



UNVEILING THE VARIATION IN CORPORATE TAX BASE DISTRIBUTION UNDER THE FORMULARY APPORTIONMENT

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Abstract

This paper reflects the tabled novel framework for corporate taxation in the European Union, founded on the Formulary Apportionment methodology and envisaged inclusion of intangible assets in the allocation formula. The objective is to simulate the variation between the currently used Separate Accounting and tabled Formulary Apportionment distribution of corporate tax base of companies active in the European Union. This paper exploits secondary microeconomic panel data obtained from the Orbis database for 77,087 subsidiaries affiliated with 2,283 parent companies observed from 2011 to 2019. The results reveal that the most significant relative declines of over 15% in the corporate tax base would be faced by Luxembourg, Malta, Cyprus, the Netherlands, and Ireland. In contrast, the biggest relative gains were accounted for Greece, Romania, Hungary, Estonia, and Latvia. If cross-border consolidation of losses is incorporated in the envisaged corporate tax framework, the EU-wide aggregate tax base reduces by 15, 67% over the examined years.

Keywords

Formulary Apportionment, BEFIT, Corporate Tax Base

I. Introduction

The European Commission tabled a novel Proposal for a Council Directive on Business in Europe: Framework for Income Taxation² (BEFIT Proposal). The BEFIT Proposal replaced the Proposal for a Council Directive on a Common Consolidated Corporate Tax Base³ (CCCTB Proposal). The CCCTB Proposal was based on a single corporate tax rulebook and allocation of corporate tax base between EU Member States based on the Formulary

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² COM (2023) 532 final. Proposal for a Council Directive on Business in Europe: Framework for Income Taxation (BEFIT).

³ COM (2016) 683 final, 25.10.2016. Proposal for a Council directive on a Common Consolidated Corporate Tax Base (CCCTB).

Apportionment (FA) method. The BEFIT Proposal, the European Commission presented three versions of implementation, namely the “Comprehensive”, “Light”, and “Composite” version. Three options for the allocation of the aggregated tax base are discussed under the BEFIT Proposal. The first option is an allocation formula with the labour factor (including payroll and/or the number of employees), tangible assets (excluding financial assets except for specific sectors), and sales by destination. The stated, commonly used, factors are defined in coincidental way to the preceding CCCTB Proposal. The second option is a formula with a novelty addition of intangible assets. The intangible assets are defined in simple terms as assets without physical (or tangible) form. Examples include intellectual property such as patents and copyright. Within the second option it is considered to reflect, first⁴, the location where intangible assets are booked in financial accounts, and second⁵, the location where research and development expenses, staff training expenses and costs for marketing and advertising are incurred. Third, due to uncertainties and limited data to estimate the effects of the FA methodology the European Commission suggested to implement a transitional allocation rule with the aim to pave the way for an allocation formula to be implemented in future. This paper reflects the indicated inclusion of intangible assets in the FA methodology under the BEFIT Proposal.

Previously, the scholarly literature has extensively investigated the effect of the FA under the CCCTB Proposal on the distribution of corporate tax base across EU Member States. The results have corroborated that the implementation of the FA methodology would have noteworthy repercussions on the aggregate corporate tax base, with certain member states receiving a greater or lesser share of the pie. This paper considers the novel allocation formula including the intangible assets within the BEFIT Proposal, and focuses on its corporate tax base implications for the EU Member States over the examined years.

The main objective of the paper is to analyse the variation between the FA distribution and Separate Accounting (SA) of corporate tax base of companies active within the EU internal market and thus contribute to the debate on the BEFIT Proposal. Furthermore, the paper contemplates the possibility of group-wide (cross border) loss consolidation as well as the alternative of consolidation without losses. The empirical analysis employs microeconomic panel data (2011–2019) obtained from the Orbis database. The final data set encompasses 77,087 subsidiaries affiliated with 2,283 parent companies. Simulating the variation between the FA and SA distribution, substantial implications were highlighted. Differentiating from previous research, this paper reflects the novel composition of the FA envisaged, including the intangible assets. Consequently, it represents a contemporary update to previous scholarly endeavours in this field. Furthermore, the analyses employ a more recent data set with an extended time series, thus enhancing the temporal dimension of the study and yielding greater robustness in the findings.

⁴ Legal ownership and (book) value as recorded in the financial statements to determine the location of intangible assets.

⁵ Research and development expenses, staff training expenses, and costs for marketing and advertising as a proxy value for intangible assets (i.e., where intangible value is created).

This paper is structured as follows: Section II reviews the literature focused on the impact of the FA on corporate tax base; Section III describes the methodology applied; Section IV presents results; Section V presents conclusions along with a list of contributions and potential limitations.

II. Literature Review

Under the traditional method currently used, the SA method, each entity (subsidiary) within the affiliated parent company calculates its independent separate tax base. Differently, under the FA method, as part of the proposed BEFIT Proposal, all entities affiliated to a parent company calculate a common corporate tax base, which is subsequently distributed across EU Member States, using quantitative allocation mechanism, the FA method. The FA method is currently mainly used in federal economies, for example, in the United States of America (USA), Canada, Germany, and Switzerland. Traditionally, countries with subnational FA systems have relied on a combination of factors, based on immaterial sources, such as tangible assets, labour, and third-party sales (Matheson et al., 2021). Intangibles and financial assets were generally excluded from the FA methodology due to their mobile nature and the risk of circumvention of the system (Roggeman et al., 2012; Mintz, 2008).

The literature on the impact of the FA methodology on the corporate tax base is extensive. In the context of the CCCTB Proposal and integrated FA methodology, a significant number of authors focused on the tax revenue implications for EU Member States. Results obtained by scholars differ considerably and a clear conclusion in this regard was not reached. Given the abundance of research conducted and the heterogeneity of their findings, the following Table 1 presents a comprehensive synthesis of the identified empirical investigations. Specifically, the primary objective(s) and/or research questions, the research design, and the findings obtained from empirical studies in this field are enumerated.

Table 1: Empirical research on the implications of implementing FA on the corporate tax base

STUDY	RQ / AIM	METHODOLOGY	MAIN FINDINGS
Nerudová et al. (2021)	<i>“What are the impacts of the CCCTB Proposal on the economic environment in the EU after Brexit.”</i>	Micro-data, database: Amadeus and Bankscope.	<i>“The overall tax base under the CCCTB in the post-Brexit period would decrease by 5.34%. The CCCTB could increase the tax base by 3.33% to 22.42%, depending on the behavioural effects.”</i>

STUDY	RQ / AIM	METHODOLOGY	MAIN FINDINGS
Cobham et al. (2021)	<i>“To evaluate the EU EC’s Proposals and assess the impact on the corporate tax base, Should the EU decide to go ahead with the CCCTB Proposal or an alternative proposal without full consolidation (CCTB)?”</i>	Micro-data, database: Orbis, years: 2007–2015, total: 34,266 individual companies, which consolidate in up to 19,223 groups.	<i>“The CCCTB including loss consolidation is likely to impose large tax revenue costs of about 1/5 of the corporate tax base. An application at only the EU level would overlook the extent of profit shifting out of the EU and lock in further unnecessary revenue losses. Major EU profit-shifting countries such as LU, IE and the NL may experience significant revenue losses.”</i>
de Mooij et al. (2021)	<i>“What is the economic and distributional impact of global FA? What are the direct revenue implications of FA for individual countries under alternative FAs?”</i>	(i) company-level data, database: Orbis, EU MNCs; (ii) country-level data, affiliates of US MNCs worldwide; database: Bureau of Economic Analysis; (iii) country-by-country reports by US MNCs with revenue greater than USD 850 million, database: Internal Revenue Service.	<i>“Countries with high levels of investment activity, such as investment hubs, face significant declines in tax revenues, with losses amounting to as much as 80%. Conversely, numerous developed economies have recorded a rise in their tax revenue. Developing countries gain mostly if the labour factor receives a large weight in the FA, yet also tend to benefit on average from a FA based on sales by destination.”</i>
Nerudová and Solilová (2019)	<i>“What is the impact of the CCCTB on the corporate tax bases allocated in the individual EU MS?”</i>	A semi-dynamic model, database: Amadeus and Bankscope, year: 2014.	<i>“In the group of large entities (mandatory implementation) results in a 4.2% decrease in the total corporate tax base. In the SME dataset, the impact of quantified as an 8.9% to 12.8% increase in the total tax base.”</i>
Nerudová and Solilová (2018)	<i>“What is the impact of mandatory CCCTB implementation in the Eurozone on tax bases in the CZ and consequently on Czech corporate tax revenues.”</i>	Micro-data, database: Amadeus and Bankscope, 2,424 parent companies with 3,860 CZ subsidiaries.	<i>“The mandatory implementation of the CCCTB system in the Eurozone would have negative impact on the tax bases currently generated and located in the CZ (loss between 0.87% and 8.84% of the corporate tax base in 2011).”</i>

STUDY	RQ / AIM	METHODOLOGY	MAIN FINDINGS
Nerudová and Solilová (2017)	<i>“What is the impact of both implementation steps of the CCCTB on the amount of the tax base allocated in the SK?”</i>	Micro-data, database: Amadeus and Bankscope, Two groups of companies: i) SK subsidiaries of the EU parent companies (52,689 tax residents in the SK), ii) EU subsidiaries with parent companies in the SK (728 entities); year: 2015.	<i>“Introduction of cross-border loss offsetting would result in decrease of SK corporate tax base by 0.27%; the full CCCTB would increase the SK corporate tax base by 3.02%”</i>
Solilová et al. (2016)	<i>“To quantify the outflow/inflow of the tax bases from/into the CZ as a result of the implementation of the CCCTB system and to quantify the impact on the tax revenue.”</i>	Micro-data, database: Amadeus and Bankscope, 1,597 CZ parent companies with 2,476 subsidiaries in the CZ and other EU MS and, 827 other EU parent companies with 1,384 subsidiaries in the CZ.	<i>“The implementation of CCCTB system in EU-27 except of the CZ would lead to a decrease of the corporate tax base (from 0.77% to 6.77%), which represents 0.20% to 1.73% of current corporate tax revenues.”</i>
European Commission (2016)	<i>“Impact assessment of the CCCTB Proposal”</i>	CORTAX model	<i>“Decrease in total tax revenues for the EU-28 of 0.08% of GDP, corresponding to about EUR 11 billion.”</i>
Nerudová and Solilová (2015)	<i>“To quantify the differences in the division of the MNCs group tax base between the individual EU MS under SA and under CCCTB with the FA.”</i>	Micro-data, database: Amadeus, i) Parent company in CZ and subsidiaries in EU, ii) Parent company in EU and subsidiaries in EU.	<i>“The CZ could gain in situation when CCCTB would be introduced in all EU MS (the share in the group tax base would increase by 1.22%). A very slight increase was also indicated in the case of the SK, SI and ES. On the contrary, the share in the group tax base was decreased in the case of DE (by 1.36%), EE, HU, and PL.”</i>
Cobham and Loretz (2014)	<i>“Aims to investigate the revenue consequences of various FA factors”</i>	Micro-data, database: Orbis, years: 2003–2011, 322,525 subsidiaries affiliated with 29,984 parents' companies.	<i>“The FA would result in a major redistribution of the tax base, in most cases towards the lower-income countries in the sample. International loss consolidation would reduce the overall tax base by around 12%.”</i>

STUDY	RQ / AIM	METHODOLOGY	MAIN FINDINGS
Domonkos et al. (2013)	<i>“What is the impact of the CCCTB Proposal on the SK budget’s revenues?”</i>	Micro-data, 11 MNCs operating in the SK (8 of prevalently industrial nature, 3 service oriented), years: 2009–2010.	<i>“The tax revenue under the SA is most likely higher than the tax revenues under the FA. The implementation of the FA would decrease the tax revenue for the SK by 31.9% in 2009, 14.6% in 2010.”</i>
Oestreicher and Koch (2011)	<i>“To assess the revenue consequences resulting from the implementation of CCCTB Proposal.”</i>	Micro-data, database: Amadeus, 11,350 EU MNCs (with 66,110 companies), years: 1994–2003.	<i>“Total tax revenue of the EU MS would decrease by 4.56% under mandatory, by 4.65% under a voluntary CCCTB. The CZ, IT, LV, PL, and SK would profit from a compulsory CCCTB, whereas IE and the NL would borne the greatest losses.”</i>
Pirvu et al. (2011)	<i>“What are the effects of the EU FA on tax revenues in RO?”</i>	Micro-data, 9 MNCs and all their subsidiaries active in RO (37 subsidiaries), years: 2006–2009.	<i>“If the FA included payroll, the tax revenue in RO would decline by 0.035% and the elimination of the payroll in the FA would generate an increase of tax revenues by 32.6%.”</i>
Bettendorf et al. (2010)	<i>“How would the introduction of the CCCTB affect behaviour by firms and governments?”</i>	CORTAX model, database: Orbis, country averages, year: 2005.	<i>“Neither a common base nor consolidation with FA will yield substantial welfare gains in Europe.”</i>
Riedel (2010)	<i>“What is the impact of corporate taxes on the input factor choice of MNCs under FA?”</i>	Micro-data, DE, approx. 1.3 million MNCs per cross section, years: 1998 and 2001.	<i>“MNCs distort their employment and payroll costs in favour of low-tax locations. On average, a 1 pp increase in the tax rate differential between an affiliate and foreign group members is found to lower the affiliate’s payroll to capital ratio by 1.9%.”</i>

STUDY	RQ / AIM	METHODOLOGY	MAIN FINDINGS
Devereux and Loretz (2008)	<i>“What is the impact on tax revenues in each EU MS?”</i>	Micro-data, database: Orbis, companies registered in one of the 25 pre-2007 EU MS	<i>“The tax revenues of the EU MS would be reduced by approx. 2.5% on average. Depending on the exact design of the FA, tax receipts could increase by around 50% for HU and SK. Their increased tax income comes primarily at the expense of DK, FI, DE, IT and LU. If all companies were forced to consolidate and apportion their profits, total tax payments would increase by roughly 2% on average. In this case, the large and high-tax countries would be likely to gain revenue.”</i>
Fuest et al. (2007)	<i>“How would the introduction of a common tax base with FA in the EU affect the size of the corporate tax base and its distribution across MS?”</i>	Combined dataset, DE company-level FDI data and balance sheet information on the parent companies, years: 1996–2001.	<i>“Due to cross-border loss offsetting, the EU-wide corporate tax base shrinks significantly (by approx. 20%). Smaller countries which are usually considered to attract book profits under the SA, i.e., IE and the NL, tend to lose a larger part of their tax base than larger countries like DE, IT, FR or UK.”</i>
Edmiston and del Granado (2006)	<i>“To evaluate the economic development and revenue aspects of increasing the sales factor weight in FA.”</i>	Micro-data, US (Georgia), corporate income tax returns, years: 1992–2002.	<i>“Increased sales factor weights should have a positive impact on the utilization of productive factors in the acting state.”</i>

III. Methodology

To simulate a result of change in tax policy, in particular the variation in the SA and the FA distribution of corporate tax base, two major approaches could be identified. First, CGE models, such as the CORTAX model, could be utilised, as did the European Commission (2016) and Bettendorf et al. (2010). Alternatively, and in this paper utilised, static comparison of micro-level data can be used (Cobham et al., 2021; Devereux and Loretz, 2008; Cobham and Loretz, 2014). This paper employs secondary microeconomic panel data obtained from the Orbis database, a global company database, produced by the Bureau van Dijk. Based on the maximum data availability in the selected database, the period 2011 to 2019 was investigated. Congruently with Domonkos et al. (2013), Clausing and Lahav

(2011), Pirvu et al. (2011), Oestreicher and Koch (2011), Gupta et al. (2009), Fuest et al. (2007) and Shackelford and Slemrod (1998), panel data analysis was chosen due to higher efficiency and power compared to cross-sectional models. Moreover, according to Hundsdoerfer and Wagner (2020), considering the variation between the SA and the FA distribution in only a single financial year would represent a snapshot.

Data

The analysis considers active companies⁶ operating within the EU internal market⁷ during the period 2011 to 2019. Multiple cumulative qualifying criteria, in accordance with the former CCCTB Proposal⁸, were applied within the search strategy. A particular member of the company is qualified as the parent company or qualifying subsidiary. According to article 3 of the CCCTB Proposal, “the qualifying subsidiary” means every immediate and lower-tier subsidiary in which the parent company has a right to exercise more than 50% of the voting rights; and has an ownership right amounting to more than 75% of the subsidiary’s capital or owns more than 75% of the rights that give entitlement to profit. In addition, at least one known value for the dependent variable in the selected time period was requested to include the company in the data set. According to article 2 of the CCCTB Proposal⁹ only companies belonging to a parent company with a total consolidated turnover that exceeded EUR 750 million were considered during the financial year preceding the relevant financial year.¹⁰

The qualifying search strategy identified¹¹ 712,572 subsidiaries affiliated with 320,216 parent companies for which information on the profit before tax¹² as a proxy for the corporate tax base was obtained. Additionally, to compute the corporate tax base under the FA, proxies for the factors of the FA, as envisaged for the BEFIT Proposal, namely labour, sales, tangible and intangible assets, were obtained from the Orbis database.

The labour factor, according to articles 32 and 33 of the CCCTB Proposal, is calculated from the total amount of the payroll and the number of employees. As did Krchnivá and Nerudová (2018), Roggeman et al. (2012), Hines (2008), this paper employs the number and cost of employees, as a proxy variable. The sales factor, according to article 37 of the CCCTB Proposal, the proceeds of all sales of goods and supplies of services after discounts and returns, excluding value added tax, and other taxes and duties. As did Krchnivá and Nerudová (2018), Roggeman et al. (2012), Hines (2008), the operating revenue turnover is a proxy variable for the sales factor. Due to database limitations, the sales factor was

⁶ An active company is understood as a legal entity whose passive income (i.e., dividends, interest income, rents, and royalties) accounted for less than 50% of gross income for the previous calendar year.

⁷ The search strategy took into consideration the current 27 EU Member States.

⁸ The tabled BEFIT Proposal (article 5) is in a full compliance with the former CCCTB Proposal in this regard.

⁹ The tabled BEFIT Proposal (article 2) suggests that the same threshold should be reached in at least two of the last four fiscal years for the multinational company to fall within the scope of the BEFIT Proposal.

¹⁰ To prevent significant loss of information, the threshold of 750 million EUR was assessed in 2011 for the year 2011.

¹¹ To be noted, the obtained dataset was further processed before utilized in the empirical analyses.

¹² The profit before tax in the Orbis database represents the total profit (operating profit plus financial profit) earned by a company before any taxes or other deductions are considered.

interpreted as sales by origin (similarly approached by Hundsdoerfer and Wagner, 2020). However, the CCCTB Proposal referred to sales by destination as an apportionment factor that cannot be obtained from the Orbis database. The factor tangible assets, according to article 34 of the CCCTB Proposal, is defined as the average value of all tangible fixed assets owned, rented, or leased by the MNC. As did Krchnivá and Nerudová (2018), Roggeman et al. (2012), Hines (2008), the fixed tangible assets, as a proxy variable, were extracted from balance sheets available in Orbis database.

Reflecting the envisaged intention of the European Commission and following the theoretical conclusions reached by Martins and Taborda (2022), discussing the recognition of intangible assets in the BEFIT FA, concluding that the intangible assets should, in principle, be involved, this paper employs novel FA factor, the intangible assets. Empirical analysis employs a proxy variable, the intangible fixed assets, as extracted from the balance sheets available in the Orbis database.

Method

The variation in the SA and the FA distribution is analysed at the level of the jurisdictions of the EU Member States. In this paper, following the methodological approach of the existing literature in this field, the corporate tax base under the SA is represented by the sum of the reported profits before tax in financial statements of companies registered in each EU Member States' jurisdiction in each year ($pbt_{j,t}^{SA}$). In the following Equation 1, (i) qualifying subsidiary, (j) jurisdiction, (t) year, (N_i) number of qualifying subsidiaries affiliated with the parent company.

$$pbt_{j,t}^{SA} = \sum_{i=1}^{N_i} pbt_{i,j,t}^{SA} \quad (1)$$

To calculate the corporate tax base under FA in each jurisdiction, in every year, ($pbt_{j,t}^{FA}$), first, the consolidated profit before tax of all qualifying subsidiaries affiliated with the parent company should be distributed throughout the jurisdictions of EU Member States according to the researched allocation mechanism within the BEFIT Proposal. The allocation mechanism of profit before tax allocated to a particular subsidiary in each year ($pbt_{i,t}^{FA}$) is denoted by Equation 2. In Equation 2, (pbt) profit before tax, (ort) operating revenue turnover, (coe) cost of employees, (noe) number of employees, (tfa) tangible fixed assets, (ifa) intangible fixed assets, (i) qualifying subsidiary, (guo) parent company, and (t) year.

$$pbt_{i,t}^{FA} = pbt_{guo,t} \times \left[\frac{1}{4} \frac{ort_{i,t}}{ort_{guo,t}} + \frac{1}{4} \left(\frac{1}{2} \frac{coe_{i,t}}{coe_{guo,t}} + \frac{1}{2} \frac{noe_{i,t}}{noe_{guo,t}} \right) + \frac{1}{4} \frac{tfa_{i,t}}{tfa_{guo,t}} + \frac{1}{4} \frac{ifa_{i,t}}{ifa_{guo,t}} \right] \quad (2)$$

Second, corporate tax base under the FA in each jurisdiction in every year ($pbt_{j,t}^{FA}$) hence corresponds to the sum of allocated profits of all subsidiaries ($pbt_{i,t}^{FA}$) registered in each EU Member States' jurisdiction, see Equation 3.

$$pbt_{j,t}^{FA} = \sum_{i=1}^{N_i} pbt_{i,j,t}^{FA} \quad (3)$$

Finally, the variation between the SA and the FA distribution was computed utilizing the subsequent Equation 4.

$$\Delta = pbt_{j,t}^{FA} - pbt_{j,t}^{SA} \quad (4)$$

If the profit deviation (Δ) is equal to zero, both systems attribute identical profit before tax and no variation is indicated. A profit deviation greater (smaller) than zero means that the FA profit before tax is greater (smaller) than the disclosed profit under SA, resulting in higher (lower) tax payments under FA than under SA. Furthermore, both the CCCTB Proposal (article 7(1)) as well as the BEFIT Proposal (article 42) introduce novelty cross-border consolidation of losses within the multinational company. The conducted empirical analysis compares the scenario with and without the proposed novel cross-border consolidation of losses. Moreover, according to CCCTB Proposal article 7(2) and BEFIT Proposal article 42(2b) a negative consolidated tax base, the loss, shall be carried forward and be set off against the next positive consolidated tax base. This feature is not included in the estimation, the loss is not carried forward.

Imputation of missing values

Any analytical endeavour aiming to estimate the effects of a policy change, on a grand scale, is prone to encounter several challenges, particularly in terms of data quality. The obtained short panel data set was, as expected, unbalanced due to true missing values and observations that are not available in the database. A high number of missing values for factors of the FA (*ort*, *noe*, *coe*, *tfa* and *ifa*) was detected. The following table summarizes the missing values for variables in each analysed year.

Differently from Hundsdoerfer and Wagner (2020) who excluded observations with missing values for the factors of the FA, in this paper, to avoid a large loss of information, the glitch was addressed through imputation technique, in particular multiple regression imputation of logarithmic function. For the sake of completeness, only observations with a known profit before tax (in a particular year) for a qualifying subsidiary were included in the analysed dataset, thus no imputation of missing values for the profit before tax was carried out. Moreover, the imputation only works with originally obtained data from the Orbis database, hence no cumulation of imputation steps was performed.

Table 2: Missing values for variables in each analysed year

Variable	n.a.	[%]	Variable	n.a.	[%]	Variable	n.a.	[%]
pbt_2020	778,850	98.00	ort_2020	786,631	99.00	coe_2020	785,749	98.90
pbt_2019	293,611	36.90	ort_2019	361,942	45.50	coe_2019	487,794	61.40
pbt_2018	206,179	25.90	ort_2018	279,016	35.10	coe_2018	426,401	53.70
pbt_2017	218,900	27.50	ort_2017	284,422	35.80	coe_2017	430,261	54.10
pbt_2016	259,959	32.70	ort_2016	312,376	39.30	coe_2016	446,660	56.20
pbt_2015	292,943	36.90	ort_2015	329,451	41.50	coe_2015	460,575	58.00
pbt_2014	363,420	45.70	ort_2014	357,540	45.00	coe_2014	499,878	62.90
pbt_2013	382,876	48.20	ort_2013	377,045	47.40	coe_2013	509,037	64.10
pbt_2012	403,961	50.80	ort_2012	397,394	50.00	coe_2012	519,375	65.40
pbt_2011	426,156	53.60	ort_2011	420,497	52.90	coe_2011	531,883	66.90
noe_2020	780,028	98.10	tfa_2020	781,633	98.40	ifa_2020	781,658	98.40
noe_2019	433,916	54.60	tfa_2019	324,242	40.80	ifa_2019	326,965	41.10
noe_2018	367,037	46.20	tfa_2018	226,545	28.50	ifa_2018	229,422	28.90
noe_2017	361,529	45.50	tfa_2017	232,748	29.30	ifa_2017	235,523	29.60
noe_2016	398,937	50.20	tfa_2016	267,955	33.70	ifa_2016	270,664	34.10
noe_2015	438,474	55.20	tfa_2015	305,338	38.40	ifa_2015	308,100	38.80
noe_2014	469,963	59.10	tfa_2014	370,036	46.60	ifa_2014	372,584	46.90
noe_2013	498,794	62.80	tfa_2013	390,236	49.10	ifa_2013	392,575	49.40
noe_2012	509,091	64.10	tfa_2012	408,139	51.40	ifa_2012	410,299	51.60
noe_2011	520,058	65.40	tfa_2011	427,363	53.80	ifa_2011	429,636	54.10

Source: Authors' calculations based on the Orbis data

Finally, the imputation was calculated based on all companies, i.e., the qualifying criterion of total consolidated turnover exceeding EUR 750 million during the financial year preceding the relevant financial year was omitted in performed imputation analyses. The imputation was computed with the total amount of 712,572 subsidiaries affiliated with 320,216 parent companies. Subsequently, the qualifying criterion of total consolidated turnover was applied on the filled dataset. After the threshold application, the final dataset consisted of 77,087 subsidiaries affiliated with 2,283 parent companies.

IV. Results

The overall EU-wide, corporate tax base over the analysed period under the currently used SA amounted to 6 037 323, 755 million EUR, which equals to the corporate tax base distributed by the FA in case of no loss consolidation scenario. Considering the loss consolidation at the level of the parent company, the overall corporate tax base accounted 5 091 081, 893 million EUR, which represents a shrinkage of 15, 67% of the total aggregated corporate tax base under SA (or the FA without cross-border loss consolidation) over the examined years. The assertion is consistent with previous scholarly research, as highlighted by Cobham et al. (2021), Nerudová et al. (2021), Cobham and Loretz (2014), Fuest et al. (2007).

Further, the variation in the SA and the FA distribution is simulated at the level of EU Member States' jurisdictions. First, we present the variation in the SA and FA distribution without cross-border loss consolidation, and second, the variation in the SA and FA distribution with cross-border loss consolidation.

In the absence of cross-border loss consolidation, the implementation of the FA methodology does not result in any shrinkage of the consolidated corporate tax base at the EU level. However, some EU Member States are benefiting from the methodological switch, and some experiences negative tax base consequence. Based on the results, Greece, Romania, Hungary, Estonia, and Latvia benefit the most, mainly at the expense of Luxembourg, Malta, Cyprus, the Netherlands, and Ireland who borne the biggest losses. Detailed results of relative change of profit before tax allocated by FA to profit before tax under SA in each EU Member State over the observed years are shown in the following table.

Table 3: Relative change (%) in the distribution of the tax base without cross-border consolidation of losses

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2011–2019
AT	–21.33	–12.95	–10.86	–19.01	–17.30	–3.17	–10.30	–8.43	3.09	–11.47
BE	–3.85	–8.33	–9.76	–18.78	–7.33	–5.97	6.44	–15.54	–5.57	–8.14
BG	95.74	121.57	112.04	108.49	29.13	9.72	13.23	31.02	25.24	45.81
CY	–46.61	–11.62	32.70	30.99	–32.88	–46.96	–67.19	–64.85	–77.16	–54.86
CZ	17.02	–4.05	1.35	6.01	15.38	–7.21	9.16	17.93	–8.35	5.04
DE	–2.09	–8.73	6.07	7.10	13.05	–6.87	4.61	20.75	15.57	6.16
DK	–4.31	–4.20	–10.18	–9.55	0.21	–6.19	–3.20	–1.26	–6.76	–3.76
EE	23.79	58.26	47.40	60.41	60.14	59.66	51.22	33.45	54.45	48.52
ES	4.10	10.91	7.91	8.97	20.21	2.85	9.81	13.51	–1.96	8.32
FI	14.24	–11.08	21.13	0.13	35.76	200.42	59.54	4.82	2.46	34.82
FR	–0.7	2.87	3.34	12.21	–0.58	4.16	2.63	18.48	11.86	6.33
GR	84.75	63.51	81.47	85.82	91.93	53.6	55.17	130.65	27.91	73.96
HR	10.92	9.40	42.53	37.93	125.05	20.12	35.10	26.95	16.77	30.74
HU	94.58	52.19	73.36	55.92	39.47	40.20	59.94	24.50	43.42	48.90
IE	–35.52	–31.9	–40.12	–20.58	–11.74	–25.35	–18.34	–11.85	–5.39	–18.23
IT	54.51	56.21	29.99	24.61	17.27	21.28	21.81	25.54	14.01	25.95
LT	27.36	39.85	47.47	66.91	12.22	–1.45	12.13	23.02	28.14	24.73
LU	–30.65	–43.41	–39.15	–61.52	–57.47	–62.06	–70.48	–85.30	–72.74	–70.59
LV	55.58	70.42	62.60	72.02	40.84	35.17	24.40	24.26	52.29	46.23
MT	–42.10	–65.22	–76.82	–56.30	–29.06	–51.49	–56.54	–65.01	14 767.3 ¹³	–55.79
NL	–36.47	–31.65	–36.64	–39.34	–24.49	–23.47	–21.62	–3.53	–18.41	–24.87
PL	32.95	19.06	10.92	24.24	26.2	37.65	34.86	87.93	38.31	36.31
PT	44.18	32.32	28.41	15.72	13.72	39.38	13.07	23.21	31.95	25.83

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	2011	2012	2013	2014	2015	2016	2017	2018	2019	2011–2019
RO	118.66	93.02	94.29	87.56	58.03	37.05	52.26	98.07	40.91	69.83
SE	–14.2	–7.51	–2.22	–8.21	–31.81	–5.94	–11.6	–12.22	–7.78	–12.5
SI	140.88	76.23	58.24	57.3	28	49.74	25.97	13	32.17	42.77
SK	15.3	5.13	2.88	17.32	14.93	8.19	25.2	22.25	29.54	16.07

Source: Authors' calculations based on the Orbis data

According to the analysis, the Czech Republic, Germany, France, Spain, and Slovakia, experienced an increase in their share of the corporate tax base under the FA without cross-border loss consolidation, however, it is worth noting that in case of cross-border loss consolidation implementation under the FA, those states face relative decline over the observed time, as shown further. Besides the highlighted decline in the overall corporate tax base in case of loss consolidation, the biggest losses are again accounted for Luxembourg, Cyprus, Malta, the Netherlands, and Ireland. On the contrary, Bulgaria, Slovenia, Hungary, Estonia, and Latvia gain the biggest share of the pie. The relative change of profit before tax allocated by FA, with cross-border loss consolidation, to profit before tax under the SA in each EU Member State, in each year, is shown in the following table.

Table 4: Relative change (%) in the distribution of the tax base with cross-border consolidation of losses

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2011–2019
AT	–31.50	–26.37	–31.58	–32.4	–37.32	–19.32	–19.78	–18.40	–8.19	–25.02
BE	–18.89	–26.37	–23.88	–29.09	–21.43	–20.65	–7.73	–24.17	–15.66	–20.74
BG	64.74	69.12	53.57	32.07	–13.88	–18.14	–4.18	6.64	2.90	12.14
CY	–48.63	–29.78	–37.17	–54.50	–44.04	–75.56	–76.13	–70.93	–86.41	–71.15
CZ	0.73	–18.66	–15.27	–12.70	2.76	–17.21	–1.13	6.93	–17.71	–7.81
DE	–17.03	–21.29	–10.58	–9.55	–7.04	–19.08	–7.93	7.48	1.03	–8.34
DK	–5.34	–6.66	–13.15	–14.27	–11.40	–17.07	–14.97	–15.61	–16.87	–15.11
EE	16.64	39.33	34.86	43.56	25.01	49.11	41.71	20.98	41.51	33.98
ES	–15.41	–16.80	–19.54	–17.04	–6.23	–18.34	–8.05	–5.47	–21.62	–13.92
FI	–23.18	–27.75	–32.69	–27.14	–18.24	177.86	34.99	–10.79	–12.97	6.42
FR	–16.87	–15.57	–14.72	–5.04	–20.17	–11.99	–10.93	1.19	–2.28	–10.29
GR	53.13	22.86	40.6	52.41	42.6	16.56	32.52	103.88	9.84	42.24
HR	–21.20	–35.72	7.69	–11.12	89.77	–2.19	20.22	18.20	8.64	6.71
HU	52.31	19.02	29.92	20.98	12.15	15.96	39.51	11.14	23.61	23.25
IE	–48.03	–43.41	–52.78	–49.40	–25.11	–40.83	–34.51	–24.51	–13.83	–32.18
IT	27.55	24.75	8.18	–0.96	–2.65	–0.31	6.46	10.99	1.04	6.36

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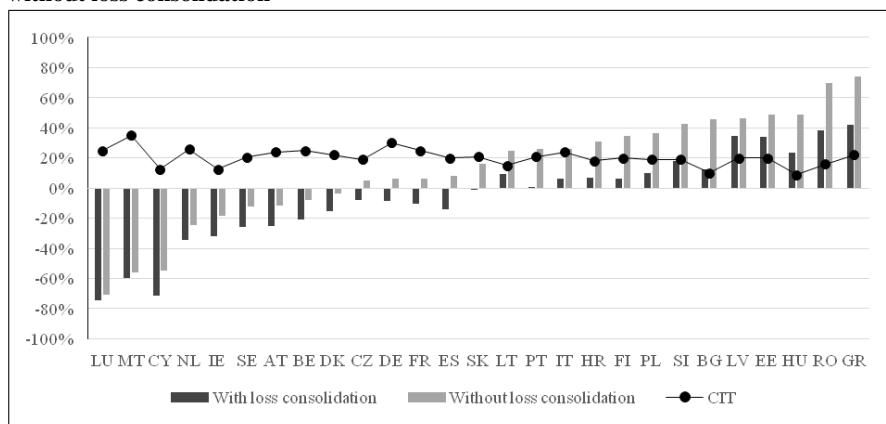
¹³ To clarify the results for MT, due to a small number of companies and exceptionally high proportion of intangible assets assigned to subsidiaries registered in MT, we obtained an order of magnitude different calculation result. Equally in the Table 3.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2011–2019
LT	15.74	17.54	23.85	39.93	-7.16	-13.76	4.22	11.86	13.20	9.34
LU	-35.42	-53.99	-47.56	-68.02	-62.94	-69.29	-74.36	-86.91	-75.31	-74.34
LV	40.39	57.14	51.83	61.91	23.81	24.7	16.57	14.90	41.41	34.85
MT	-55.88	-73.08	-80.30	-59.24	-33.33	-57.71	-58.72	-65.87	12 836.90	-59.53
NL	-44.00	-42.33	-45.31	-49.90	-37.93	-34.70	-31.67	-13.50	-24.24	-34.56
PL	11.97	-5.80	-10.81	-0.51	-5.56	4.15	13.17	62.91	5.40	9.83
PT	18.78	-5.73	-5.70	-13.97	-14.98	13.66	-8.90	5.08	11.65	0.05
RO	76.20	43.61	41.25	41.83	27.53	8.30	30.04	74.62	18.45	38.06
SE	-28.51	-24.77	-22.37	-22.48	-46.14	-21.17	-21.45	-24.27	-16.99	-26.09
SI	99.10	30.52	14.83	19.69	-8.74	23.14	11.59	3.23	16.74	18.10
SK	-5.86	-14.71	-20.72	-7.76	-3.31	-4.51	11.76	8.54	18.68	-1.07

Source: Authors' calculations based on the Orbis data

In addition, it was hypothesised that high tax countries have disproportionately low shares of the allocated profit before tax under the SA compared to their actual shares of employment, assets, or sales, thus they were expected to gain tax revenues under the FA. Concurrently, low-tax countries, were expected to face a shrinkage in their corporate tax base. The results confirmed that prominent profit-shifting countries within the EU, such as Luxembourg, Ireland, and the Netherlands, experience a decline in their corporate tax base under the FA distribution. Also, the considered FA indicted for the BEFIT Proposal allocates more tax base in low-income EU Member States such as Slovakia, Poland, Bulgaria, Hungary, or Romania. In addition, the Figure 1 shows the difference in FA and SA distribution with and without cross-border loss consolidation, and the relation with the corporate income tax rate (CIT) in each EU Member State.

Figure 1: Variation in corporate tax base distribution under the FA and the SA both with and without loss consolidation



Source: Authors' calculations based on the Orbis data; CIT obtained from PricewaterhouseCoopers (2023)

V. Conclusion

This paper endeavours to contribute to the debate on the BEFIT Proposal by updating the empirical research on the impact of the FA on tax base distribution. Focusing on the application of the FA methodology without cross-border loss consolidation, no shrinkage of the aggregated corporate tax base at the EU level originates and the EU-wide corporate tax base remains identical under both methodological approaches. However, some EU Member States benefiting from experiences negative consequences and acquire a smaller share of the pie. The results reveal that the most significant relative declines of over 10% in the corporate tax base during the observed timeframe would be faced by Luxembourg, Malta, Cyprus, the Netherlands, Ireland, Sweden, and Austria. In light of the findings, it is pertinent to highlight the substantial decrease in the corporate tax base for prominent profit-shifting countries within the EU, such as Luxembourg, Ireland, and the Netherlands. Concurrently, the largest relative gains over 10% of their corporate tax base were accounted for Slovakia, Lithuania, Portugal, Italy, Croatia, Finland, Poland, Slovenia, Bulgaria, Latvia, Estonia, Hungary, Romania, and Greece. Considering the scenario of cross-border loss consolidation, the EU-wide aggregate tax base reduces by 15, 67% over the examined years. A significant decline in the corporate tax base during the observed time frame were accounted for by Luxembourg, Cyprus, Malta, the Netherlands, Ireland, Sweden, Austria, Belgium, Denmark, Spain, and France. On the contrary, Bulgaria, Slovenia, Hungary, Estonia, Latvia, Romania, and Greece, gain more than 10% in the corporate tax base during the observed time frame. Drawing upon our analysis, a primary policy recommendation emerges, urging a reassessment of the proposed cross-border consolidation of losses in order to ascertain its alignment with the fundamental objective of the discussed tax policy reform, particularly the equitable taxation of MNCs and prevention of profit-shifting practices.

To highlight the contributions of this paper, in contrast to existing studies, the envisaged novel composition of the FA, including the intangible assets, is considered in the empirical analyses. In the realm of empirical research, only the present study and the study conducted by Roggeman et al. (2012) have exclusively incorporated intangible assets into the analyses. Moreover, in conjunction with the utilization of a more contemporaneous dataset, this paper offers a current advancement in the domain of research, building upon the prior scholarly endeavours in this area, offering a complex simulation of variation in the FA and the SA distribution.

However, a significant limitation acknowledged in this study pertains to the quality of the data under investigation. To address the issue of missing data and mitigate information loss, the paper employed multiple regression imputation. Moreover, in relation to the methodological approach employed, the analyses do not adequately consider the behavioural dynamics that may arise following the announcement of a substantial tax policy change. Consequently, the study lacks evidence in the initial stage of policy changes that could potentially impact long-term equilibrium.

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