CENTER FOR TAX AND ACCOUNTING RESEARCH

TAXATION, ACCOUNTING, AND FINANCE

TAF WORKING PAPER

No. 3 / June 2014

Ortmann, Regina / Sureth, Caren

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University of Paderborn
www.taf-wps.cetar.org

Can the CCCTB Alleviate Tax Discrimination Against Loss-making European Multinational Groups?

Regina Ortmann* and Caren Sureth**

Abstract

In March 2011, the European Commission submitted a proposal for a Council Directive on an optional common consolidated corporate tax base (CCCTB). If this proposed CCCTB system comes into force, taxes calculated under the currently existing system of separate accounting might be replaced by a system of group consolidation and formulary apportionment. Then, multinational groups (MNGs) would face the decision as to whether to opt for the CCCTB system. While prior research focuses mainly on the differences in economic behaviour under both systems in general, we study the conditions under which one or the other tax system is preferable from the perspective of an MNG, with a particular focus on loss offsets. We focus on European MNGs with losses at the parent and subsidiary level. While in our base model, the CCCTB proves to be attractive for temporarily loss-making MNGs, in our extended model we find mixed results. We identify four effects that determine the decision of an MNG: the tax-utilization of losses, the allocation of the tax base, the dividend and intragroup interest taxation. We find, e.g., that the CCCTB system proves advantageous for increasing loss/profit streams (e.g. from start-ups or R&D projects) of the individual group entities, whereas the system of separate accounting is beneficial for decreasing profit/loss streams (e.g. caused by a decrease in return from a mature product). The results of our analysis are helpful for MNGs facing the decision as to whether to opt for the CCCTB system. Moreover, our findings can support legislators and politicians in their tax reform discussions, as we provide information on the possible consequence of implementing this system on the expected decisions of corporate taxpayers that anticipate the tax effects of the CCCTB.

JEL classification: H25, H21

Keywords: Loss-Offset, CCCTB, Separate Accounting, Investment Decisions

We would like to thank Eva Eberhartinger, Edward Maydew, Richard Sansing, the participants of the 2013 American Accounting Association meeting, the participants of the Doctoral Workshop of the 2013 arqus meeting and the members of the DIBT Doctoral Program in International Business Taxation at Vienna University of Economics and Business for their helpful comments. Any remaining errors or inaccuracies are, of course, our own. Financial support from the Austrian Science Fund (FWF grant W 1235-G16) is gratefully acknowledged.

* Vienna University of Economics and Business, DIBT Doctoral Program in International Business Taxation, Department of Finance, Accounting and Statistics, Chair of Tax Management, Welthandelsplatz 1, 1020 Vienna, Austria, email: regina.ortmann@wu.ac.at.

** University of Paderborn, Department for Taxation, Accounting, and Finance, Chair of Business Administration, especially Business Taxation, Warburger Straße 100, 33098 Paderborn, Germany, and Vienna University of Economics and Business, DIBT Doctoral Program in International Business Taxation, Vienna, Austria, email: caren.sureth@wiwi.upb.de.

1 Introduction

Cross-border loss-offset has become an important topic for multinational groups (MNGs) in the European Union (EU) in recent years. In the aftermath of the financial and economic crisis, in many EU countries the amount of incurred losses and loss carry-forwards has increased significantly. Furthermore, in particular, start-ups and R&D investment as examples for innovative activities, which are crucial for MNGs' future performance, often are characterized by initial losses.

However, under the system of separate accounting (SA) currently applied in Europe, MNGs often are unable to use their losses to decrease their tax payments. The majority of EU countries does not allow the cross-border offsetting of group losses.[1] Thus, losses incurred by a subsidiary in one country may not be offset against taxable profits of a parent company domiciled in another country.[2] Limited cross-border loss-offsets ultimately result in an over-taxation of MNGs.[3] The European Commission states that "the limited availability of cross-border loss relief is one of the most significant obstacles to cross-border business activity".[4] Thus, the Commission aims to introduce a common tax base to address those provisions in the tax system that limit the growth of companies seeking to benefit from the European single market.[5] In March 2011, the European Commission submitted a proposal for a Council Directive on a Common Consolidated Corporate Tax Base (CCCTB).[6] In April 2012, the European Parliament adopted a resolution on the CCCTB Directive and proposed certain amendments to the Commission's initial version.[7] The debate continues on how to refine the CCCTB system.

The CCCTB Directive is a comprehensive set of rules. If this directive comes into force, MNGs operating within the EU would be able to opt for the CCCTB system and calculate their taxable profits on a consolidated basis. However, even if the proposed CCCTB system were to reduce the over-taxation arising from the widespread use of the system of SA in the EU, it would not necessarily always be advantageous for a European MNG to opt for it. To make the right choice, MNGs would have to weigh the advantages and disadvantages of the CCCTB system against those of the respective national laws which govern companies that use SA. Against this background it is important to investigate the implications of both systems for temporarily loss-making MNGs. Assuming the CCCTB system as outlined in the Council Directive, we identify factors that determine whether a European temporarily loss-making MNG should opt for the CCCTB system. The loss-offset regulations under the

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1 Only Denmark, Austria and Italy are exceptions. Under certain conditions they allow consolidated taxation of MNGs. See *Schuchter* and *Kras* (2014), p. 13; *Ambagtsheer-Pakarinen* (2014), p. 13; *Gallo* (2014), p. 14.

2 See *Andersson* (2007), p. 85.

3 See *European Commission* (2011); p. 4, *Andersson* (2007), p. 98.

4 *European Commission* (2006), p. 10.

5 See *European Commission* (2010), p. 18.

6 See *European Commission* (2011).

7 As it is uncertain if and to what extent these proposed amendments will be considered in the course of a potential CCCTB implementation, we disregard them in this analysis.

system of SA and under the CCCTB system are of major importance to the following analysis.

Even though the cross-border loss-offset is one of the main pillars of the proposed CCCTB system, there is little research that compares the proposed CCCTB system and the current system of SA with regard to loss-offset possibilities. The few existing studies presume simplified, stylized national loss-offset provisions and account – if at all – for a few representative profit/loss scenarios. We expand these studies by accounting for national tax characteristics in detail and by investigating implications about the tax systems in dependence on a vast range of different profit/loss patterns. Whereas *Gérard* and *Weiner* (2003) and *Dahle* and *Bäumer* (2009) ignore specific characteristics of the loss-offset rules under the system of SA, we take them into account and find that a detailed investigation of these rules might change the conclusions. Thus, in contrast to *Dahle* and *Bäumer* (2009), we find that under certain conditions, the system of SA might be preferable over the CCCTB system from the perspective of an MNG due to its loss-offset possibilities.

As a first step, we build a *basic general model* which captures the main characteristics of most European national tax systems and of the CCCTB system. We assume in this model equal tax rates in both jurisdictions and, in line with the majority of EU countries, losses may only be carried forward (and not back) under national laws. The findings from the basic model suggest that a temporarily loss-making European MNG is likely to opt for the CCCTB system.

However, as the basic model captures only the main characteristics of the tax environment in the EU countries under the system of SA, we seek to further investigate tax effects by considering more specific tax details. To obtain deeper insights into the potential complexity of the decision-making process of MNGs, as a second step, we focus on selected countries and develop an *extended model* that allows us to integrate loss carry-backs and simultaneously model a loss-offset restriction by a minimum tax provision.

As an example and to model common loss-offset rules in more detail, we examine an MNG domiciled in both France and Germany. We select these countries as representative examples for three reasons. First, the national loss-offset provisions of these countries add complexity to the basic model. In particular, both countries allow for loss carry-backs. Thus, the example adds further insights into the relevance of the design of national tax laws for the evaluation of the advantageousness of the CCCTB system and the system of SA. Furthermore, French and German tax laws include many typical characteristics of loss-offset provisions that can also be found in other EU countries.[8] Thus, this ex-

[8] Germany and France allow for a loss-carry back, as do Ireland, the Netherland and the United Kingdom. Furthermore, Germany and France restrict the loss carry-forward, as do, for example, Greece, Hungary, Poland, the Netherlands, Portugal, Romania and Spain.

ample allows us to draw conclusions about the advantageousness of either tax system also for MNGs that are located in other EU countries. Second, Germany and France are the biggest economies in the EU.[9] Third, Germany and France are strongly pushing for a coordinated European tax base and have already attempted to establish a mutual CCCTB that is independent of the other EU Member States.[10] Thus, the implementation of a CCCTB between those two countries is more likely than between any other EU countries.

We model different combinations of profit/loss streams for the Franco-German MNG. The time patterns and magnitudes of the profits and losses are key determinants of the advantageous nature of one tax system over the other. The Franco-German model identifies four effects that determine whether one or the other tax system is advantageous: the tax utilization of losses during the considered time frame, the different allocation of the tax base between France and Germany under each tax system and the taxation of intragroup interest and dividends. The analysis reveals that for most combinations of profit/loss streams for the Franco-German MNG, the CCCTB system is advantageous. However, the system of SA tends to be advantageous for investments generating time sequences of profits and losses that allow for the utilization of loss carry-backs. Counter-intuitively – and in contrast to previous studies and our base model, the CCCTB system is no longer unconditionally preferable if a cross-border loss-offset is available. Depending on the timing and magnitude of the entities' profits and losses, the benefit from loss carry-backs under SA may exceed the advantage of the cross-border loss-offset under the CCCTB.

This article first provides an overview over the most relevant literature (Section 2), followed by an explanation of the legal basis of both tax systems (Section 3). In Section 4, the basic model and the enhanced Franco-German model are introduced. The numerical analysis in Section 5 compares the after-tax outcome for the MNG, given different combinations of profit/loss streams of both group companies between both tax systems. Finally, the main results of the analysis are summarized (Section 6).

2 Prior Literature

Two main streams of research are relevant to our research question. First, prior research examines the impact of loss treatment on investment in either an interstate or cross-border loss-offset situation. *Auerbach* (1986), *Auerbach* and *Poterba* (1987) and *Majd* and *Myers* (1987) find that the absence of loss-offset possibilities discourages investment. Against this background, we expect that the design of loss-offset rules also matters for the advantageousness of the CCCTB system and of the

[9] See *The World Bank* (2012).
[10] See *German Federal Ministry of Finance* (2012).

system of SA. Both tax systems allow the offsetting of losses, but differ in the design of the rules. Hence, we investigate how specific loss-offset provisions impact the relative attractiveness of the underlying tax systems.

In prior research *Barlev* and *Levy* (1975) distinguish between loss carry-forwards and carry-backs, which are both applied under the system of SA in our extended model. In contrast, *Donnely* and *Young* (2002) focus on the loss-offset by means of group consolidation as applied under the CCCTB system. By determining the expected value of tax savings in different countries, *Barlev* and *Levy* (1975) find that in addition to loss carry-forwards, carry-back provisions are highly valuable and can improve the economic conditions for companies greatly. *Donnely* and *Young* (2002) conclude that under group taxation regimes, the tax value of losses is highest. In line with *Donnely* and *Young* (2002) and *Barlev* and *Levy* (1975), we expect that the loss carry-back provision under the system of SA and the cross-border loss offset under the CCCTB system increase the attractiveness of each tax system.

However, from these studies we cannot identify which tax system benefits most. Based on data of German multinationals, *Dreßler* and *Overesch* (2013) analyse empirically how the treatment of potential losses impacts multinational investment. In contrast to the analytical study of *Barlev* and *Levy* (1975), *Dreßler* and *Overesch* (2013) find no statistically significant effects of loss carry-back and, in contrast to *Donnely* and *Young* (2002), they find only mixed evidence that group loss-offset provisions foster investment. However, their results suggest that limiting the time frame for loss carry-forwards has detrimental investment effects for companies with a high probability of incurring losses. The limitation of loss carry-forwards, e.g., as applied under SA by the minimum taxation in France and Germany, reduces the attractiveness of SA. While previous studies often disregard detailed loss-offset rules, we integrate them into our model and find loss carry-forward and carry-back, as well as cross-border loss-offsets are significant features of a tax system and a driver as regards whether an MNG is likely to opt for the CCCTB system. We expand the previous studies also by taking account of different profit/loss time patterns. Thus, we are able to draw conclusions about the effects of differently designed loss-offset regimes, depending on different profit/loss-scenarios.

The second literature stream deals with the shift from SA to consolidation and formulary apportionment, particularly, the differences in profit-shifting behaviour of multi-jurisdictional groups under both systems.[11] As we do not focus on profit-shifting activities, we refer to those studies that investigate at least to some extent the differences in loss offset possibilities. Using a model-theory approach, *Gérard* and *Weiner* (2003) compare the impact of cross-border loss-offset and consolidation

[11] E.g. *Klassen* and *Shackelford* (1998); *Goolsbee* and *May*dew (2000); *Mintz* and *Smart* (2004).

under a system of consolidation and formulary apportionment and under a system of SA for the investment behaviour of an MNG. They assume that under SA, no loss offset or a cross-border loss offset is applied. Thus, contrary to our approach, they do not include the possibility of a separate per country loss-offset, which is currently common in EU Member States. They show that cross-border loss-offsets mitigate the reactions to tax changes, whereas consolidation and formulary apportionment boosts the sensitivity thereto.

Using a numerical analysis, *Dahle* and *Bäumer* (2009) compare the effects of selected loss-offset limitations under SA with those under the CCCTB system and the European tax allocation system for MNGs' cross-border investment. While we consider different profit/loss time frames and also include in our investigation currently applied EU loss-offset rules, they restrict their analysis to selected increasing/constant cash-flow streams. They conclude that the replacement of SA by the CCCTB system would generally increase profitability due to cross-border loss-offsets.[12] By contrast, in this article we find mixed results and clarify that the CCCTB system – even in loss scenarios – may not be beneficial. *Oestreicher*, *Keser* and *Kimpel* (2013) study loss-making corporate groups and their decision regarding whether to opt for the CCCTB system. In contrast to the present article, they shed light on the decision-making process from a behavioural perspective. Their experiment with human subjects indicates that loss-exposed groups tend to opt for the CCCTB system. Their results are in line with the outcomes of our basic general model.

To our knowledge, there is, as yet, no analytical investigation that compares SA and CCCTB with regard to loss offset rules and different profit/loss time frames. This is surprising, given that prior research indicates that both loss offset rules and cash flow time structures are crucial for investment decisions. In this article, we aim to fill this void. As the lack of cross-border loss-offset under SA is "one of the most important obstacles to cross-border economic activity",[13] loss-offset rules under a CCCTB system may be a promising avenue to improve the environment for cross-border investment. We identify conditions for such an improvement for MNGs. Our results allow investors to anticipate the tax effects in loss scenarios, and also allow tax reformers to improve their estimation of the expected behaviour of MNGs on CCCTB enforcement. These results are particularly noteworthy in the aftermath of economic crises, which are likely to generate huge amounts of loss carry-forwards. Thus, our findings may contribute to national and European tax reform discussions.

[12] For more literature regarding asymmetric taxation in an international setting that does not specifically refer to the CCCTB, see *Lyon* and *Silverstein* (1995) and *Niemann* (2004).
[13] *European Commission* (2001), p. 39.

3 Legal Basis

3.1 CCCTB

Here, we assume that the CCCTB system will come into force as proposed in the draft of the Directive.[14] The main purpose of the CCCTB project is to enable the consolidated computation of taxable income for corporations operating within the EU.[15] Thus, losses incurred by one taxpayer are automatically offset against profits of other group entities.[16] The consolidation eliminates intragroup transactions, such as transfer pricing transactions and interest and dividend payments (article 59).[17] The consolidated tax base is subsequently reallocated to the group members by using a formula-based sharing mechanism.[18] The formula takes into account three equally weighted factors, namely sales, labour and assets. The CCCTB system does not imply a harmonized tax rate. The Member States still have the right to tax their share of the tax base at their national corporate tax rate (article 103). MNGs are allowed to carry forward losses indefinitely and without limitation as to the amount (article 43), whereas a loss carry-back is not allowed at all. EU resident companies and non-EU resident companies with permanent establishments or subsidiaries in the EU may opt for the CCCTB system.[19] In cases where only EU companies are involved, MNGs that wish to opt for the CCCTB must use a special form (listed in Annex 1) and are subject to the corporate taxation system of the respective countries (listed in Annex 2, article 2). The system is based on an “all-in, all-out” approach (article 55 c)), that is, companies which belong to the same group may not opt for the CCCTB system separately, but only jointly with other group members.[20] Once a company has opted into the system for the first time, it must apply the CCCTB system for at least five consecutive tax years (article 105 (1)).

3.2 Germany and France

In the course of France and Germany’s efforts to establish a mutual CCCTB, Germany and France matched their loss-offset provisions. Thus, the loss carry-forward and carry-back provisions are now almost identical in both countries. Losses that are not carried back “may only be carried forward to be set off against the first € 1 million of net income in a given year without restriction”[21] in both countries. The remaining loss carry-forward can only be offset against up to 60% in Germany and up to 50% in France of the net income exceeding € 1 million.[22] There is no time limitation for loss carry-forwards in both countries. Corporate taxpayers are also allowed to carry losses back amounting up

[14] See *European Commission* (2011).
[15] See *Barenfeld* (2007), p. 259.
[16] See *Temme, Sporken* and *Okten* (2011), p. 323.
[17] See *Barenfeld* (2007), p. 261.
[18] See *European Commission* (2011), p. 8 (iii).
[19] See *Piot, Sigurdardottir* and *Rasch* (2011), p. 415.
[20] See *Temme, Sporken* and *Okten* (2011), p. 324.
[21] *Perdelwitz* (2014), p. 9. See also *Gaoua* (2014), p. 11.
[22] See *Gaoua* (2014), p. 11; *Perdelwitz* (2014), p. 9.

to € 1 million for one year in both countries.[23] The loss carry-back entitles a French taxpayer to a tax credit. “The tax credit may be used during the following [five] years, and will be refundable in the sixth year”.[24] In Germany, the loss carry-back is directly offset against the net income of the previous year and leads to an immediate tax refund. Furthermore, neither France nor Germany currently allows cross-border loss-offsets.

The effects resulting from dividend taxation are crucial for the following analysis, as well. The dividends that the German parent receives from the French subsidiary are tax-exempt, with a lump sum of 5% of the gross dividend considered as a non-deductible expense.[25] France levies withholding taxes neither on these dividends in line with the Parent-Subsidiary Directive nor on interest payments.[26] Moreover, interest payments are fully deductible from the tax base under both national tax codes[27] insofar as thin capitalization rules do not apply. In addition to the classic corporate tax, companies in Germany and France are also subject to a local business tax and a surcharge. The different kinds of taxes are taken into account in our model by the applied tax rate.[28] The two tax systems explained above are used in our extended model in section 4.3

4 Model

4.1 Basic model

In the following, we introduce a stylized one-period model that aims to capture the basic effects arising from the treatment of losses under the CCCTB system and under the system of SA. The model compares the advantageousness of the two tax systems on the basis of the after-tax net cash flows NCF_t in period t. This model is generally applicable, as it accounts for the main characteristics of the national tax systems of almost all EU Member States.[29] We consider an MNG consisting of corporations only with a parent and one subsidiary, which are located in two different EU countries. Both companies have invested in the past in a project that generates cash flows C_t and entails depreciation D_t in period t. In this basic model, the tax base TB_t in period t consists only of the cash flows

[23] See *Gaoua* (2014), p. 11; *Perdelwitz* (2014), p. 9.
[24] *Gaoua* (2014), p. 11.
[25] See *Perdelwitz* (2014), p. 13.
[26] See *Gaoua* (2014), p. 23.
[27] See *Perdelwitz* (2014), p. 7; *Gaoua* (2014), p. 8. For the considered numerical examples, the safe harbour rule applies for the deductibility of interest in France.
[28] As the German local business tax is of key significance for the taxation of corporations, its treatment is also crucial under the CCCTB system. However, so far it has failed to resolve whether and, if so, how the German local business tax would be integrated into the CCCTB system (see Scheffler et al. (2013), p. 28.). We assume that the local business tax is applied under the CCCTB system as applied under the German tax code. Consequently, we apply the same statutory profit tax rate for Germany under both systems.
[29] The model does not capture the possibility of the cross-border group consolidation under national tax laws in Italy, Austria and Denmark. As this possibility has a decisive impact on the net cash flow of an MNG located in these countries, we exclude the consideration thereof in this model.

and depreciation. A negative tax base denotes a loss, $TB_t^- = (CF_t - D_t)^-$, and a positive one a profit, $TB_t^+ = (CF_t - D_t)^+$.

In line with domestic law in the majority of the EU countries, we exclude the possibility of carrying back losses.[30] However, losses may be carried forward, either unlimited or limited in terms of time and/or amount.[31] Furthermore, also in line with most national laws, we disregard any kind of dividend taxation in the corporate sector.[32] To allow us singling out effects of losses we assume that the tax rate τ is the same in both countries and under both tax systems.[33] Thus, to calculate the MNG's after-tax net cash flow under the CCCTB system, it is not necessary to determine which share of the overall group tax base is allocated to which country. The MNG's goal is to choose the tax system that maximizes the present value of the after-tax net cash-flows in $t = 1$: Thus, the objective function of the MNG is as follows:

$$max\, NCF_1 = max\{NCF_1^{SA}; NCF_1^{CCCTB}\}. \tag{1}$$

Depending on the structure of profits and/or losses of the two group companies, for the purpose of our paper, two cases can be distinguished:

(i) The parent and the subsidiary incur losses, $TB_1^{par^-}, TB_1^{sub^-}$. Since we assume similar tax rates and similar present value factors a for both companies, we can sum up the tax bases on the group level to a group tax base even under SA.

(ii) One company incurs a profit, TB_1^+, and the other a loss, TB_1^-. The outcomes of the model are identical, irrespective of whether the parent or the subsidiary incurs the profit or the loss. Thus, we refrain from labelling the variables respectively in Case (ii). In contrast to the Case (i), under SA, it is necessary to consider the tax base of each company individually.

The net cash flow in period $t = 1$ is obtained by subtracting the tax burden from the gross income.

In Case (i), the respective net cash flows of the MNG under both tax systems are determined as follows:

$$NCF_1^{SA} = (TB_1^{par^-} + TB_1^{sub^-}) * (1 - \tau) * a^{SA}, \qquad a^{SA} = \sum_{t=2}^{T^{SA}} \frac{v_t^{SA}}{(1+i_\tau)^{t-1}}, \tag{2}$$

$$NCF_1^{CCCTB} = (TB_1^{par^-} + TB_1^{sub^-}) * (1 - \tau) * a^{CCCTB}, \quad a^{CCCTB} = \sum_{t=2}^{T^{CCCTB}} \frac{v_t^{CCCTB}}{(1+i_\tau)^{t-1}}, \tag{3}$$

with $v_t \geq 0$ and $\sum_{t=2}^{T} v_t \leq 1$.

[30] Carrying losses back is allowed only in France, Germany, Ireland, the Netherlands and the United Kingdom.

[31] All EU countries allow losses to be carried forward, although some countries restrict the amount and/or time for a carry-forward.

[32] Only in Belgium, France, Germany and Italy is 5% of the gross dividend taxed.

[33] See *Nielsen et al.* (2010), p. 124.

The losses must be carried forward under both tax systems and may lead to future tax refunds. Although this is a one-period model, we account for loss-offset in periods $t = 2, 3, \dots, T$ introducing a present value factor a.[34] We assume that no further losses will be incurred by the group companies in the subsequent periods $t = 2, 3, \dots, T$ so that we can isolate the effects arising from losses caused by the underlying investment in the group companies under the respective tax system. The share v_t of the loss may be offset in the future period $t > 1$ and remains within a range of zero to 100%. The final period T denotes either the period in which the remaining share of the losses is offset under the respective tax system, or the last period in which the MNG exists in the event that the losses could not be offset entirely. Due to the after-tax interest rate ($i_\tau > 0$) and the absence of an immediate tax refund for the losses, the present value factor can never reach a value of one: $0 \leq a < 1$. By equating eqs. (2) and (3), we demonstrate that the two tax systems lead to identical results if the pattern of the future loss-offset is equal: $a^{CCCTB} = a^{SA}$.

The structure of the future profits of each group company and the design of the loss-offset provisions under each tax system are decisive for the share v_t of the present losses that may be offset in each single future period. As the future profits are consolidated under the CCCTB system and SA often implies stricter loss-offset provisions, potentially a bigger share of the losses may be offset in a potentially shorter time interval under the CCCTB system. Thus, the present value factor under the CCCTB system can be higher – or at least as high as that under the system of SA: $a^{CCCTB} \geq a^{SA}$. Consequently, in this case the MNG would be well advised to opt for the CCCTB system.

In Case (ii) one of the group companies incurs a profit TB_1^+ and the other a loss TB_1^-. For modelling the net cash flow under the CCCTB system, it is necessary to distinguish between (a) a negative or (b) a positive CCCTB. The CCCTB is determined by consolidating the tax bases of both group companies ($CCCTB = TB_1^+ + TB_1^-$). As a negative CCCTB implies that the taxation of the resulting loss is delayed, the tax base must be discounted using the present value factor a^{CCCTB}. We obtain:

$$NCF_1^{SA} = TB_1^+ * (1-\tau) + TB_1^- * (1-\tau) * a^{SA}, \tag{4}$$

$$NCF_1^{CCCTB^+} = (TB_1^+ + TB_1^-) * (1-\tau), \quad \text{if CCCTB is positive or zero,} \tag{5a}$$

$$NCF_1^{CCCTB^-} = (TB_1^+ + TB_1^-) * (1-\tau) * a^{CCCTB}, \quad \text{if CCCTB is negative.} \tag{5b}$$

Given a positive CCCTB, equating eqs. (4) and (5a) shows that the two tax systems lead to identical outcomes if all losses may be offset immediately under the system of SA. However, due to the assumed lack of loss carry-backs, a^{SA} is always less than one ($a^{SA} < 1$). Thus, again, the MNG should

[34] For reasons of simplicity, we assume that the future loss-offset is the same under the system of SA for the parent and the subsidiary in Case (i) (see eq. 2). Thus, the same present value factor is applied to both companies.

opt for the CCCTB system.

If the CCCTB is negative, this loss must be carried forward and may be utilized only in future periods $t > 1$. Equating eqs. (4) and (5b) illustrates that the tax systems give rise to identical outcomes if:

$$(TB_1^+ + TB_1^-) * a^{CCCTB} = TB_1^+ + TB_1^- * a^{SA}. \tag{6}$$

Eq. (6) shows that both tax systems can lead to identical outcomes only if $a^{SA} > a^{CCCTB}$. As under the given set of assumptions losses never may be offset earlier under the system of SA ($a^{SA} \leq a^{CCCTB}$), the equilibrium condition $a^{SA} > a^{CCCTB}$ cannot be met. Consequently, it is always advantageous for the MNG to opt for the CCCTB system in Case (ii)(b), as well.

We find that, under the given assumptions, opting for the CCCTB system either leads to the same results as separate accounting or is favourable for the MNG. The analysis demonstrates that the CCCTB system is, in this stylized setting, especially attractive due to the cross-border loss-offset for MNGs. Our results highlight the potential of the CCCTB system for lowering an MNG's tax burden.

4.2 Extended model

The legal environment in some EU countries can be much more complex than that captured in the base model. It neglects significant loss-relevant elements, such as other loss-offset restrictions common under several domestic tax regimes. Thus, in the following, we introduce a more complex model taking into account the most noteworthy loss-related characteristics of both tax systems. We assume that the parent company is based in Germany and its wholly-owned subsidiary in France. As in the basic model, we assume that both companies have invested in a national real investment project that generates cash flows and gives rise to depreciation. During the period under review, this project is taken as the companies' only business activity. The French subsidiary distributes all profits, in the form of dividends, to its German parent at the end of each year.[35] By assumption, the German company uses these funds either to invest in the capital market or to redeem a loan. It carries out the capital market investments in Germany, since the German after-tax interest rate is the higher one.[36]

To focus on the effects of the respective tax systems, we assume that the companies do not adjust their investment behaviour (e.g. reallocate their assets or workforce) in order to achieve a more tax-efficient situation through formulary apportionment under the CCCTB system.[37] Furthermore, we

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[35] A yearly dividend distribution is also assumed by *Gérard* and *Princen* (2012), p. 5.

[36] See *Niemann* and *Treisch* (2006), p. 1020; *Gérard* and *Princen* (2012), p. 10. Taking into account the statutory profit tax rates in France (37.06%) and Germany (30.95%), the interest rate and the dividend taxation, Germany turns out to be the country of choice for financial investments.

[37] See *Devereux* and *Loretz* (2008), p. 2; *Oestreicher* and *Koch* (2011), p. 92. They also abstract from behavioural changes of firms.

neglect compliance costs[38] and abstract from shareholder taxation. Given heterogeneous shareholders with different tax brackets, investment decisions in MNGs are typically made without reference to shareholder-level taxation.[39] By simplifying our analysis in this way, the impact of the different loss-offset mechanisms under the two tax systems can be highlighted.

We focus on dividend distribution and loan grants[40] as the only means of economic integration of the parent company and subsidiary. We abstract from further interaction of the companies to exclude tax planning via transfer pricing under SA.[41] This is reasonable, as we also abstract from all tax-induced types of behavioural responses under the CCCTB system. We take the behaviour of taxpayers as given and focus instead on inherent differences in the two alternate tax regimes. Annual depreciation of the underlying asset is assumed to be straight-line and identical under both systems.[42]

Furthermore, we assume that neither France nor Germany levies a different corporate tax rate under the CCCTB system than under their domestic systems.[43] By assumption, the group fulfils all eligibility requirements for the CCCTB system.[44] We also assume a perfect capital market with a pre-tax debit interest rate for borrowing identical to the pre-tax credit interest rate.[45] The pre-tax interest rates in France and Germany are assumed to be identical. We take the after-tax net cash flow as a criterion for identifying tax effects.

In sketching the multi-period setting, we first describe the net cash flows of the MNG in only one period and, on this basis, demonstrate the cash flows and tax payments in all periods of the time frame under review.

4.2.1 Separate accounting

The MNG again maximizes its objective function given in eq. (1). Now, the net cash flow NCF_t^{SA} of the MNG in period t under the system of SA is determined by summing up the gross cash flows CF_t^{GER}, CF_t^{FR} and the interest income (pre-tax interest rate i_t times the financial investment of the previous period $FI_{t-1}^{SA\_GER}, FI_{t-1}^{SA\_FR}$[46]) and subtracting the tax payments $TP_t^{SA\_GER}, TP_t^{SA\_FR}$[47] of both

38 See *Bettendorf et al.* (2010), p. 577; *Devereux* and *Loretz* (2008), p.3.

39 See *Cooper and Knittel* (2010), p. 52; *Egger* and *Loretz* (2010), p. 1025; *Niemann* and *Treisch* (2006), p. 1016; *Oestreicher* and *Koch* (2011), p. 70.

40 French thin capitalization rules do not apply, as in our numeric example the interest payments are not greater than € 150,000. See *Gaoua* (2014), p. 8.

41 See *Gérard* and *Princen* (2012), p. 4.

42 We interpret depreciations under both tax systems as a proxy for all other kinds of non-cash accruals. See, e.g., *Niemann* (2004a), p. 362, and *Dahle* and *Bäumer* (2009), p. 8.

43 Also, *Oestreicher* and *Koch* (2011); *Fuest et al.* (2007) and *Devereux* and *Loretz* (2008) assume for their empirical studies the same tax rate under the CCCTB systems.

44 We refer here in particular to the two-part test that determines the membership of a company in a group by control and ownership (article 54).

45 See *Dahle* (2011), p. 61.

46 If variables used for building the relevant models do not have the same values under both systems, the vari-

group companies:

$$NCF_t^{SA} = CF_t^{GER} + CF_t^{FR} + i_t \ * FI_{t-1}^{SA_{GER}} + i_t \ * FI_{t-1}^{SA_{FR}} - TP_t^{SA_{GER}} - TP_t^{SA_{FR}}. \tag{7}$$

If the French company incurs a positive net cash flow $NCF_t^{SA_{FR}}$ it distributes a dividend to the German company. Under the principle of prudence, the dividend distribution is limited to the net cash flow less depreciation.[48] Given that the distribution limitation applies, surplus liquidity amounting to the value of the depreciation is retained in the French company. The French company is assumed to reinvest this excess liquidity in the French capital market. Whenever the French company incurs losses, we assume that it takes out a loan from the German company. The French company is assumed to redeem 50% of the principal amount P_t^{FR} in the following period. Furthermore, it pays interest at the market rate to the German parent. If the company redeems the principal amount of the loan, the dividend in eq. (8) is determined following deduction of this payment. If the German parent is short on funds, it borrows from the capital market to fill the gap. Finally, the fraction of the French net cash flow that exceeds the value of the depreciation and the redemption of the principal amount is distributed to the German parent company as a dividend DIV_t. The German parent company invests all of its surplus liquidity in the German capital market.[49]

$$DIV_t = \ max\left\{CF_t^{FR} + i_t \ * FI_{t-1}^{SA_{FR}} - TP_t^{SA_{FR}} - D_t^{FR} - 0.5 * P_t^{FR}; 0\right\}. \tag{8}$$

We obtain the tax payments TP_t^{SA} to be made by each company by multiplying the tax rate τ_t by the tax base TB_t^{SA}. In both countries, the tax base TB_t^{SA} is determined by the adjusted gross income AGI_t^{SA} , the loss-offset LO_t^{SA} and the loss carry-back LCB_t.[50]

$$TB_t^{SA} = \max\{AGI_t^{SA} - LO_t^{SA}; 0\} - LCB_t \ . \tag{9}$$

Apart from the addition of 5% of the gross dividend under German law, the adjusted gross income AGI_t^{SA} is similarly determined in both countries:

$$AGI_t^{SA_{FR}} = CF_t^{FR} - D_t^{FR} + i_t \ * FI_{t-1}^{SA_{FR}}, \tag{10}$$

$$AGI_t^{SA_{GER}} = CF_t^{GER} - D_t^{GER} + i_t \ * FI_{t-1}^{SA_{GER}} + 0.05 * DIV_t. \tag{11}$$

Eq. (12) reflects the determination of the loss-offset for the German company. The equation for the French company is similar, except that 0.5 (instead of 0.6) of the € 1 million exceeding amount of the

ables are additionally labelled with “SA” or “CCCTB”, respectively.

47 The formulas are based on the approach of *Schanz* and *Schanz* (2011), pp. 275-293, and adjusted for CCCTB and separate accounting purposes in our setting.

48 See *Meller* (2010), p. 148.

49 See *Bäumer* (2011), p. 72. See also *Sureth* and *Bäumer* (2010), pp. 176-179.

50 As eq. 9 is valid for both the French company and the German company, we decided not to label the variables with the country-specific abbreviations.

net income may be utilized to offset losses.

$$LO_t^{SA_{GER}} = min\{LCF_{t-1}^{SA_{GER}}; max\{AGI_t^{SA_{GER}}; 0\}; 1{,}000{,}000 + 0.6\ [max\{AGI_t^{SA_{GER}}; 0\} - 1{,}000{,}000]\}. \quad (12)$$

The loss carry-forward LCF_t at the end of period t, that can be utilized in period $t+1$, can be derived from the following equation for the German and the French company:

$$LCF_t^{SA} = LCF_{t-1}^{SA} - min\{0; AGI_t^{SA}\} - LCB_t - LO_t^{SA}. \quad (13)$$

France and Germany allow for an annual loss carry-back LCB_t up to € 1 million:

$$LCB_t = \min\left\{1{,}000{,}000; \max\{\mathrm{TB}_{t-1}^{SA}; 0\}; \max\{-\mathrm{AGI}_t^{SA}; 0\}\right\}, \quad (14)$$

The model defined in this subsection depicts the main legal characteristics of the national French and German tax law that we take into account for our analysis.

4.2.2 CCCTB

Similar to the system of SA, net cash flow under the CCCTB system is determined as follows:

$$NCF_t^{CCCTB} = CF_t^{GER} + CF_t^{FR} + i_t\ * FI_{t-1}^{CCCTB_{GER}} + i_t\ * FI_{t-1}^{CCCTB_{FR}} - TP_t^{CCCTB_{GER}} - TP_t^{CCCTB_{FR}}. \quad (15)$$

The taxes to be paid under the CCCTB system result from the application of the German and French tax rate to the respective shares of the group tax base. The apportionment factor β denotes the share of the group tax base that is allocated to the German company. Thus, $(1-\beta)$ of the tax base is allocated to the French company.

$$TP_t^{CCCTB} = TP_t^{CCCTB_{GER}} + TP_t^{CCCTB_{FR}} = (\beta * \tau_t^{GER} + (1-\beta) * \tau_t^{FR}) *\ TB_t^{CCCTB}, \quad (16)$$

where $0 \leq \beta \leq 1$.

The tax base under the CCCTB system TB_t^{CCCTB} consists of the adjusted gross income AGI_t^{CCCTB}, insofar as it is positive, minus a potential loss-offset LO_t^{CCCTB} at the group level. If the sum of the adjusted gross incomes is negative, the tax base will take on a value of zero.

$$TB_t^{CCCTB} = \max\{AGI_t^{CCCTB}; 0\} - LO_t^{CCCTB}, \quad (17)$$

with the adjusted gross income AGI_t^{CCCTB}:

$$AGI_t^{CCCTB} = CF_t^{GER} - D_t^{GER} + i_t\ * FI_{t-1}^{CCCTB_{GER}} +\ CF_t^{FR} - D_t^{FR} + i_t\ * FI_{t-1}^{CCCTB_{FR}}. \quad (18)$$

The amount to be offset under the CCCTB system is restricted by the lesser of two terms: the adjusted gross income and the loss carry-forward accumulated in the previous periods. As a minimum taxation provision is not implemented, we obtain for the loss-offset LO_t^{CCCTB}:

$$LO_t^{CCCTB} = \min\left\{LCF_{t-1}^{CCCTB}; max\{AGI_t^{CCCTB}; 0\}\right\}. \quad (19)$$

The loss carry-forward LCF_t^{CCCTB} under the CCCTB system is determined in the same way as under the system of SA, except that no loss carry-back needs to be considered:

$$LCF_t^{CCCTB} = LCF_{t-1}^{CCCTB} - min\{0; AGI_t^{CCCTB}\} - LO_t^{CCCTB}. \tag{20}$$

Based on the models for the system of SA and the CCCTB system, we built up the financial plans for the numerical analysis.

5 Numerical Analysis

Providing a detailed picture of the loss-offset rules under either system in a closed-form, multi-period, theoretical model is difficult, as non-linear functions and condition-based provisions must be taken into consideration. Even in short-period perspectives, analytical models become inscrutable and scarcely allow any generalizable economic conclusions. As a result, we are forced to fall back on financial plans with numerical examples to capture specific conditions from the analysis.[51] Financial plans allow us to deal with complex rules also in multi-period settings. In the numerical analysis, we calculate the after-tax future value[52] of the underlying investment of the MNG by summing up the net cash flows of each period under consideration.

5.1 Scope of the numerical analysis

By considering a continuous period, the values of the previously introduced variables[53] are functions of the cash flows CF_t^{GER}, CF_t^{FR} and the depreciation D_t^{GER}, D_t^{FR} from the current or prior periods and the exogenous variables, i.e. i, τ^{FR}, τ^{GER}.[54] Consequently, the decision to opt for the CCCTB system ultimately depends only on the cash flow time pattern[55] of the French and the German companies, the corresponding depreciation and the exogenous variables. The following analysis focuses on the impact of different combinations of time patterns and magnitudes of cash flows and depreciation on the relative advantageousness of either tax system. By assumption, the decision as to whether to opt for the CCCTB system must be made at the beginning of the first period.

To demonstrate the tax effects, we consider pre-tax cash flows for both the German and the French company that vary in increments of € 200,000 between -€ 3 million and € 3 million in the first period. This range of values is sufficient to illustrate which cash flow pattern is advantageous for which tax

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51 This approach is in line with *Majd* and *Myers* (1987); *Haegert* and *Kramm* (1977); *Niemann* (2004a).

52 See *Sureth, Mehrmann* and *Dahle* (2010), p. 168.

53 These are the adjusted gross incomes, the tax bases, the loss carry-forwards, the loss carry-backs, the loss-offsets, the dividend payments and the financial investments.

54 The apportionment factor *β* consists partly of a fixed component (allocation of assets and labour) and partly also on the cash flows as a proxy for the sales of the respective company. See section 5.2.1.

55 Earlier analyses have already shown that cash flow time patterns are important for potential loss-offsets. See *Barlev* and *Levy* (1975), p. 178; *Haegert* and *Kramm* (1977), p. 205; *Niemann* (2004a), p. 3; *Dahle* (2011), p. 62.

system. To analyse the effect of different loss-offset rules, both the French company and the German company are required to have at least one tax year with losses. In order to ensure this and, furthermore, to ensure that the alternative time patterns and magnitudes of the pre-tax cash flows are still comparable, we assume that the pre-tax present value of the cash flows of each company is always € 100,000.[56] Thus, a specific growth factor ε must be applied to the first period's cash flows to determine the cash flows for the subsequent period. This factor is calculated as follows:

$$\varepsilon = (100{,}000 - CF_1)/(CF_1 * (1+i)^{-1}). \tag{21}$$

Using eq. (21) leads to a high positive cash flow in the first period and a high negative cash flow in the second period, and vice versa, for each company. This determination of the cash flows in both periods guarantees that a change in the ranking of the alternative tax systems is impacted only by the different taxation procedures.

Nevertheless, the determination of positive and negative pre-tax cash flows is not sufficient to ensure that a tax loss or profit arises, as the tax base depends also on the interest payments/income, on depreciation allowances and, in addition, on 5% of the gross dividend under the system of SA. However, the values of the crucial variables are chosen in the numerical analysis in such a way that both companies always face one profit period and one loss period under both systems. The depreciation D, amounting to € 30,000 for both companies $D_t^{GER} = D_t^{FR} = D$, is chosen in such a way that the French and German investment projects are worthwhile after taxes.[57] We use statutory profit tax rates for Germany and France of 30.95% and 37.06%, respectively, as computed by the Centre for European Economic Research.[58]

We assume that remaining loss carry-forwards at the end of the second period may be offset against profits of other future investment projects.[59] Using a two periods-model allows us to capture the decisive characteristics of both tax systems and simultaneously to single out the loss induced implications. The main differences in the utilization of losses between the two systems already arise in the first two periods since the group can make use of the loss carry-back under SA while not under

[56] Assuming equal after-tax present values of the cash flows of both companies under one tax system, and taking this case as a benchmark for the analysis of the respective other tax system, would not reveal the inherent differences between Germany and France in the former tax system and is thus inappropriate for our analysis.

[57] Whether an investment project is worthwhile depends in part on the size of the initial investment, which we do not consider here explicitly. However, it is assumed that the initial investment equals the sum of the depreciation for the object of the investment. We have chosen the depreciation in such a way that the sum thereof is smaller than the after-tax income generated from the project. Consequently, the investment project is worthwhile.

[58] See *Elschner et al.* (2012). The statutory profit tax rate of the French corporation and the German corporation for 2012 are provided by the Centre for European Economic Research (ZEW).

[59] See *Oestreicher* and *Koch* (2011), p. 80.

CCCTB. Although in the following periods the group may use remaining loss-carry forwards under SA, however, we already find in the base model that in tendency the overall tax benefit from loss-offset under the CCCTB system is greater. Thus, and in order to keep the analysis as simple as possible, it is adequate to estimate the future tax effects from loss carry-forwards. Empirical evidence suggests that the remaining loss carry-forwards of both companies can be valued at θ^{SA} = 40% of their face value under the system of SA.[60] As the possibilities to offset losses tend to be better under the CCCTB system, we assume that θ^{CCCTB} = 45% of the loss carry-forwards may be utilized.[61] We test the robustness of our result with respect to these values in the sensitivity analysis.

5.2 Future values under each tax system

The following two figures illustrate how the MNG's after-tax future values under the CCCTB system and under the system of SA, respectively, depend on the "cash flows less depreciation" (hereinafter, $CF - D$) of the German company and the French company. Here, we refer to the after-tax future values as relative decision criteria since they allow us to compare the decisions effects of the respective tax systems directly. The values for the German and French $CF - D$ are plotted in increments of € 200,000. However, we consider that two periods, the abscissa and the ordinate are scales with regard to "cash flows less depreciation in the first period". As the cash flows of the second period are endogenously determined by the growth factor ε, the corresponding values of $CF - D$ for the second period do not have to be plotted explicitly. The disparity in the future values is, under both tax systems, mainly driven by the utilization of losses. The more that losses may be utilized during the time frame under consideration, the higher the after-tax future values.

5.2.1 CCCTB system

The group tax base under the CCCTB system is allocated to the French company and the German company according to the apportionment formula. We assume that the formula factors of assets and labour are equally allocated between both companies, so that 50% of these factors is attributed to each company in both periods.[62] The accumulation of financial assets in Germany does not change

[60] Empirical evidence indicates that approximately 40% of German losses may later be offset against profits. See *Schneider* (1988), p. 1222; see also *Niemann* and *Treisch* (2006), p. 1020; *Haegert* and *Kramm* (1977), p. 205. As the German and the French provisions for loss carry-forward are almost similar, we assume that this evaluation holds for the French company as well.

[61] Due to the cross-border loss-offset and the non-existence of the minimum and dividend taxation, the possibilities to offset losses might be better under the CCCTB system.

[62] As both group companies incur the same present value of pre-tax cash flows, we presume that both companies invested the same amount of money in their respective projects. Assuming that the investment involves the same level of labour and assets in both countries, 50% of these factors are allocated to each company. As liquid funds are invested in the capital market and not in real investment projects of the companies, we further assume that no additional assets are purchased and no additional workforce is hired in the period under review. Vice versa, we assume that the companies do not sell part of their assets or reduce workforce in loss-making periods. Thus, the magnitude of assets and labour is assumed to remain constant. Also *Eber-*

the asset allocation between both companies, as financial assets are disregarded for determining the asset factor. The sales factor for each company is assumed to vary in line with the respective pre-tax cash flows. We take the magnitude of the pre-tax cash flows as a proxy for the magnitude of the sales of every company.[63] If the pre-tax cash flow is negative for one company, we assume that this company does not engage in any sales, so that 100% of the sales are generated by the other company. In that extreme case, the group tax base is apportioned to the companies in the proportion of 33% to 67%.[64] We obtain the following future values for varying French and German $CF - D$:

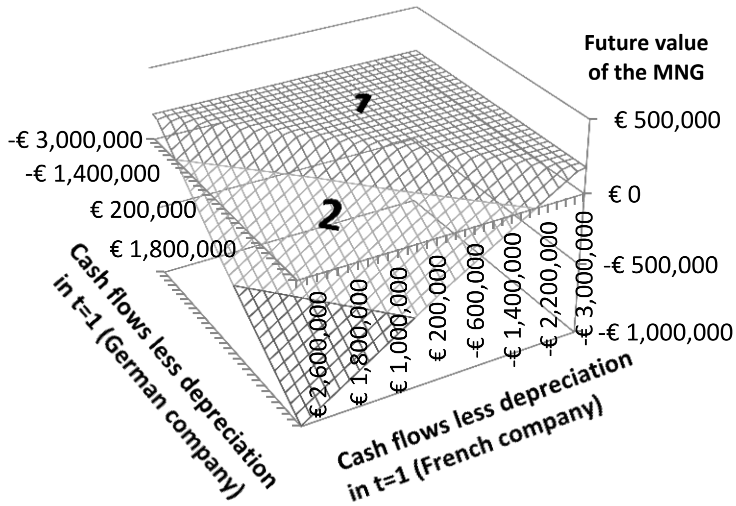

Figure 1: Future values under the CCCTB system

The highest future values (approximately € 180,000) emerge for that half of the combinations of French and German $CF - D$ that result in a negative or zero CCCTB in the first period (combinations of area 1).[65] For the other half of the combinations (combinations of area 2), that lead to a positive CCCTB in the first period, the future values decrease with increasing French and German $CF - D$. When the German and French $CF - D$ take the maximum considered value of approximately € 3 million, the lowest future value of -€ 996,208 occurs.

A negative or zero CCCTB in the first period (combinations of area 1) leads to the highest future val-

hartinger and *Petutschnig* (2014) assume in their game-theoretic analysis that assets are distributed equally between their two considered countries.

63 The share of the sales factor, which is allocated to each company, is approximated by the relation of the pre-tax cash flows of the respective company to the pre-tax cash flows of the group. We assume that the German company sells to German clients, and the French company to French clients. The companies are assumed to not export to other countries.

64 In an alternative approach, we assume that the apportionment factor β is fixed and constant over time and thus it is independent of the magnitude of the pre-tax cash flows. Untabulated results show that this variation has little impact on our results even if the apportionment factor β takes on extreme values of zero or one.

65 This is the case if the absolute value of negative $CF - D$ of one company is greater than or equal to the positive $CF - D$ of the other company, or both group companies incur negative or zero $CF - D$ in the first period.

ues, as all losses may be utilized to decrease the tax burden during the time frame under consideration. The loss carry-forward of the first period may be utilized to offset a large share of the taxable profits of the second period. A positive CCCTB in the first period (combinations of area 2) leads to lower future values, as the resulting losses of the second period may not be utilized during the time interval considered. Taxes must be paid on the profits of the first period, whereas the losses of the second period are evaluated at only θ^{CCCTB} = 45% to offset future profits. By increasing first period's $CF - D$ of a group company, the relative gap between taxes paid in the first period and the assigned present value of the future tax refunds for the loss carry-forwards of the second period increases, as well. Thus, by increasing $CF - D$ in the first period, more taxes must be paid in relation to the pre-tax cash flows of € 100,000, and this results in lower future values for the group.

5.2.2. System of separate accounting

The following graph shows the MNG's future values under the system of SA:

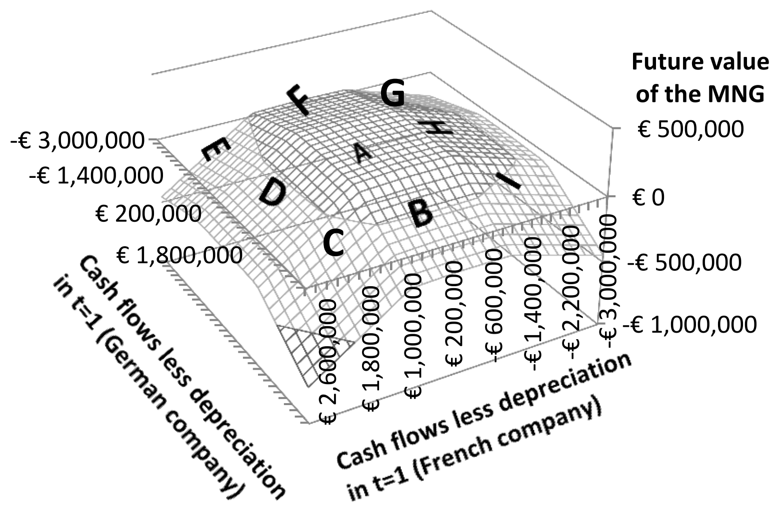

Figure 2: Future values under the system of separate accounting

Due to the application of SA in determining the tax burden of the group companies, and due to increased complexity with regard to the treatment of losses, this graph is more complex than that in Figure 1. The largest share of losses may be utilized for tax purposes if neither the loss carry-back restriction nor the minimum taxation applies for the companies. This is the case if the $CF - D$ of both group companies range between - € 1.2 million and € 1 million in the first period (area A in Figure 2). In area A, the future values are not identical but do not differ by much. The highest future value under the system of SA amounts to € 178,493.

If the $CF - D$ of the German and/or the French group company exceeds € 1 million in the first period, the loss carry-back restriction will apply in the second period. The minimum taxation applies in the second period, given that the $CF - D$ of the respective group companies fall below -€ 1.2 million in the first period. The future values decrease with increasing/decreasing $CF - D$ of the group companies in the first period if the $CF - D$ exceed the respective limits for the loss carry-back restriction and/or the minimum taxation. The more the $CF - D$ exceed these limits, the smaller the share of the overall losses that may be utilized during the given time frame and the smaller the resulting future values.

As long as only one of the two group companies may not entirely utilize its losses in the given time frame but the respective other company may do so, the future values of the group range between areas B (loss carry-back restriction applies to the German company), D (loss carry-back restriction applies to the French company), F (minimum taxation applies to the German company) or H (minimum taxation applies to the French company). If both of the group companies may not entirely utilize their losses, the future value lies in areas C (loss carry-back restriction applies to both companies), E (minimum taxation applies to the German company and the loss carry-back restriction applies to the French company), G (minimum taxation applies to both companies) or I (loss carry-back restriction applies to the German company and minimum taxation applies to the French company). The lowest future value (-€ 721,177) of the group arises if the $CF - D$ of both group entities take the highest values considered in this analysis (i.e. approximately € 3 million), as then due to the loss carry-back restriction the largest share of losses remains unused.

We find that the time pattern of the profits/losses streams and, arising from this, the divergent opportunities to utilize the upcoming losses are the key drivers of the MNG's future values under both tax systems in our setting.

5.3 Which tax system is advantageous for which combinations of cash flows less depreciation?

The following graph illustrates which of the two underlying tax systems is advantageous for which combinations of $CF - D$ of the French company and the German company, based on the future values shown in the previous two graphs (Figures 1 and 2).

As the graph in Figure 3 shows, the CCCTB system is advantageous for most of the plotted $CF - D$. The graph shows 961 combinations, and for 632 of them the CCCTB system is preferable. However, the system of SA is advantageous if the values for the German and French $CF - D$ are positive in the first period or if the $CF - D$ values are slightly negative for one group entity and positive for the other.

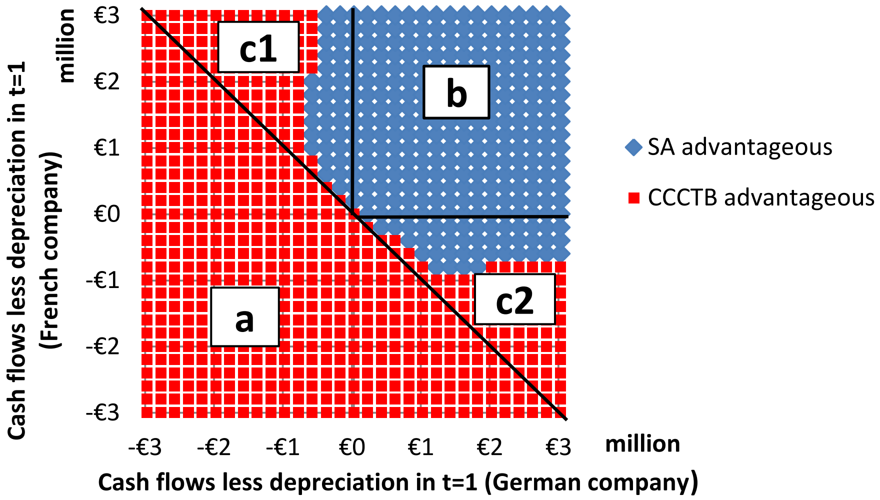

Figure 3: Separate accounting versus CCCTB depending on cash flows less depreciation of both companies

There are four effects that determine whether one or the other tax system is preferable:

- *loss utilization effect*: This effect refers to the share of overall group losses that may be offset against profits under each tax system. The evaluation of the remaining loss carry-forwards at the end of the second period is also decisive for the advantageousness of each tax system;
- *dividend taxation effect*: This effect is always to the disadvantage of the system of SA, as 5% of the intragroup dividends constitute a non-deductible expense for the German company. To check whether our results hold for fully tax-exempt dividends[66] on the parent level, we conducted a sensitivity analysis and found in tendency corresponding results. [67]
- *interest taxation effect*: Given that the French subsidiary must take a loan from the German parent, the interest payments in subsequent years are deductible in higher-taxed France and are taxed in the lower-tax Germany under the system of SA. Intragroup loans are irrelevant for tax purposes under the CCCTB system. Thus, in this setting, the interest taxation effect always favours the system of SA;[68]
- *tax base allocation effect*: The shares of the overall group tax base that are taxed in France/Germany under the CCCTB system differ from the shares that are taxed under the system of SA.[69]

Generally speaking, the tax base allocation between the two companies tends to be more moderate under the CCCTB system than under the system of SA, due to consolidation and due to the equally-allocated formula factors of assets and labour. As the French tax rate is higher than that in Germany

[66] Only in France, Germany, Italy and Belgium 5% of the gross dividend is subject to tax.
[67] Only in some exceptional cases our results change.
[68] The interest taxation effect occurs only if the French subsidiary incurs losses in the first period and thus takes a loan in the first period. Consequently, it pays interest in the second period.
[69] Only in rare situations the tax base allocation under the CCCTB system and the system of SA might be lead to similar outcomes. See *Petutschnig* (2012), p. 63.

$(\tau_t^{GER} < \tau_t^{FR})$, it is desirable from the group's perspective that most profits be taxed in Germany and most losses in France. However, as every company generates profits in one period and incurs losses in the other, the tax system that proves to be advantageous with regard to the tax base allocation in one period becomes disadvantageous in the other period. Thus, the tax base effects counterbalance each other to some extent during the periods under review. However, due to the positive present value of the pre-tax cash flows and due to the partly extinguished losses at the end of the second period, the impact of the tax base allocation in the profit period is stronger than that of the loss period.

For the following interpretation, we first consider the combinations of $CF - D$ that result in a negative or zero CCCTB in the first period (combinations of area a, area a also includes also the diagonal line of the graph). A full utilization of losses may be achieved for all combinations of area a under the CCCTB system,[70] but for only a few combinations under the system of SA, due to the loss carry-back restriction and the minimum taxation. Even in cases in which losses may be offset entirely under both systems, the dividend taxation under the system of SA ensures that the CCCTB system is always preferable under such conditions. The interest taxation effect and – depending on the specific combinations in area A – the possibly preferable tax base allocation under the system of SA are not strong enough to lead to a change in the ranking of the tax systems.

In the following, we consider only the combinations above the line in Figure 3. To compare the tax consequences under the CCCTB system with those under the system of SA, we first focus on combinations of only positive $CF - D$ of both companies in the first period (area b). For these combinations, the system of SA is always advantageous, mainly because the resulting losses of the second period may at least partially be carried back under the system of SA. In contrast, under the CCCTB system, the second period's loss may not be utilized at all during the time frame under review, but must be carried forward and is valued at $\theta^{CCCTB} = 45\%$. The tax base allocation effect and the dividend taxation effect play rather minor roles and are crucial only in marginal cases. As the French company does not lack liquidity in the first period, the interest taxation effect does not appear.

Next, we consider the tax consequences in the case where only one company incurs positive $CF - D$ and the other company incurs negative $CF - D$ (area c1 and c2). Here, whether one or the other tax system is advantageous depends on the specific combination of $CF - D$ of both companies. In area c2 (c1) the German (French) company may carry back its losses of the second period and the French (German) company must carry forward the losses of the first period under the system of SA. Under the CCCTB system, the profits and losses of each group company may be offset cross-border in each

[70] Compare with area 1 of Figure 1.

period. In both areas, the CCCTB is positive in the first period (all losses of the German (French) company may be offset cross-border in area c1 (c2)) and negative in the second period (the losses of the French (German) company exceed the profits of the German (French) company in area c1 (c2)). The system of SA is beneficial if the advantage from carrying back the second period's losses of the German (French) company (area c2 (c1)) is rather high. Specifically, the group benefits from SA if this advantage exceeds:

- the benefit from a cross-border loss-offset under the CCCTB system;
- the disadvantage of a loss carry-forward in the other company under SA in comparison to an immediate loss-offset under the CCCTB;
- the disadvantage of the dividend taxation effect in period 1 (2) in area c1 (c2); and
- in area c1, the disadvantage of the tax base allocation effect, which favours in this area the CCCTB system.

The main driver of the results is the loss utilization effect. The interest taxation effect and the tax base allocation effect favour the system of SA in area c2, as well. Only for these combinations may the group deduct interest in higher-taxed France and tax them in Germany, and only for these combinations more tax base is taxed in lower-taxed Germany under the system of SA than under the CCCTB system. Due to these two additional effects in favour of the system of SA, there are more combinations for which the system of SA is advantageous in area c2 than in area c1. As becomes apparent from Figure 3, with increasing $CF - D$ of the company that may make use of the loss carry-back provision (the German (French) company in area c2 (c1)), the system of SA remains advantageous only for decreasing $CF - D$ of the other company. Under the system of SA, the relative share of utilizable losses decreases due to the loss carry-back restriction with increasing $CF - D$, and thus the system of SA declines in its relative advantageousness. Thus, it can remain advantageous only if the profits and losses under the CCCTB system are very unbalanced and the advantage from the cross-border loss-offset is rather low. This is the case when the $CF - D$ of the other company decrease.

The following graph clarifies to what extent one or the other tax system is superior. It shows, by example, the future value of the group for fixed German $CF - D$ of -€ 30,000 in the first period and for varying $CF - D$ for the French group under both systems.

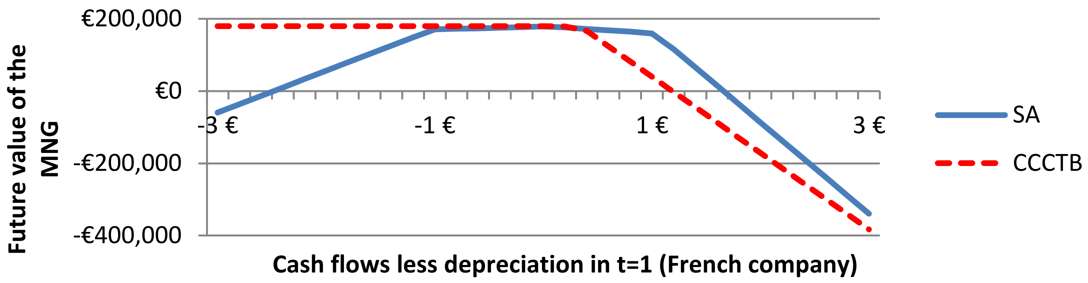

Figure 4: Future value of the MNG for a fixed value of German cash flows less depreciation of -€ 30,000

The observable effects have been described previously. The graph shows that in the most extreme case (French $CF - D$ amount to -€ 3.03 million), the difference in future values between both systems amounts to approximately € 230,000. If the French $CF - D$ amount to -€ 30,000, the difference between both systems is the smallest. The future value under the system of SA is approximately € 900 higher than that under the CCCTB system. The graph clarifies that the differences in future values between both systems vary considerably, from marginal to substantial differences.

The unlimited loss carry-forward provision without minimum taxation and the possibility of a cross-border loss-offset make the CCCTB system advantageous for most of the combinations considered. However, the system of SA becomes advantageous if the profit/loss streams allow the utilization of the loss carry-back provision. These results are in line with the outcomes of the basic model, as the system of SA can be advantageous only due to the possibility of carrying losses back. The dividend and interest taxation effect and the tax base allocation effect are not the main drivers of our results, but in borderline cases they can be decisive. In the next section we investigate the impact of the assumptions made for our model on our findings through a sensitivity analysis.

5.4 Sensitivity analysis

To draw more general economic conclusions as to the advantageousness of each tax system, we must examine the robustness of the previous results. To this end, different parameter variations are applied. In three steps, we analyse, *ceteris paribus*, the influence on the results of the evaluation of the remaining losses at the end of the second period as well as the relation between these evaluations under both tax systems, and finally we have broadened the scope of the $CF - D$ for both group companies while retaining the parameter settings of the base scenario.

We analyse the impact of the evaluation of the remaining loss carry-forwards at the end of the second period. First, we vary the portion of losses that may be utilized in the future while retaining a constant relation between the utilizable losses under both tax systems. By varying the portion of the utilizable losses equally under both systems, it is obvious that higher loss utilization favours CCCTB. In the extreme case where 100% of the losses may be utilized in the next period under the CCCTB system and approximately 90% under the system of SA, there remain 25 out of 961 combinations under which the system of SA is preferable for the MNG (compared to 320 combinations in the base scenario, see Figure 3).[71] SA remains advantageous if the $CF - D$ of both companies are slightly below or exactly € 1 million in the first period, as then the advantage from loss carry-backs is maximal.

In a next step, we vary the relation between the shares of losses that may be utilized for tax purposes in the future under both tax systems. Depending on the future profit/loss streams, the scope for utilizing losses might be fundamentally better under the CCCTB than under SA. This is because under the CCCTB, losses may be offset cross-border and no minimum taxation exists. Obviously, with an increase in α^{CCCTB}, the relative advantageousness of the CCCTB system increases, as well. If, for example, the share of utilizable losses under the CCCTB is $\alpha^{CCCTB} = 98\%$ while the share of utilizable losses under the system of SA amounts to α^{SA} = 40%, there remain 26 combinations for which the system of SA is advantageous. Again, these combinations are characterized by $CF - D$ of close to € 1 million for both group companies in the first period.

Last but not least, we broaden the scope for the $CF - D$ to be considered. Instead of considering $CF - D$ from approximately minus € 3 million to plus € 3 million, as in the base scenario, we now consider $CF - D$ from approximately minus € 45 million to plus € 45 million.[72] The values for the German and French $CF - D$ are now plotted in increments of € 500,000. The parameter settings remain the same as those in the base scenario. The following graph shows only the results for positive $CF - D$ of both group companies (comparable to area b of Figure 3). For the remaining combinations, the results do not add anything new to the findings of the base scenario.

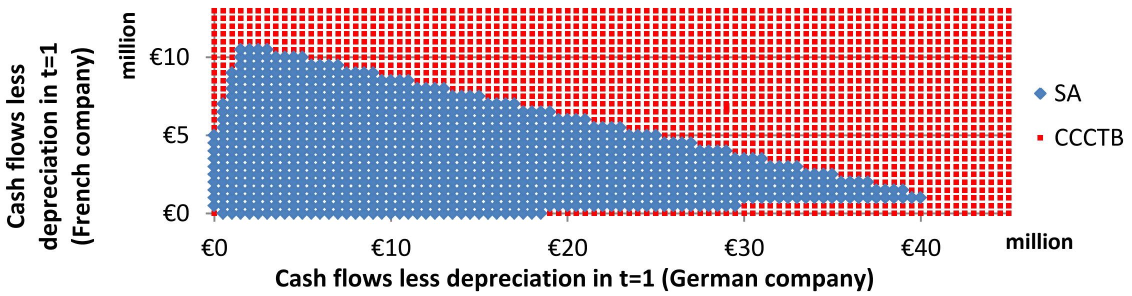

Figure 5: Separate accounting vs. CCCTB depending on a broader scope of cash flows less depreciation

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[71] In the base scenario the relation factor between the evaluations of the remaining losses under both tax systems is $\delta = \frac{\alpha^{CCCTB}}{\alpha^{SA}} = \frac{45\%}{40\%} = 1.13$. For this sensitivity analysis, we increased α^{CCCTB} and α^{SA} but δ is kept constant.

[72] By considering a broader scope, the interest payments can be higher than € 150,000. See footnote 40. However, even in cases with high losses the thin capitalization rule does not apply for the French company because we assume that the indebtness condition (safe haven) is not violated. See *Gaoua* (2014), p. 26.

Figure 5 shows that the system of SA is advantageous only up to a limited amount of positive $CF - D$ of the French and German company in the first period. The main reason for this is that there is a break-even-point where the advantage of the utilization of a larger share of losses under the system of SA due to the loss carry-back, is overcompensated by the effects of a higher value of the remaining losses at the end of the second period under the CCCTB system ($\theta^{CCCTB} = 0.45, \theta^{SA} = 0.4$).

The area in Figure 5 for which the system of SA is advantageous is triangular shaped. The triangle can be described by its apexes and the point of origin. Specific combinations of German and French $CF - D$ determine the edge and apexes of the triangle, and thus the break-even point of SA and CCCTB's relative attractiveness. Under the given set of assumptions:

- the German $CF - D$ are limited to € 1 million and the $CF - D$ are limited to € 10.5 million (top apex); or
- the French $CF - D$ amount to € 1 million and the German $CF - D$ amount to € 40 million (right apex)

in the first period to favour SA. The upper and right apex of the triangle result mainly from the loss carry-back provision under the system of SA: The relative advantage of the system of SA over the CCCTB system is highest if the $CF - D$ of German or French company takes on a value of € 1 million, as the benefit from the loss carry-back provision is maximal then. Due to the high relative advantageousness of the system of SA over the CCCTB system for $CF - D$ of € 1 million for one company in the first period, the system of SA remains advantageous even if the $CF - D$ of the other company are very high in the first period. Very high $CF - D$ in the first period imply that the share of utilizable losses is, due to the application of the loss carry-back restriction, rather low in the second period.

The CCCTB system turns out to be advantageous for lower French $CF - D$ (top apex) than for German $CF - D$ (right apex). There are two reasons for this imbalance. First, dividend taxation under the system of SA for increasing French $CF - D$ favours the CCCTB system. Second, the tax base allocation for increasing French $CF - D$ favours the CCCTB system, as well, because – compared to the system of SA – a lower share of the group tax base is taxed in higher-taxed France in the profit period.[73,74]

Our sensitivity analysis shows that the results are dependent on the evaluation of the remaining losses at the end of the second period. Improved utilization of the remaining losses under both tax systems, as well as only under the CCCTB system, have a clear effect in favour of the CCCTB system.

[73] The effects of the tax base allocation in the profit period exceed that of the loss period. See section 5.3.

[74] By considering a broader scope of $CF - D$, the tax base allocation effect becomes more important, as under separate accounting the allocation for the group tax base between the two companies can become more extreme. In some settings, low profits of one company meet very high profits of the other company. Thus, the first company maintains a very small share of the group tax base, while the latter company retains a very large one. In contrast, under the CCCTB system, the allocation of the tax base is smoother.

However, varying the evaluation of the remaining losses does not challenge the basic findings of our analysis. By broadening the magnitude for $CF - D$ of both group companies, we show that the advantageousness of the system of SA for positive French $CF - D$ is limited to rather low values.

6 Conclusion

We have analysed the conditions under which the CCCTB system or the system of SA will be advantageous for an MNG of which the member companies incur temporary losses. The focus on losses is particularly relevant and noteworthy, as the recent crisis led to enormous loss carry-forwards in MNGs and, furthermore, innovative activities like start-ups and R&D investment, which are crucial for MNG future performance, usually are characterized by initial losses. Against this background, it is vital to investigate the implications of the tax environment for temporarily loss-making MNGs.

While prior research focuses mainly on the differences in economic behaviour under both systems in general, we study the conditions under which one or the other tax system is preferable from the perspective of an MNG, with a particular focus on loss-offsets. We simulate possible decision scenarios of MNG to ascertain under which conditions MNGs are likely to opt for the CCCTB system. We focus on European MNGs with losses at the parent and subsidiary levels. First, we build a basic model that captures the main characteristics of most national tax systems in Europe under the system of SA and the CCCTB system. In line with the majority of the EU countries, the model integrates the opportunity for carrying losses forward under national laws. The basic model suggests that a temporarily loss-making European MNG would always be well advised to opt for the CCCTB system, as it can make use of the scope for offsetting losses cross-border. Although the tax environment is more complex than depicted in the basic general model, the conclusions highlight the huge impact that the introduction of the CCCTB system may have for temporarily loss-making MNGs in Europe.

To explore in more detail the conditions that MNGs must take into account in their decision-making process, we build in a next step a tailor-made, numerical model for a representative MNG. This model allows us to derive further implications. To demonstrate typical differences between the respective national loss-offset provisions and that of the CCCTB system, we consider a group the parent of which is domiciled in Germany, with a subsidiary in France. Departing from the main characteristics under the national laws captured in the basic model, France and Germany allow losses to be carried back. By considering different magnitudes and time sequences of profit/loss streams of each group company, we vary the degree to which the MNG may utilize its losses by carrying them back and/or forward. We aim to focus only on differences inherent in the tax systems. Thus, we disregard behavioural adaptations in order to reduce tax payments under the respective systems.

While in our base model, the CCCTB proves to be attractive for temporarily loss-making MNGs, in our extended model, we find mixed results. We identify four effects that determine the decision of an MNG: the tax-utilization of losses, the allocation of the tax base to the respective group companies, dividend taxation and intragroup interest taxation. We find that the CCCTB system proves advantageous for increasing loss/profit streams (e.g. from start-ups or R&D projects) of the single group entities, whereas the system of SA is beneficial for decreasing profit/loss streams (e.g. caused by a decrease in return from a mature product). The loss-offset under the CCCTB system has two major advantages compared to the system of SA: no minimum taxation is applicable and cross-border loss-offsets are possible. The inherent advantage of the French and German national tax regimes under the system of SA, is the possibility to carry back losses. In line with the outcomes of the basic model, which neglects loss carry-backs, we can conclude that the possibility of carrying losses back is decisive for the advantageousness of the system of SA.

If the MNG's entities carry out projects that result in opposing profit/loss streams, the CCCTB system will, in most cases, be advantageous, as losses may be offset cross-border. However, counter-intuitively, the CCCTB system is not unconditionally preferable in cases where a cross-border loss-offset is applicable. Rather, it is the magnitude of these entities' profits and losses that determines whether the CCCTB system is worthwhile. If the CCCTB is initially positive but becomes negative over time and, furthermore, if the relationship between the losses and profits of the respective group entities is rather unbalanced, the decision not to opt for the CCCTB system tends to be attractive. The reason is that losses may be utilized earlier under the system of SA, thanks to the loss carry-back provision. However, if the CCCTB is initially negative and becomes positive over time, the results of the analysis point towards choosing the CCCTB system, as in these constellations at least some of the losses may be utilized immediately, thanks to the cross-border loss-offset, while any remaining losses may be carried forward without limitation.

Furthermore, our findings suggest that the CCCTB system tends always to be advantageous if only one of the group companies incurs high initial losses that are followed by high profits. Such extreme profit/loss streams are typical for projects that involve high initial R&D expense, for example in the pharmaceutical industry. The advantageousness of the CCCTB system in such cases is explained by the application of the minimum taxation under the system of SA, which strongly restricts the loss-offset for the extreme profit/loss streams considered here.

Our findings must be interpreted against the background of our set of assumptions. The results are strongly driven by the evaluation of remaining losses at the end of the second period. A better utilization of losses may fundamentally benefit the CCCTB system. However, the results of the sensitivity analysis clarify that even if we vary the loss-offset possibilities strongly in favour of the CCCTB system, there still remain combinations for which the system of SA is advantageous. Thus, our basic conclusions are not challenged by the assumptions about the loss carry-forwards at the end of the second period. Furthermore, broadening the range of $CF - D$ reveals that the system of SA can be advantageous only for combinations that include relatively low profits of both companies in the first period. Consequently, the sensitivity analysis reveals that our outcomes are not limited to just specific numerical examples, but can – to some extent – be generalized. They are helpful in revealing the conditions under which it is advisable to opt for the CCCTB system. Moreover, the results may also contribute to the discussion of corporate group tax harmonization within other economic zones, such as the United States.

Our analysis contributes three important findings to the existing literature. First, in addition to the tax base allocation effect,[75] it identifies further determinants that potentially have a decisive influence on the choice of the preferable tax systems, namely the dividend and interest taxation effect and the loss utilization effect. Second, as some prior studies deny the economic significance of the loss carry-back provision,[76] our study demonstrates that this provision does have a significant impact at least with regard to the choice of the preferable tax system. Third, our study makes clear that the intercompany loss-offset across borders under the CCCTB system is not necessarily preferable over the intertemporal loss-offset under the system of SA.

Whether the CCCTB proposal will be adopted is, in fact, far from certain. In moving toward its adoption by the EU, there has been a public debate on various adjustments to its provisions. Two of the many aspects under discussion are whether a common tax base without consolidation (CCTB) could prove acceptable and whether to implement the minimum taxation based on the German model. Our results indicate that each of these amendments would have a fundamental impact on the relative advantageousness of the CCCTB system and would substantially decrease its attractiveness for MNGs. If both of the restrictions under discussion were applied, scarcely any incentive would remain for Franco-German MNGs to opt for the CCCTB system.

There are still several important issues that have not yet been sufficiently addressed. For instance, our results indicate the difficulty of determining the optimal timing for a company's decision to opt for the CCCTB system. This merits more careful examination in future research so that the overall tax effects in a dynamic setting that may arise as a consequence of the transition to the new system, can be anticipated.

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[75] Prior analytical studies focus mainly on the tax base allocation influenced by income shifting. See *Nielsen et al.* (2010); *Gérard* and *Princen* (2012); *Martini et al.* (2012).

[76] See *Haegert* and *Kramm* (1977); *Dwenger* (2008); *Dreßler* and *Overesch* (2013).

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