact on EU-25. They indicated the decrease of overall corporate tax revenues by 4.45% in case of obligatory CCCTB implementation in the EU, decrease by 4.57% in case of voluntary implementation. However, as the most complex research can be considered the study by Cline et al. (2010). The authors concluded that in case of obligatory implementation of CCCTB, the overall corporate tax revenues might increase by 0.2%. However, in case of individual Member States it could result in to decrease by 8.4% in case of Denmark, or to

increase by 6% in case of France. Further, voluntary implementation of CCCTB would lead according to the authors to the decrease in overall corporate tax revenues by 0.6% and concurrently to the decrease in average corporate tax base by 2.2%.

The last (fourth) stream in the research on the impacts of CCCTB represents the studies, which are aimed not on the impact on the EU but on the impact on the individual states. The implications of CCCTB implementation on tax revenues in Romania were researched by Pirvu, Banica and Hagi (2011). The authors were simulating the impacts on the sample of nine biggest companies resident in Romania. They conclude that the CCCTB implementation in Romania would result into the decrease in corporate tax base by 0.035%. Similar methodology was used by Domonkos et al. (2013) to research the impact of CCCTB implementation on the Slovak Republic. Based on the sample of 11 biggest companies in the Slovak Republic the authors concluded that the implementation of CCCTB would lead to a 31.9% decrease in tax revenues for the Slovak Republic in 2009 and to drop by 14.6% in 2010. Detailed research of the possible implementation scenarios and their impact on the tax revenues of the Czech Republic was researched by Nerudová and Solilová (2015a; 2015b), and Solilová and Nerudová (2016). The research was based on the large datasets gained from Amadeus and Bankscope databases. The results show that in case of obligatory implementation, the Czech Republic would additionally gain 3.39% of corporate tax revenue in comparison with current situation. However, in situation of cross-border loss offsetting, the Czech Republic would lose 0.78% of current corporate tax revenues.

As can be seen from the review of the existent research, the simulation based on the dataset of all eligible entities from Amadeus database was not applied in research of the impacts on budget revenues in Slovak Republic so far. Moreover, also the variant of cross-border loss offsetting has not been research so far. Based on this, we are developing the research on the impacts of Slovak Republic further, by using the dataset of all illegible entities accessible from Amadeus database, and also by researching the variant of the common rules for tax base construction (CCTB) with the element of possible cross-border loss offsetting.

2. Data and Methodology

The research is based on the company data gained from Amadeus database provided by Bureau van Dijk update No. 2552 from December 2015 and Bankscope database. The empirical analysis is based on similar assumptions and methodology as used by Nerudová and Solilová (2014) or Nerudová and Solilová

(2015b). With respect to the fact that the proposal of the CCCTB directive sets two-layer cumulative condition for companies to be legible for group taxation scheme and consolidation – at least 50.01% of ownership rights and more than 75% of voting rights conditioning the subjection to consolidation and group taxation scheme – all the companies in the above mentioned databases were subjected to this test. However, at the end we have found out, that only the sample of companies from Amadeus database can be used for further research. Data from Bankscope database were classified as unsuitable for further research; mainly due to the fact that dataset included a lot of missing data (more than 80% would have to be imputed). Moreover, it was impossible to create complex structure of group corporate tax bases needed for the determination of CCCTB and cross-border loss offsetting, because legible companies were not retrievable in the database.

Following, the gained dataset of companies (fulfilling two-layer cumulative condition for entering into group taxation scheme and consolidation) was divided into two groups. First group consisting of 52,689 entities comprised Slovak subsidiaries of EU parent companies (i.e. tax residents in the Slovak Republic), while the second consisting of 728 entities comprised EU subsidiaries with parent companies in the Slovak Republic (i.e. tax residents of other countries).

In order to map the current situation in corporate tax base allocation in the Slovak Republic, we have applied four possible models of group taxation regimes, which are currently applied within the European Union (i.e. full consolidation, pooling, intra-group loss transfer and no group taxation scheme applied in the country) according to the country of the residency of parent company. Moreover, the creation of the structure of group corporate tax bases in current situation also allowed to research the impacts of the first implementation step – i.e. the impact of the possibility of cross border loss offsetting on the corporate tax bases allocated in the Slovak Republic.

Further, in order to apply below stated allocation formula, the information on different financial indicators from the financial statements of the companies had to be gained – i.e. information on total sales, payroll, number of employees and total assets of companies.

$$ShareX = \left(\frac{1}{3} \frac{S^A}{S^{group}} + \frac{1}{3} \left(\frac{1}{2} \frac{P^A}{P^{Group}} + \frac{1}{2} \frac{E^A}{E^{Group}} \right) + \frac{1}{3} \frac{A^A}{A^{Group}} \right) * CCCTB \quad (1)$$

where

S – represents total sales,

P – payroll,

E – stands for number of employees,

A – represents total assets.

The research revealed that information on some of the financial indicators was often missing in Amadeus database. In order to eliminate the negative impacts of missing data (i.e. not to shrink the dataset of companies fulfilling two-layer cumulative condition for entering into the taxation scheme and consolidation regime), we followed the methodology of Nerudová and Solilová (2014), and we applied three methods for missing data imputation – regression model, imputation model and Monte Carlo method.

The regression methods are considered to be as the basic method for estimation of missing data. The below stated equations represent the linear regression model, which was employed to estimate the missing data – number of employees, sales and payroll. The model can be expressed following:

$$No.Employees_imputed = koeficient\beta_0 + TFA * koeficinet\beta_1 \quad (2)$$

$$Operating_revenue = koeficient\beta_0 + TFA * koeficinet\beta_1 \quad (3)$$

$$Payroll = koeficient\beta_0 + No.Employees_imputed * koeficinet\beta_1 \quad (4)$$

As the independent variables were used tangible fixed assets (*TFA*), for the estimation of number of employees (*No.Employees_imputed*) and sales (*Operating_revenue*) and number of employees for the estimation of payroll (*Payroll*).

This model was also used for the estimation of missing data through Bayesian model using an adaptive Metropolis-Hastings algorithm – i.e. Monte Carlo method, which uses likelihood models including univariate normal linear regression with a distribution argument in the form of *var* (i.e. variances based on variables). Monte Carlo method is primarily designed for fitting regression models; therefore regression specification is the same as in previous method (regression). Once regression specification was performed, the adaptive random-walk through Metropolis-Hastings algorithm was applied to obtain Markov Chain Monte Carlo correlation (MCMC), which assumes that the missing data are random. To obtain reproducible results the random-number used were set based on the default setting (i.e. default burn-in period of 2,500 iterations and the default MCMC sample size of 10,000 iterations). Following, we have performed multivariate regression. In addition, by default, 95% equal-tailed credible intervals are reported.

The third selected possible method, which was applied in case of missing data, represents the single imputation method. This method enables to impute the missing data by probable values and therefore allows not shrinking the dataset. The missing information on operating revenue (*Operating_revenue*) was added by the information on recorded assets (*TFA_reported*) and the ratio of average operational revenues (*AOperR*) to average fixed tangible assets (*ATFA*) in case

of companies from the same industry sector. The relation is expressed by following equation:

$$\text{Operating_revenue} = (A\text{OperR} \div ATFA) * TFA_reported \quad (5)$$

The missing data on number of employees (*No.Employees_imputed*) was added through the application of the information on recorded fixed tangible assets (*TFA_reported*) and the ratio of average number of employees (*ANoE*) to average tangible fixed assets (*ATFA*) in case of companies from the same industry sector. The relation is expressed by following equation:

$$\text{No.Employees_imputed} = (ANoE \div ATFA) * TFA_reported \quad (6)$$

The missing data on payroll (*Payroll*) was added through the application of the recorded number of employees (*No.Employees_imputed*) and the ratio of average payroll (*APayr*) to average number of employees (*ANoE*) in case of companies from the same industry sector. The relation is expressed by following equation:

$$\text{Payroll} = (APayr / ANoE) * \text{No.Employees_imputed} \quad (7)$$

In order to research the most suitable method for missing data imputation (i.e. the method which is distorting the allocation of the group tax bases across the EU Member States the least) the sensitivity analysis was performed. Based on the obtained results, the regression model was selected.

Consequently, after the imputation of the missing data into the dataset, we applied the allocation formula on the tax bases of the identified group of companies, and determined the amount of the tax base allocated to the Slovak Republic. Based on the performance of the comparative analysis with current situation, we were able to identify possible increase or decreases in the allocated corporate tax bases in the Slovak Republic.

At the end, it is also necessary to mention the limitations and assumptions of the study. Firstly, our simulation of the impacts CCTB and CCCTB is based on the static model, which means that the changes in the behavior of the economic subjects (as a reaction on CCTB or CCCTB) are not taken into account in the model. Secondly, as in the time of the research there were not available any results of the micro simulation of the CCTB impact on the whole EU economy, we assume, that the overall volume of corporate tax base in the Slovak Republic is not changed. Thirdly, as the model used for the simulation was static, the recapture element in case of cross-border loss off-setting is not covered. Finally, we assume in our model that profit before tax is the same as tax base for the determination of CCCTB. Fourth, our simulation of the impacts CCTB and CCCTB

is based on the mandatory implementation for all economic subjects fulfilling the two-layer cumulative condition for entering into a group taxation scheme and consolidation.

3. Results

Currently, majority of MNEs are taxed as separate entities in the European Union, in countries, in which they are tax residents (with the exception of Netherlands applying full consolidation scheme). The final result of the project CCCTB re-launching should be the situation, when group taxation scheme and full consolidation is accessible for all the EU companies meeting the two-layer cumulative conditions already described above. This will result into the changes in allocated corporate tax bases of EU Member States, especially those, which do not allow applying group taxation schemes at all.

The aim of the paper is to simulate the impacts of introduction of cross-border loss offsetting (i.e. first implementation step) and the impacts of full CCCTB implementation (i.e. second implementation step) on the tax bases allocated in Slovak Republic. In order to gain the dataset of companies legible for group taxation scheme and consolidation under CCCTB, we have filtered from the Amadeus and Bankscope database all the companies fulfilling the two-layer cumulative criteria for entering into the group taxation scheme under CCCTB, having either parent or subsidiary company resident in the Slovak Republic. Secondly, only the entities with known information on profit or loss before taxation and on fixed tangible assets were selected, as those indicators are crucial for further application of methods for missing data imputation. However, dataset from Bankscope database included a lot of missing data and non-retrievable companies therefore it was unsuitable to use it for further research.

Based on the procedure described above, two datasets of companies were gained. First group of companies created 52,698 companies representing SK subsidiaries of EU parent companies and second group created 728 companies representing EU subsidiaries of SK parent companies.

Consequently, the detailed analysis of the financial statements of the companies was performed, in order to gain the information on the financial indicators employed in the allocation formula suggested by CCCTB and also to gain the information on profit or loss before the taxation. Further, the current situation of group tax bases allocation with respect to the Slovak Republic in the defined two groups was mapped. The data are shown in following Table 1 and Table 2.

As can be seen from the above stated table 1, 34.08% of SK subsidiaries are having parent companies in SK, 26% of SK subsidiaries are having parents in Germany and 10.44% of SK subsidiaries are having parent in Cyprus. Table 2

shows that in the second group of companies, SK parents are having biggest group of subsidiaries in the Czech Republic (83.64%), in Romania (4.77%) and Poland (3.18%). Currently, the first group creates the tax base of EUR 3,586.7 mil. in Slovak Republic, while the second group creates the tax base of EUR 49.9 mil. outside of Slovak Republic (i.e. all the companies legible for group taxation scheme and consolidation under CCCTB generate at present the corporate tax base in the amount of EUR 3,636.6 mil.).

Table 1

Current Situation – 1st Group

Current situation			
Code	Subsidiary country	Profit before tax* in mil EUR	Profit before tax in %
GROUP 1 – SK subsidiaries of EU parent company			
AT	Slovakia	170.06	4.74
BE	Slovakia	16.11	0.45
BG	Slovakia	1.38	0.04
CY	Slovakia	374.54	10.44
CZ	Slovakia	134.65	3.75
DE	Slovakia	955.03	26.63
DK	Slovakia	20.74	0.58
EE	Slovakia	0	0.00
ES	Slovakia	35.63	0.99
FI	Slovakia	9.67	0.27
FR	Slovakia	294.02	8.20
GB	Slovakia	96.03	2.68
GR	Slovakia	0.57	0.02
HR	Slovakia	1.33	0.04
HU	Slovakia	31.59	0.88
IE	Slovakia	30.93	0.86
IT	Slovakia	72.45	2.02
LT	Slovakia	0.14	0.00
LU	Slovakia	22.59	0.63
LV	Slovakia	1.47	0.04
MT	Slovakia	0	0.00
NL	Slovakia	31.98	0.89
PL	Slovakia	31.18	0.87
PT	Slovakia	0.51	0.01
RO	Slovakia	1.34	0.04
SE	Slovakia	29.76	0.83
SI	Slovakia	0.69	0.02
SK	Slovakia	1 222.34	34.08
Total	SK	3 586. 7	100

Source: Amadeus database; own calculations.

After the mapping the current situation and identification of the groups of companies legible for the group taxation scheme and consolidation under CCCTB, the impact of the first implementation step was researched. In this step Commission suggests to replace the consolidation element by the possibility of the cross-border loss offsetting. Hence, within the identified group of companies, having subsidiaries outside of SK (i.e. group 2), the possibility of cross-border

loss offsetting within the group was applied. The impacts on the corporate tax bases allocated in the Slovak Republic are shown in Table 3.

Table 2

Current Situation – 2nd Group

Current situation			
Code	Subsidiary country	Total_profit before tax in mil EUR	Total_profit before tax in %
GROUP 2 – Sub. outside of SK (parent company in SK)			
SK	Austria	0	0.00
SK	Bulgaria	0.25	0.50
SK	Croatia	0.04	0.08
SK	Cyprus	0	0.00
SK	Czech Republic	41.74	83.64
SK	Estonia	0.54	1.08
SK	Germany	0	0.00
SK	Hungary	0.10	0.21
SK	Italy	1.42	2.84
SK	Latvia	0.62	1.24
SK	Luxembourg	0	0.00
SK	Netherlands	0.67	1.34
SK	Poland	1.58	3.18
SK	Portugal	0	0.00
SK	Romania	2.38	4.77
SK	Slovenia	0.0015	0.00
SK	Spain	0.56	1.12
SK	United Kingdom	0	0.00
Total		49.90	100

Source: Amadeus database; own calculations.

Table 3

Impact of Cross-border Loss Offsetting

Country of parent	Subsidiary country	Total_losses_2014 in mil. EUR	
GROUP 2		Absolute	%
SK	Austria	0	0
SK	Bulgaria	-0.0097	0.10
SK	Croatia	-0.10	1.04
SK	Cyprus	0	0
SK	Czech Republic	-8.43	86.68
SK	Estonia	0	0
SK	Germany	0	0
SK	Hungary	-0.21	2.17
SK	Italy	0	0
SK	Latvia	0	0
SK	Luxembourg	0	0
SK	Netherlands	0	0
SK	Poland	0	0
SK	Portugal	0	0
SK	Romania	-0.97	10.02
SK	Slovenia	0	0
SK	Spain	0	0
SK	United Kingdom	0	0
Total losses in mil. EUR		-9.72	100
Total	Profit before tax in SK in mil. EUR	3 586.73	
Change in %		-0.27	

Source: Amadeus database; own calculations.

The introduction of the first implementation step results into the decrease of total corporate tax base by EUR 9.72 mils. i.e. by 0.27%, as is obvious from the above stated Table 3. The decrease would be caused mainly by the offsetting of losses of subsidiaries from the Czech Republic (by 86.68%) followed by the offsetting of losses of subsidiaries in Romania (10.02%) and Hungary (2.17%).

Consequently, in order to simulate second implementation step – i.e. the impact of introduction of consolidation element, it was necessary to impute the missing data. The following table 4 shows the proportion of missing data in case of every employed financial indicator from the data set of companies. The most frequent imputed data were number of employees and payroll. Therefore, the impact of imputation of missing data on the dataset and consequently on the amount of tax base (i.e. profit before taxation) was further considered. Based on it, in the case of 23,743 entities their mean value of profit before tax without any imputation was in the amount of EUR 93,297 contrary with the amount of EUR 7,222 as a mean value of profit before tax in the case of 29,420 entities with at least one imputed value. The analysis proved that imputation of missing data was performed for dataset generating lower value of profit before tax and therefore its impact on the overall results is not serious, however, its covering was necessary due to following aspects. Firstly, to render a realistic form of whole groups and all its members which meet the criteria for consolidation and consequently to provide better application of allocation formula. Secondly, omitting a dataset with imputed data could significantly affect the results (approximately about EUR 212 mil. as a profit before tax and its possible taxation in the country based on the allocation formula).

Table 4

Missing Data Proportion

2014	No. of entities		
	Imputed	Data set	%
Group 1			
Operating turnover	0		0
No. Employees	22 391	52 698	42.49
Payroll	22 356		42.42
Group 2			
Operating turnover	30		4.12
No. Employees	354	728	48.63
Payroll	322		44.23

Source: Amadeus database; own calculations.

The missing data were imputed by three methods as indicated in methodological part (regression model, imputation and Monte Carlo method) and the sensitivity analysis was performed in order to research the method which is the most

suitable for imputation (for details see methodological part). The performance of all three methods and sensitivity analysis is stated in appendix of the paper. The results of the sensitivity analysis show that pure regression is the best method for missing data imputation in case of Slovak Republic. The following Table 5 presents the results in case of CCCTB implementation as well as the comparison of the results with current situation.

Table 5

CCCTB Implementation and Comparison with Current Situation

Current situation		CCCTB – GROUP 1		Current situation		CCCTB – GROUP 2	
Country	Profit before tax 2014 in mil. EUR	Real data	Regression imputation	Country	Profit before tax 2014 in mil. EUR	Real data	Regression imputation
GROUP 1 – SK subsidiaries of EU parent company		Profit before tax 2014 in mil. EUR		GROUP 2 – Sub. outside of SK (parent company in SK)		Profit before tax 2014 in mil. EUR	
AT	170.06	128.82	106.18	AT	0	0.0062	0.12
BE	16.11	17.92	17.28	BE	0	0	0
BG	1.38	0.10	1.8	BG	0.25	0	0.11
CY	374.54	56.50	51.14	CY	0	0	0
CZ	134.65	110.34	104.19	CZ	41.74	33.33	34.62
DE	955.03	1 464.03	1 311.56	DE	0	0.019	0.16
DK	20.74	94.77	78.72	DK	0	0	0
EE	0	7.57	7.53	EE	0.54	0.63	0.62
ES	35.63	16.16	16.42	ES	0.56	0.72	0.65
FI	9.67	16.20	14.89	FI	0	0	0
FR	294.02	300.68	258.87	FR	0	0	0
GB	96.03	598.35	279.52	GB	0	0.13	1.41
GR	0.57	0.62	0.64	GR	0	0	0
HR	1.33	0.41	0.46	HR	0.04	0.047	0.048
HU	31.59	73.55	68.24	HU	0.10	0.17	0.19
IE	30.93	20.2	17.95	IE	0	0	0
IT	72.45	63.31	57.39	IT	1.42	0.73	0.72
LT	0.14	0.32	0.21	LT	0	0	0
LU	22.59	16.59	19.3	LU	0	0	0
LV	1.47	1.69	1.68	LV	0.62	0.25	0.54
MT	0	0.028	0.02	MT	0	0	0
NL	31.98	114.57	96.69	NL	0.67	0.0098	20.39
PL	31.18	17.46	14.61	PL	1.58	0.89	1.23
PT	0.51	2.15	2.30	PT	0	0	0
RO	1.34	0.64	0.75	RO	2.38	2.39	2.31
SE	29.76	71.09	78.04	SE	0	0	0
SI	0.69	0.48	0.49	SI	0.0015	0	0.0015
SK	1 222.34	1 017.85	1 077.50	SK	0	0	0
Total	3 586.7	4 212.26	3 683.40		49.90	39.34	63.11
Change		+625.56	+96.70			-10.56	+13.21

Source: Amadeus database and own calculations.

As can be seen from above stated Table 5, based on the dataset with imputed data the second implementation step would result into the allocation of tax bases in the first group (i.e. SK subsidiaries) in the amount of EUR 3,683.40 mil. and in the second group (i.e. EU subsidiaries outside of SK) in the amount of EUR

63.11 mil. In comparison with current situation it means an increase of the allocated tax bases in the first group by EUR 96.7 mil. and in the second group the increase of allocated tax bases by EUR 13.21 mil. The overall corporate tax bases allocated in the Slovak Republic would increase after the full CCCTB implementation by 3.02%. However, based on the dataset with real data, the second implementation step would result into the allocation of tax bases in the amount of EUR 4,212.26 mil. (first group) and EUR 39.34 mil. (second group) which means an increase of overall corporate tax bases allocated in the Slovak Republic by EUR 615 mil. after the full CCCTB implementation. As is obvious, the results of both dataset differ. It is caused by the fact that dataset with imputed data includes more complex data about groups resulting with better application of allocation formula (i.e. it is possible to say that approximately EUR 500 mil. was allocated outside the Slovak Republic).

The results of our research differ from the results obtained by (Devereux and Loretz, 2008), who predicted the increase of allocated tax bases in Slovak Republic by 31.9%. The difference is caused mainly by the fact, that the dataset for Slovak Republic used by authors consisted of 130 subsidiaries and 3 parents on the contrary to dataset consisting of 52,698 SK subsidiaries and 728 EU subsidiaries outside of SK (of SK parent companies) used in this paper. Moreover, the authors did not apply any method for missing data imputation; the research is purely based only on the data available in the Amadeus database. Similar reason can also be mentioned in case of the research performed by Cline et al. (2010). The authors indicated the decrease of allocated tax bases after the full implementation of CCCTB by 4.2% in the Slovak Republic based on the dataset of 57 legible groups of companies.

However, as we already mentioned before, performing of the imputation was necessary due to two important aspects. Firstly, to render a realistic form of whole groups and all its members which meet the criteria for consolidation and consequently to provide better application of allocation formula. Secondly, as our results show, omitting a dataset with imputed data can significantly affect the results (approximately about EUR 212 mil as a profit before tax and its possible taxation in the country based on the allocation formula in our case). Domonkos et al. (2013) predicted the decrease in the corporate tax revenue in Slovak Republic by 14.6% in 2010. Similarly, it is mainly due to the fact that the research was done on the sample of 11 companies only, while dataset comprised in this paper covers 53 426 legible companies. Moreover, the research performed by Domonkos et al. (2013) is based on significantly different data – years 2009 and 2010 – i.e. the years of the financial crises, which resulted into the significant changes in groups of MNEs.

Conclusion

Currently, CCCTB represents the tool for the fight against the aggressive tax planning as a result of the existent loopholes between the national corporate tax systems. Due to this fact, on 17th July 2015, as a part of the Action plan for fair and efficient taxation, the Commission has relaunched the CCCTB project, which should take place in two implementation steps. Firstly, only common rules for corporate tax base construction should be implemented, together with the possibility of the cross-border loss offsetting. Only then, in the second step the full CCCTB system should be implemented.

The aim of the paper was to simulate the impacts of introduction of cross-border loss offsetting (i.e. first implementation step) and the impacts of the full CCCTB implementation on the tax bases allocated in Slovak Republic. The empirical analysis is based on dataset of companies fulfilling two-layer cumulative condition for entering into group taxation scheme and consolidation divided into two groups. First group consisting of 52,689 entities comprised Slovak subsidiaries of the EU parent companies (i.e. tax residents in the Slovak Republic), while the second consisting of 728 entities comprised EU subsidiaries with parent companies in the Slovak Republic. Based on the results of the research we conclude that the introduction of the first implementation step in Slovak Republic would result into the decrease of total corporate tax base by 0.27%. And further, in case of the full obligatory CCCTB implementation, Slovak Republic would gain additional tax bases in the first group in the total amount of EUR 96.7 mil. and in the second group in the total amount of EUR 13.21 mil – i.e. that the overall corporate tax bases allocated in the Slovak Republic would increase after the second implementation step by 3.02%.

The results show that the impact of CCTB or CCCTB on the budget of the Slovak Republic would probably have only limited financial effect. However, as indicated in the preliminary position of the Slovak Republic and in the context of the latest development in the form of Brexit, we recommend to expand the research further and to simulate the impact of Brexit on the results. Moreover, in this light, we strongly recommend to the policy makers in the Slovak Republic to simulate also effects of implementation of this system on macro indicators as GDP, employment, interests rates and others in order to gain the complete picture of the CCCTB impacts on the whole economy of the Slovak Republic.

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Appendix

Table 1
Sensitivity Analysis – Standard Deviation from Reality

Country	Turnover imputation	Turnover regression	Turnover mcmc	Employees imputation	Employees regression	Employees mcmc	Costs of Employees imputation	Costs of Employees regression	Costs of Employees mcmc
AT	1.89E+18	1E+16	1E+16	2.08E+05	1.34E+04	1.34E+04	6.79E+18	1.13E+15	1.13E+15
BE	1.3E+17	3.61E+16	3.61E+16	3.57E+05	1.13E+05	1.13E+05	1.29E+15	2.35E+14	2.35E+14
BG	5.65E+13	2.53E+13	2.53E+13	2.56E+04	1.74E+03	1.74E+03	1.44E+12	1.45E+11	1.45E+11
CY	5.73E+16	5.53E+16	5.53E+16	7.38E+03	3.06E+03	3.06E+03	–	–	–
CZ	2.84E+15	1.64E+15	1.64E+15	5.06E+04	1.13E+04	1.13E+04	8.6E+12	1.94E+12	1.94E+12
DE	2.78E+18	6.87E+17	6.87E+17	1.93E+07	1.20E+06	1.20E+06	2.03E+18	3.49E+16	3.49E+16
DK	7.19E+18	1.13E+17	1.13E+17	2.92E+08	6.53E+07	6.53E+07	3.32E+16	4.02E+15	4.02E+15
EE	2.06E+14	1.16E+14	1.18E+14	1.05E+04	3.85E+03	3.85E+03	5.57E+12	1.01E+12	1.01E+12
GR	3.24E+15	2.71E+15	2.71E+15	6.45E+04	3.63E+04	3.63E+04	–	–	–
ES	4.45E+17	2.29E+17	2.29E+17	7.41E+06	1.44E+06	1.44E+06	6.31E+15	1.01E+15	1.01E+15
FI	5.52E+16	2.69E+16	2.69E+16	7.13E+05	1.61E+05	1.62E+05	3.48E+14	1.01E+14	1.01E+14
FR	1.06E+17	6.9E+16	6.9E+16	6.18E+08	1.36E+06	1.36E+06	5.75E+17	2.32E+15	2.32E+15
HR	3.97E+14	2.67E+14	2.67E+14	3.05E+04	1.16E+04	1.16E+04	5.1E+12	1.52E+12	1.52E+12
HU	2.37E+16	1.19E+16	1.19E+16	7.33E+05	3.31E+05	3.31E+05	2.32E+14	7.86E+13	7.86E+13
IE	2.81E+19	4.64E+16	4.67E+16	2.86E+06	3.51E+04	3.52E+04	1.34E+16	9.32E+13	9.32E+13
IT	5.71E+16	1.8E+16	1.8E+16	1.58E+06	6.00E+04	6.00E+04	2.4E+15	7.01E+13	7.01E+13
LT	1.72E+15	5.43E+14	5.43E+14	1.61E+05	3.56E+04	3.56E+04	–	–	–
LU	2.58E+17	1.37E+17	1.37E+17	4.79E+05	1.94E+04	1.92E+04	2.93E+14	1.44E+14	1.41E+14
LV	5.25E+13	3.73E+13	3.73E+13	2.72E+03	4.49E+02	4.49E+02	7.1E+15	1.2E+11	1.12E+11
MT	2.35E+15	4.62E+14	4.62E+14	–	–	–	–	–	–
NL	1.54E+20	5.82E+18	5.83E+18	7.73E+06	1.21E+06	1.21E+06	1.18E+18	6.42E+14	6.07E+14
PL	1.1E+16	5.75E+15	5.75E+15	4.25E+07	1.55E+05	1.50E+05	5.73E+13	1.17E+13	1.32E+13
PT	8.23E+16	3.32E+16	3.33E+16	7.51E+05	5.74E+05	5.74E+05	8.28E+14	2.17E+14	2.17E+14
RO	1.16E+14	5.83E+13	5.83E+13	1.83E+04	2.80E+03	2.80E+03	4.54E+12	4.16E+11	4.16E+11
SE	4.64E+16	2.6E+16	2.6E+16	5.14E+05	1.86E+05	1.86E+05	2.35E+15	5.58E+14	5.58E+14
SI	1.58E+14	1.17E+14	1.17E+14	4.28E+03	2.39E+03	2.39E+03	2.22E+12	1.23E+12	1.23E+12
SK	1.34E+14	6.59E+13	6.59E+13	3.54E+04	6.03E+03	6.03E+03	7.34E+12	1.35E+12	1.35E+12
UK	8.16E+18	6.47E+17	6.47E+17	2.96E+08	3.81E+06	3.81E+06	5.84E+17	7.11E+15	7.1E+15

Source: Amadeus database; own calculations.

Table 2

Sensitivity Analysis – Evaluation of the Missing Data Methods

Country	Turnover imputation ¹	Turnover regression ¹	Turnover mcmc ¹	Employees imputation ¹	Employees regression ¹	Employees mcmc ¹	Costs of Employees imputation ¹	Costs of Employees regression ¹	Costs of Employees mcmc ¹
AT	5	1	1	5	1	2	5	2	1
BE	5	1	1	5	1	2	5	1	1
BG	5	1	1	5	1	2	5	1	1
CY	5	1	2	5	1	2	–	–	–
CZ	5	1	1	5	1	2	5	1	1
DE	5	1	1	5	1	2	5	1	1
DK	5	1	1	5	1	2	5	1	2
EE	5	1	2	5	1	2	5	1	1
GR	5	1	1	5	1	2	–	–	–
ES	5	1	2	5	1	2	5	1	1
FI	5	1	2	5	1	2	5	1	1
FR	5	1	2	5	1	2	5	1	1
HR	5	1	2	5	1	2	5	1	1
HU	5	1	2	5	1	2	5	1	1
IE	5	1	2	5	1	2	5	1	1
IT	5	1	1	5	1	2	5	1	1
LT	5	1	1	5	1	2	–	–	–
LU	5	1	1	5	1	2	5	2	1
LV	5	1	1	5	1	2	5	2	1
MT	5	1	2	–	–	–	–	–	–
NL	5	1	2	5	1	2	5	2	1
PL	5	1	2	5	2	1	5	1	2
PT	5	1	2	5	1	2	5	1	1
RO	5	1	1	5	1	2	5	1	1
SE	5	1	1	5	1	2	5	1	1
SI	5	1	1	5	1	2	5	1	1
SK	5	1	1	5	1	2	5	1	1
UK	5	1	1	5	2	1	5	2	1

Note: ¹ Values between 1 and 5 mean the evaluation of each method. The best result is 1, the worst one 5.

Source: Amadeus database; own calculations.