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Would a CCCTB mitigate profit shifting?

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Résumé/abstract

In this paper we look into the probability that, given the choice, corporate groups would opt for taxation on a consolidated basis. We further consider what effects separate accounting and taxation on a consolidated basis (formula apportionment) might have on the location of investments and exploitation of remaining leeway for profit shifting. To this end, we present an experimental framework that captures the most relevant aspects of theses decision for EU multinationals.

In a controlled laboratory experiment we use a basic 2-by-2 treatment design with two levels of tax-rate differential between two investment locations and two different remuneration functions allowing the participants to act as owners or managers of a company. In addition, we control for the way in which information on possible extra costs associated with profit shifting is presented to participants.

Our results show that taxation using formula apportionment, while being a viable alternative, does not emerge as the preferred regime. In both separate accounting and formula apportionment, the allocation of production factors depends on the tax-rate differential. Higher tax rates lead to lower amounts of investment, in particular if formula apportionment (CCCTB) is used. Moreover, profit shifts to companies not eligible for consolidation (i.e., companies not resident in the EU) are significantly higher under formula apportionment than under separate accounting. We do not observe significant differences in the behavior of managers and owners. However, the form in which information is provided on possible extra costs has an impact on the extent of profits shifted to low tax countries.

Mots clés/keywords : International Company Taxation; Separate Accounting; Formula Apportionment; Transfer Pricing; Experimental Economics

Codes JEL/JEL Codes : C91, H25, M41

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1. Introduction

In March 2011 the European Commission submitted a draft directive proposing the introduction of a Common Consolidated Corporate Tax Base (European Commission 2011). In the scope of its "Action Plan for Fair and Efficient Corporate Taxation in the EU" the EU Commission took up this proposal again (European Commission 2015). Under a CCCTB the companies belonging to a corporate group would be allowed to file one single tax return and consolidate all the profits and losses they incur across the EU. The aim of this proposal is to remove existing tax obstacles to the development of the internal market. A main issue of the present system, in which corporations in the EU are taxed separately (*separate accounting*), concerns the high costs relating to compliance with transfer-price regulations according to the arm's-length principle. In addition, over-taxation arises in cross-border activities where a cross-border loss offset is only available under certain pre-conditions. What is more, the network of double taxation treaties grants businesses insufficient protection against double taxation since such treaties are designed to address bilateral relations.

Under a CCCTB the consolidated tax base would be shared out amongst the member states in which the corporation is active, according to a specific formula using a combination of tangible fixed assets, labor costs, employment, and sales by destination as the allocation key (*formula apportionment*). The CCCTB constitutes a form of group taxation allowing for a cross-border loss offset, which under the current system of separate accounting only applies locally in a small number of countries under very specific conditions.

If a CCCTB were to be introduced on an optional basis it would offer some institutional choice. A corporation could then opt either for tax planning under separate accounting with no cross-border loss offset but the opportunity for profit shifts, or for cross-border loss offset with tax planning under formula apportionment. Under formula apportionment, corporations would lose opportunities for profit shifting, and we might expect consequences for investment (allocation of production factors) and the choice of location. In contrast to the original plan for an optional CCCTB, however, the EU Commission has now considered mandatory consolidation and formula apportionment at least for MNEs.

Our study investigates the extent to which formula apportionment finds acceptance. Moreover, it looks into the effects that introduction of an optional CCCTB might have

on the location of investment and usage of specific tax-planning alternatives available under separate accounting and formula apportionment. However, this question as to the possible effects on investment and utilization of accounting leeway also arises under a mandatory regime, albeit only with reference to formula apportionment. Furthermore, the extent to which formula apportionment would be chosen could indicate whether the EU Commission's assumption is correct that companies minimizing their profits through aggressive tax planning will not opt for a CCCTB (European Commission 2015).

Up to now, these questions have been examined only in part. Empirical investigations have been limited to the domestic context. The impact of 'institutional choices' has been subjected to scant examination as a whole. As a rule, these choices are made on the basis of a complex network of facts and circumstances, for which scarcely any data can be scrutinized. Research relating to profit shifting often neglects the possibility of potential losses in the analysis.[1] Since we lack real-life data that would allow us to analyze the effect of an optional taxation on a consolidated basis, we use the method of experimental economics. The experimental method has an additional advantage. Psychological aspects can be investigated more easily in a controlled laboratory environment than in real-life data. Such aspects play an important role when it comes to decisions regarding taxes. The controlled laboratory environment is of particular significance in our experiment due to the complexity of the issue under examination. Beyond behavioral anomalies that are often observed in cases of decisions made in a situation of uncertainty, we can investigate how people deal with complexity extending beyond their cognitive limits (Simon 1957).

To increase the validity of our results, we base our laboratory experiment on empirically observed input data regarding tax rates, likelihood of a loss, and the production functions. In addition, we control for the way in which information on possible extra costs associated with profit shifting is presented, thus replicating all four treatments of the basic 2x2 design with different participants at a different point of time and with a different presentation of possible extra costs. The empirical basis of our experiment is designed to guarantee that the participants are faced with situations comparable to those actually experienced by a multijurisdictional enterprise.

[1] The influence of taxation on investment under uncertainty is analyzed on a theoretical basis by Mackie-Mason (1990), Alvarez, Luis H. R. et al. (1998), Sureth (2002), Niemann and Sureth (2004), Edmiston (2004), Alvarez, Luis H. R. and Koskela (2008) und Gries et al. (2012).

Our experiment focuses on the choice of tax regime (separate accounting or formula apportionment), the allocation of production factors, and profit-shifting activities in the presence of uncertain returns on investment. In a 2-by-2 treatment design, we consider the impact of two levels of tax-rate differential and of a manager versus an owner compensation scheme. Several empirical investigations have shown that tax-rate differentials impact investment-location and transfer-pricing decisions (see Section 2 below). The remuneration scheme could play an important role since owners have to bear losses, while managers do not.

With respect to the proposed introduction of a CCCTB, we observe in our experiment that participants make use of taxation on a consolidated basis in a substantial number of cases, while at the same time they exploit the benefits of shifting profit to lower taxed investment alternatives outside the consolidated group. Furthermore, our experimental results suggest that the use of formula apportionment influences the allocation of economic values taken up in the allocation formula. These findings suggest that profit shifting will continue to take place and is carried out using the same avenues, i.e., allocation of assets to low-taxed investment alternatives and shifting of 'paper' profits. However, they also make it clear that formula apportionment provides an equivalent alternative tax regime since it offers intra-group loss offset and, hence, brings with it tax advantages in cases that investments end up in a loss.

Our paper is structured as follows. Section 2 provides a brief survey of theoretical and empirical studies on tax-planning strategies under separate accounting and formula apportionment. In Section 3 we present a model based view on the impact of the tax regime (separate accounting and formula apportionment) on the optimal allocation of production factors and tax-planning activities making use of profit shifting to low-tax jurisdictions. Section 3.4 describes the experimental design and develops our research hypotheses. Section 5 provides the results of our analysis. Section 6 concludes the paper.

2. Literature

Institutional settings involving tax planning either under separate accounting or formula apportionment have been the object of a number of empirical investigations. Many of these investigate the impact of tax rates on the choice of investment location and intra-group transfer pricing under separate accounting. Losses, the possibilities

for offsetting losses, or other non-debt tax shields[2] have been granted relatively little attention, however.

Arachi and Biagi (2005) and Hanlon and Heitzman (2010), report on the impact of tax differentials on investment location decisions. Moreover, the opportunities for using tax differentials by way of transfer pricing are examined (1) directly on the basis of given market prices or transaction volumes (Clausing 2003, Swenson 2001, Weiner 1990, Bernard and Weiner 1990), or (2) indirectly via reported profits or profitability, and are shown both for the USA (Grubert and Mutti 1991, Harris et al. 1993, Harris 1993, Klassen et al. 1993, Collins et al. 1998, Klassen and Laplante 2012) and the OECD (Bartelsman and Beetsma, Roel M. W. J. 2003) as well as for Europe (Huizinga and Laeven 2008, Egger et al. 2010, Dharmapala and Riedel 2013).[3]

Devereux (1989) and Devereux et al. (1994) consider the influence of asymmetric taxation of profits and losses on investment decisions. Dreßler and Overesch (2013) deal with the impact of existing loss-carry forwards and the treatment of future losses on the extent of German outbound investment.

In the context of capital structure, the impact of any losses or loss carry-forwards has been largely neglected. In some cases this influence is taken into account using a binary regression variable that controls for existence or non-existence of loss carry-forwards (Ramb and Weichenrieder 2005, Buettner et al. 2011a).

In order to avoid generating distorted results, losses or tax loss carry-forwards are, for the most part, neglected or explicitly omitted from the analysis, also when it comes to looking into profit shifting via transfer pricing (Klassen et al. 1993, Huizinga and Laeven 2008, Dharmapala and Riedel 2013). To our knowledge, only Creedy and Gemmell (2011) have given specific scrutiny to loss-making companies up to now. These authors show analytically that tax-rate sensitivity of tax revenue decreases the more asymmetrical the tax system becomes.

Regarding taxes levied on a federal level (where there is no tax-rate differential), offsetting losses against profits is of central importance when businesses are deciding whether to opt for a group taxation regime, which allows for domestic intra-group loss-offset. In this context it is shown that with regard to a federal corporate income

[2] See, for example, the current OECD "Action Plan on Base Erosion and Profit Shifting" OECD (2013a, 2013b) for more sophisticated approaches.

[3] In the scope of a meta study Heckemeyer and Overesch (2013) calculate a semi elasticity of EBIT in relation to the statutory tax rate of 1.3.

tax, on a domestic level companies opt for group taxation if this is advantageous for them in the interests of improved loss-offset (Oestreicher and Koch 2010). Companies with cross-border activities interpose significantly more often than not pure holding companies in their host countries wherever group taxation is available (Mintz and Weichenrieder 2010, Oestreicher and Koch 2012).

The determination of profits under formula apportionment is based on some form of group income resulting from consolidation or combination of income arising at the level of the group companies involved. As a general rule, such consolidation or combination includes offsetting profits against losses earned or suffered by the companies concerned. Besides, the consolidation or combination of income removes all incentives to undertake profit shifting by way of intra-group finance or transfer pricing. Instead, in such a regime the corporate income tax takes the form of separate taxes on the factors included in the allocation formula (Mintz 1999, McLure 1980). This implies that, where allocation factors relate to company parameters, companies can use this to optimize the distribution of these amounts across the individual tax jurisdictions. This feature influences decisions relating to economic values (allocation of assets, payroll costs, number of employees and/or sales volume, for example) underlying the allocation formula in a highly complex manner (Gordon and Wilson 1986). (Gérard 2006, 2007) expects the tax-rate sensitivity of investment to increase if the definition of the formula is based predominantly on a factor that is under the control of the multinational.

In contrast to separate accounting there are few empirical studies on tax planning and the impact of differences in tax rates and formula weights on company decisions under formula apportionment. Existing analyses are based to a large extent on data from the U.S. and Canada (Weiner 1990, Klassen and Shackelford 1998, Grubert and Mutti 2000, Goolsbee and Maydew 2000, Gupta and Hofmann 2003, Edmiston 2002, Edmiston and Arze del Grando, J. 2006). Mintz and Smart (2004) find that taxable income of companies under separate accounting varies with tax rates to a significantly larger extent than taxable income of entities using formula apportionment, which indicates that determining income under separate accounting is subject to profit shifting.

The tax regimes analyzed do not allow the optional application of either separate accounting or formula apportionment for corporate groups to be considered, as would be the case if the CCCTB were to be established. In Canada the option of employing

separate accounting or formula apportionment is linked with the choice between a subsidiary and a branch, which should also be influenced by factors other than taxation, whereas in the U.S. states under 'unitary taxation' formula apportionment is mandatory with respect to 'unitary businesses' if the criteria constituting such unitary businesses are met.

In Germany, when a commercial enterprise operates in several different municipalities, the trade income of this enterprise in Germany must be allocated to its parts operating in the municipalities concerned according to a given formula (Riedel 2010, Buettner et al. 2011b). For trade-tax purposes, allocation of profits according to a formula is also prescribed for tax groups (Buettner et al. 2011b). Unlike legally and economically independent entities, however, since 2002 the group can opt to fulfill the preconditions of a tax group by concluding a profit and loss transfer agreement (i.e., to consolidate profits and losses and apply formula apportionment) or, alternatively, to assess the group companies individually (separate accounting). In 2001 a reform of corporate income tax had the effect that the costs associated with non-consolidation for trade tax purposes were increased because loss-offset opportunities were reduced for those firms that were not consolidated. Given the fact that non-consolidation involves an increase of costs, in the scope of a natural experiment for the year 2001 Buettner et al. (2011b) were able to examine whether multi-jurisdictional entities increase profit-shifting to non-consolidated entities under a tax system based in principle on consolidation and formula apportionment, if this tax system allows individual affiliates to be run as separate entities for tax purposes. Using company data reported in the trade-tax statistics for 1998 and 2001, the authors point out that the varying trade tax rate among German municipalities exercises a significantly negative influence on the number of consolidated group companies. Hence, Buettner et al. (2011b) consider the choice between separate accounting and formula apportionment, where possibilities for intra-group loss offset are given also under separate accounting.

3. A model-based view of the decisions to be made

3.1 Basic assumptions

If a CCCTB is introduced, the representatives of MNEs face the choice of utilizing this option or continuing to be subject to the present tax system. In the first of these scenarios, taxation is based on consolidated profit, with tax bases allocated to the MNE

companies according to a specific formula ("formula apportionment"). Under the current tax system, the tax bases of MNE companies are determined separately using transfer prices to account for intra-group transactions ("separate accounting"). This choice has a direct effect on the net income (i.e., after tax) of owners, whereas the manager is affected directly only in the case of profits being made in excess of a target.

In this section we develop a generalized representation of the profits and income of MNE owners and managers under separate accounting and formula apportionment. This representation takes into account investment alternatives and volumes, the probability of profits and losses resulting from these investments, relevant tax rates, possible tax-loss carry forwards and differences in the compensation schemes. Moreover, the possibilities of profit shifting via transfer pricing under both separate accounting and formula apportionment are included in the depiction, whereby under formula apportionment such profit shifting is only possible in relation to companies excluded from consolidation (i.e., non EU companies in the CCCTB context). Modeling this decision-making situation is intended to focus our research question and demonstrate the complexity of the decisions facing MNE representatives. Choice of tax regime, the allocation of investment budget to investment alternatives subject to different tax rates and the regimes adopted, and the shifting of profits are analyzed with respect to net profits and income of MNE owners and managers.

Assume an MNE operating in three countries referred to as I, II and Z. Each country hosts a constituent company of this multinational enterprise. Countries I and II host production sites (referred to as investment objects IO I and IO II), while country Z hosts passive functions. IO I and IO II produce homogenous goods using v_i production factors, $v_i \in \mathrm{R}^+$, with $i \in \{1,2\}$. For simplicity, we do not distinguish between labor and capital input, assuming that they are linked (i.e., applying a production function of the Cobb-Douglas-type). The profits reported for the passive functions hosted in Z are subject to transfer prices applied to their services.

The investment objects in countries I and II differ in marginal profits. We assume that each investment object may make profits or losses, whereby a profit occurs with the probability p, and a loss with the residual probability $1 - p$, the levels depending on the number of production factors allocated to the respective investment object. In other words, we assume for each investment object i profits $F_P^i\ (v_i)$ or losses $F_L^i\ (v_i)$,

depending on the allocation of production factors to the investment object concerned. The profit functions are standardized, with $F_P^i/dv_i > 0$ and $d^2F_P^i/dv_i{}^2 \leq 0$. Loss functions show the same characteristics, but with opposite algebraic signs. We assume that a number of *N* production factors is available to the multinational enterprise and that these *N* factors are to be allocated among the two investment objects. Since it thus holds that $v_2 = N - v_1$, we can express each profit or loss function as a function of v_2.[4] Note that the following analyses are based on the assumption of risk neutrality.

In the two investment alternatives IO I and IO II, four possible situations of making profits and losses can occur with the outcomes denoted as follows.

- PP (Profit-Profit, with probability p^2): $\boldsymbol{F}_P^1 + \boldsymbol{F}_P^2 = \boldsymbol{F}_{PP}$
- PL (Profit-Loss, with probability $p(1-p)$): $\boldsymbol{F}_P^1 + \boldsymbol{F}_L^2 = \boldsymbol{F}_{PL}$
- LP (Loss-Profit, with probability $(1-p)p$): $\boldsymbol{F}_L^1 + \boldsymbol{F}_P^2 = \boldsymbol{F}_{LP}$
- LL (Loss-Loss, with probability $(1-p)^2$): $\boldsymbol{F}_L^1 + \boldsymbol{F}_L^2 = \boldsymbol{F}_{LL}$

Against this background the multinational enterprise's expected pre-tax profit, $\tilde{\prod}_{pt}$, is determined by the sum of expected pre-tax profits in IO I and IO II:

$$\prod_{PT} = p^2\boldsymbol{F}_{PP} + p(1-p)\boldsymbol{F}_{PL} + (1-p)p\,\boldsymbol{F}_{LP} + (1-p)^2\boldsymbol{F}_{LL} \qquad (1)$$

$\prod_{PT}$ is maximized if the production factors are allocated such that the expected marginal profit of IO I equals that of IO II.

Introducing taxation, we assume that the enterprise is in a position to shift profits. Profits accrued in IO I or IO II, or shifted to Z, are taxed at a country specific rate t_1, t_2 and t_Z, respectively. Without loss of generality, it is assumed that $t_1 < t_2$ and $t_Z < t_2$. Losses do not lead to immediate tax refunds but can be carried forward, thereby decreasing the tax burden in future periods.

In the following, we assume that, prior to its factor-allocation and profit shifting decision and prior to the making profits or losses in the two investment objects, the enterprise can choose between separate accounting or formula apportionment.

[4] Since $v_2 = N - v_1$ the profit and loss functions ($\boldsymbol{F}_P^1$, $\boldsymbol{F}_L^1$, $\boldsymbol{F}_P^2$, $\boldsymbol{F}_L^2$) depend on v_2 (i.e. $\boldsymbol{F}_P^1(v_2)$, $\boldsymbol{F}_L^1(v_2)$, $\boldsymbol{F}_P^2(v_2)$, $\boldsymbol{F}_L^2(v_2)$). For purposes of reducing complexity, we denote them as $\boldsymbol{F}_P^1$, $\boldsymbol{F}_L^1, \boldsymbol{F}_P^2$ and $\boldsymbol{F}_L^2$ in the following.

3.2 Separate accounting

In the case of separate accounting, the multinational enterprise has two ways of reducing its tax burden; these can be combined. The first possibility allows the multinational enterprise to shift pre-tax income from the highly taxed investment object IO II to the lower taxed investment object IO I. The amount thus shifted is represented as T_1. The second possibility allows the multinational enterprise to shift pre-tax income from IO II to the lower taxed additional investment object located in country Z (T_Z). After use of tax-planning strategies and deduction of potential losses carried forward at the level of IO I (lcf_1) and/or IO II (lcf_2), the profits of IO I, IO II and Z, are taxed at the country specific rate t_1, t_2 and t_Z. Due to the asymmetric taxation of profits and losses and therefore potential loss carry-forwards, we can express the tax burden (S^{SA_PS}) of IO I and IO II using four maximum conditions depending on the profit or loss situations of the two investment alternatives. In the following, PP indicates a situation of profits in both investment objects; PL represents profits in IO I and losses in IO II; LP stands for losses in IO I and profits in IO II; and LL represents losses in both investments objects.

- PP: $S_{PP}^{SA\_PS} = Max[0, (\boldsymbol{F}_P^1 + T_1 - lcf_1)t_1] + Max[0, (\boldsymbol{F}_P^2 - T_1 - T_Z - lcf_2)t_2] + T_Z t_z$ (2a)
- PL: $S_{PL}^{SA\_PS} = Max[0, (\boldsymbol{F}_P^1 + T_1 - lcf_1)t_1] + T_Z t_z$ (2b)
- LP: $S_{LP}^{SA\_PS} = Max[0, (\boldsymbol{F}_L^1 + T_1 - lcf_1)t_1] + Max[0, (\boldsymbol{F}_P^2 - T_1 - T_Z - lcf_2)t_2] + T_Z t_z$ (2c)
- LL: $S_{LL}^{SA\_PS} = Max[0, (\boldsymbol{F}_L^1 + T_1 - lcf_1)t_1] + T_z t_z$ (2d)

However, it has to be further considered that the use of this accounting leeway may result in extra costs since the accounts may be subject to an audit by the tax authorities in the country hosting IO II having the effect that the tax costs might be increased by the charging of interest or other additional levies such as withholding taxes on deemed profit distributions f. If a profit shift between IO I and IO II (or Z) is detected in the course of this process, an additional payment may be assessed. This would amount to T_1 (or T_z) multiplied by the tax-rate differential between IO II and IO I (or IO II and Z) and multiplied by a "penalty factor" c (c > 1). The probability of an additional amount being charged likewise depends on the shifted amount multiplied by a factor d_1 or d_z ($d_1 > 1, d_z > 1$), respectively.

The overall expected costs C_1 of shifting profits under separate accounting are:

$$C_1 = (t_2 - t_1)\, c\, d_1\, {T_1}^2 + (t_2 - t_Z)\, c\, d_Z\, {T_Z}^2 \tag{3}$$

For an owner running the MNE, under separate accounting and taking into account profit shifting, the expected after-tax profits ($\prod_{\text{OWN}}^{\text{SA\_PS}}$) are as follows:

$$\begin{aligned} \prod_{\text{OWN}}^{\text{SA\_PS}} &= p^2 \left(\boldsymbol{F}_{PP} - S_{PP}^{SA\_PS}\right) + p(1-p)\left(\boldsymbol{F}_{PL} - S_{PL}^{SA\_PS}\right) \\ &+(1-p)p\left(\boldsymbol{F}_{LP} - S_{LP}^{SA\_PS}\right) + (1-p)^2\left(\boldsymbol{F}_{LL} - S_{LL}^{SA\_PS}\right) - C_1 \end{aligned} \tag{4}$$

In contrast to owners, managers receive compensation only if the net profit (pre-tax profit minus tax burden and costs of profit shifting) of the company exceeds a defined threshold (MT); if this is not the case, they will receive no compensation. Therefore the compensation function of managers ($\prod_{\text{MAN}}^{\text{SA\_PS}}$) can be set out as follows:

$$\begin{aligned} \prod_{MAN}^{SA,PS} &= p^2 Max\left[0, \left(\boldsymbol{F}_{PP} - S_{PP}^{SA\_PS} - C_1 - MT\right)\right] \\ &+p(1-p)Max\left[0, \left(F_{PL} - S_{PL}^{SA\_PS} - C_1 - MT\right)\right] \\ &+(1-p)p\; Max\left[0, \left(F_{LP} - S_{LP}^{SA\_PS} - C_1 - MT\right)\right] \\ &+(1-p)^2 Max\left[0, \left(F_{LL} - S_{LL}^{SA\_PS} - C_1 - MT\right)\right] \end{aligned} \tag{5}$$

The large number of maximum conditions makes it evident that optimal behavior depends strongly on the prevailing conditions. Optimal investment on the part of both owners and managers is given where the expected marginal after-tax profit of IO I and IO II correspond, and the optimal amount of profits being shifted to IO I or Z is determined such that the expected marginal tax reduction equals the expected marginal cost of a profit shift.

3.3 Formula apportionment

In the case of formula apportionment, those consolidated profits of IO I and IO II that after adjustment via profit shifting to Z (T_Z) exceed losses carried forward (lcf_{FA}) are taxed at a combined tax rate (ŧ). The passive operations in country Z are not subject to consolidation. Again, profits derived in Z are taxed at the rate t_Z. The weighting of local tax rates, t_1 and t_2, in the combined tax rate (ŧ) depends on the sum of wages paid in each of the two investment objects. Since we do not explicitly model the input of labor and capital in a production function, we use the sum of the marginal profits of each production factor allocated to an investment object as a proxy for the sum of wages paid in this investment object (under the general assumption that labor is remunerated such that the wage equals the marginal productivity of labor):

$$L_i(v_i) \;=\; p \sum_{j=1..v_i} \boldsymbol{F}_i^{P\prime}(j) \;+\; (1-p) \sum_{j=1..v_i} \boldsymbol{F}_i^{L\prime}(j) \tag{6}$$

Based on L_1, L_2 and t_1, t_2 the resulting combined tax rate is

$$\text{ŧ} = \; t_1 \frac{L_1(v_1)}{L_1(v_1)+L_2(v_2)} + t_2 \frac{L_2(v_2)}{L_1(v_1)+L_2(v_2)} \tag{7}$$

The tax burden of IO I and IO II can be presented using four maximum conditions, depending on the profit and loss situations of the two investment alternatives.

- PP: $S_{PP}^{FA\_PS} = \; Max[0,\; (\boldsymbol{F}_{PP} - T_z - lcf_{FA})\text{ŧ}] + T_Z t_z$ (8a)
- PL: $S_{PL}^{FA\_PS} = \; Max[0,\; (\boldsymbol{F}_{PL} - T_z - lcf_{FA})\text{ŧ}] + T_Z t_z$ (8b)
- LP: $S_{LP}^{FA\_PS} = \; Max[0,\; (\boldsymbol{F}_{LP} - T_z - lcf_{FA})\text{ŧ}] + T_Z t_z$ (8c)
- LL: $S_{LL}^{FA\_PS} = T_Z t_z$ (9d)

Again, such use of accounting leeway may lead to additional payments since the accounts may be subject to an audit. If a profit shift to Z is detected an additionalpayment may be assessed. This payment would amount to T_z multiplied by the difference between the combined tax rate and t_z and multiplied by the "penalty factor" c (c > 1). Here, too, the probability of an extra amount being charged depends on the shifted amount multiplied by a factor d_z ($d_z > 1$).

The expected costs of a profit shift under formula apportionment are:

$$C_2 = (\text{ŧ} - t_Z)\; c\; d_z {T_Z}^2 \tag{10}$$

Taking possible extra payments into account, the expected after-tax profit of owners ($\prod_{\text{OWN}}^{\text{FA,TZ}}$) and managers ($\prod_{\text{MAN}}^{\text{FA,TZ}}$) using formula apportionment can be determined as follows:

$$\begin{aligned}\prod\nolimits_{\text{OWN}}^{\text{FA\_PS}} = {} & p^2\left(\boldsymbol{F}_{PP} - S_{PP}^{FA\_PS}\right) + p(1-p)\left(\boldsymbol{F}_{PL} - S_{PL}^{FA\_PS}\right) + (1-p)p\left(\boldsymbol{F}_{LP} - S_{LP}^{FA\_PS}\right) \\ & + (1-p)^2\left(\boldsymbol{F}_{LL} - S_{LL}^{FA\_PS}\right) - C_2\end{aligned} \tag{11}$$

$$\begin{aligned}\prod\nolimits_{\text{MAN}}^{\text{FA\_PS}} = {} & p^2 Max\left[0, \left(\boldsymbol{F}_{PP} - S_{PP}^{FA\_PS} - C_2 - MT\right)\right] \\ & + p(1-p) Max\left[0, \left(\boldsymbol{F}_{PL} - S_{PL}^{FA\_PS} - C_2 - MT\right)\right] \\ & + (1-p)p\; Max\left[0, \left(\boldsymbol{F}_{LP} - S_{LP}^{FA\_PS} - C_2 - MT\right)\right] \\ & + (1-p)^2 Max\left[0, \left(\boldsymbol{F}_{LL} - S_{LL}^{FA\_PS} - C_2 - MT\right)\right]\end{aligned} \tag{12}$$

Under formula apportionment, for both owners and managers an optimal investment in IO II requires that the expected marginal after-tax profit in IO I equals that of IO II. The optimal amount shifted to Z is such that the expected marginal tax savings equal the expected marginal cost.

3.4 Hypotheses

In order to develop testable hypotheses, we apply our empirically-based assumptions regarding underlying functions and parameters, as set out in Section 4.1, to our model-based view as presented above.

The expected profits under separate accounting and formula apportionment are exhibited in Figure 1 for owners and Figure 2 for managers for all possible investments (from one to 14 production factors in IO II), leaving aside profit shifts and losses carried forward. Each of the two figures shows the expected profits for both high and low tax-rate differentials. We denote the high tax-rate differential for separate accounting and formula apportionment as S*A_TD15* and *FA_TD15,* and the low tax-rate differential as *SA_TD5* and *FA_TD5*.

Figure 1 indicates that formula apportionment is beneficial for owners since for each allocation of production factors, the expected profits of *FA_TD15* are above those of *SA_TD15* and the expected profits of *FA_TD5* are above those of *SA_TD5*. This result can be traced back to the fact that due to the direct offset of pre-tax gains and losses of IO I and IO II under formula apportionment, owners face a lower probability of making a net loss than under separate accounting.

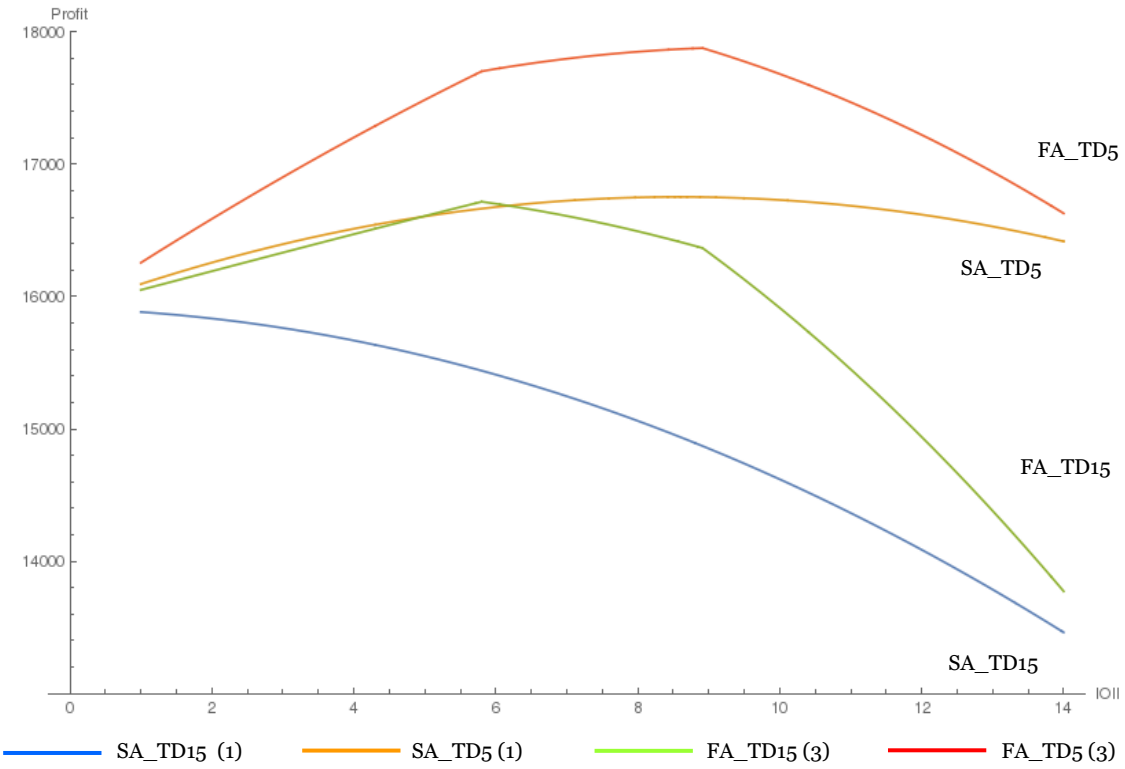

Figure 1: Expected profits received by owners under SA and FA

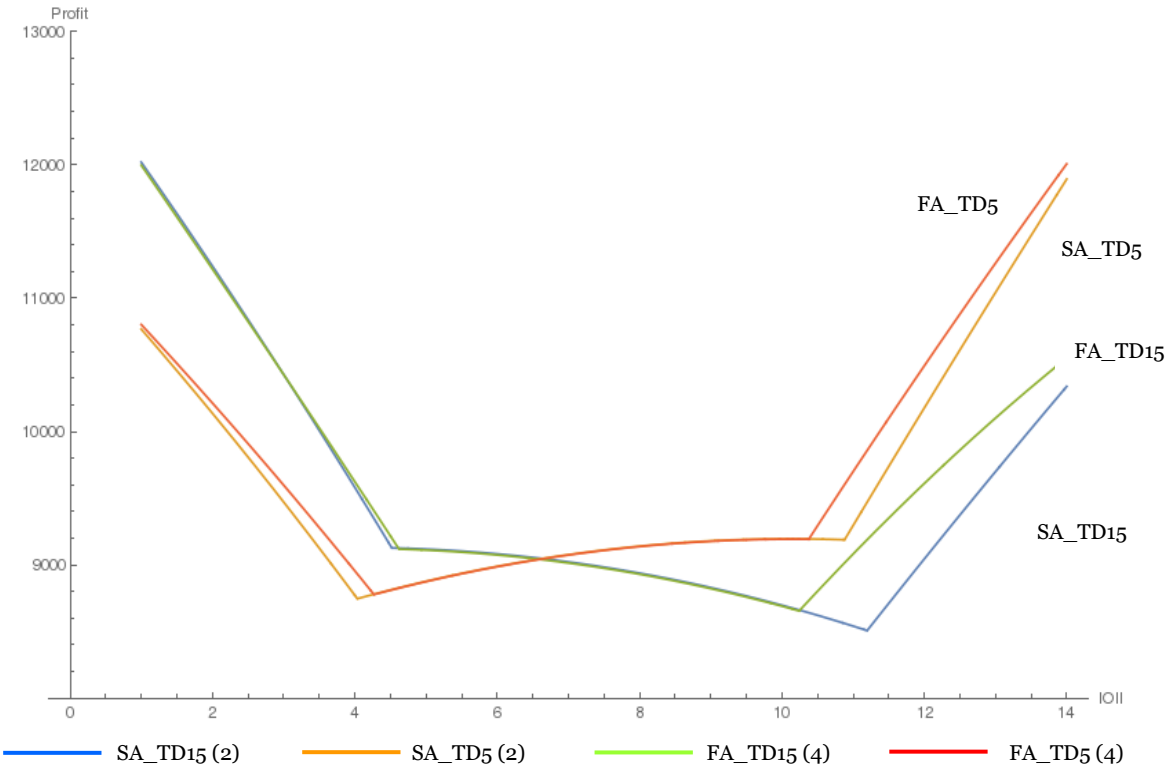

Figure 2: Expected profits received by managers under SA and FA

For managers, Figure 2 exhibits an advantage of formula apportionment, if only a small one. In terms of expected profits, separate accounting and formula apportion-

ment could be considered as being more or less equivalent if profit shifting and loss carry-forwards are neglected.

If the possibility of profit shifting under separate accounting is taken into account, the difference between the expected after-tax profits of both tax regimes narrows. Separate accounting could even become more favorable than formula apportionment, in particular for managers. This is due to the fact that tax planning by way of shifting profits from high-taxed investments to low-taxed investments is only available under separate accounting. The resulting increase in expected profits is all the more noticeable where the tax-rate differential between the two investments is large.

If we additionally consider the possibility of losses, separate accounting may again have advantages over formula apportionment due to the fact that losses can be carried forward, increasing the expected after-tax profits in later periods. Since there is no direct offset of losses against profits under separate accounting, this regime leads to a larger number of cases where losses are to be carried forward. Furthermore, also the amounts concerned in losses carried forward exceed those carried forward under formula apportionment.

These findings lead us to the following hypothesis. [5]

Hypothesis 1: Given the possibility of profit shifting and losses to be carried forward, from the perspective of owners there is no clear preference for separate accounting or formula apportionment. If managers are remunerated as set out in Section 4.1, in this group we may expect a slight preference for separate accounting.

Our discussion so far has not taken into account the optimal investment policy. Figure 1 makes it clear that where the tax-rate differential is high, less investment is made in IO II. This effect is more pronounced for managers than for owners. In the latter case, under a large tax-rate differential profit maximization implies more investment in IO I under formula apportionment than under separate accounting. However, where the tax-rate differential is small, less investment is expected under formula apportionment than under separate accounting.

5 Mathematica code and example figures demonstrating the influence of profit shifting and loss carry-forwards on the advantageousness of separate accounting for *managers* are available upon request.

For managers, Figure 2 indicates low (high) investment amounts in IO II where the tax-rate differential is large (small). These investment policies are independent of the tax regime applied. These considerations lead us to our second hypothesis.

Hypothesis 2: The tax-rate differential has an impact on the investments made. Where the tax-rate differential is small, investment in the higher taxed investment object is high. The impact of difference in taxes rates is expected to be more pronounced for managers than for owners.

When making use of separate accounting, managers and owners have to decide whether, and to what extent, they wish to make use of tax planning by shifting profits to IO I and Z. It can be expected that the amount shifted is positively correlated with the tax-rate differential. This expectation is in keeping with theoretical and empirical literature analyzing the influencing factors of profit shifting (see e.g., Dharmapala and Riedel (2013) and Clausing (2003)). However, in contrast to the existing literature experimental design allows us to distinguish between pure profit shifting and the shifting of economic values underlying the allocation formula.

Due to the fact that the tax-rate differential between the combined tax rate applicable to the investments under formula apportionment and Z is smaller than between the high-taxed investment and Z under separate accounting, the positive effect of profit shifting to Z is comparatively small under formula apportionment.

These considerations lead to our hypotheses 3 and 4, which hold for owners and managers alike.

Hypothesis 3: The amount of profits shifted between investment objects (i.e., group companies) is positively correlated with the tax-rate differential. However, if taking underlying assets explicitly into account, the effect should be less pronounced.

Hypothesis 4: The amount of profits shifted to an additional investment object (i.e., outside the defined scope of the corporate group) is positively correlated with the tax-rate differential. The amount of profits shifted to the additional investment object is greater under separate accounting than under formula apportionment.

4. Experimental design

4.1 Basic assumption

Based on the model presented above, we conduct a laboratory experiment to tackle the research questions, (1) to what extent corporations would be inclined to take up a consolidation option under various conditions, and (2) how this would impact the location of investment and transfer-pricing activities. Over the course of **15 periods**, the participant in this experiment will make individual decisions as the responsible representative of a group of companies. The experiment consists of a basic 2-by-2design, varying the tax-rate differential and the remuneration of the decision maker. In addition, we control for the way in which information on possible extra costs associated with profit shifting is presented to participants. Each treatment involves the choice between separate accounting and formula apportionment, and the possibility of using tax-planning strategies associated with these tax regimes. These strategies include the allocation of production factors and the transfer of profits from IO II to IO I (under separate accounting), and the transfer of profits (from IO II or the tax group) to the additional investment object Z.

In principle, the validity of findings resulting from experimental investigations depends on their transferability into real world settings. For increased external validity, we base our laboratory experiment on empirically observed input data in respect to tax rates, likelihood of a loss, and the production functions applicable to IO I and IO II. Such an empirical basis guarantees that the participants face situations that are comparable to those of a multijurisdictional enterprise. For this reason our input factors are linked to (German) company data (the proportion of profits made and losses incurred by the subsidiaries of a multijurisdictional enterprise, including the relevant probabilities associated with these profits or losses), making use of the database AMADEUS (updates 125 and 172).

AMADEUS is a comprehensive, pan-European database containing financial information on some nine million public and private companies in 38 European countries. It is made available by the private database provider Bureau van Dijk. The database contains standardized (consolidated and unconsolidated) annual accounts, financial ratios, activities, and ownership information on the companies included. AMADEUS data allows us to derive the proportion of profits made and losses incurred by the subsidiaries of a multijurisdictional enterprise (on average), providing us with a basis

for determining the probability of companies making profits or incurring losses. In order to do so, in a first step we calculate (1) the 'average profit of all companies observed', and (2) the 'average profit of all profitable companies' and the 'average losses of all companies that incurred losses'. Based on the results of these calculations, in a second step scaling factors for the profits and losses incurred by the companies are derived as follows.

$$Profit = \frac{Average\ profit\ of\ all\ profitable\ companies}{Average\ profit\ all\ companies\ observed} \tag{13a}$$

$$Loss = \frac{Average\ loss\ of\ all\ companies\ that\ incurred\ losses}{Average\ profit\ all\ companies\ observed} \tag{13b}$$

The probability p of companies making profits is derived by dividing the proportion of German companies reporting profits by the total number of German corporate enterprises.[6] Conversely, the probability of companies incurring losses is $1 - p$. According to our data, this latter probability fluctuates around a value of 20 percent, justifying values between ten and 30 percent. Against this background, in this study we assume a probability $1 - p$ of 30 percent.

We assume for both IO I and IO II a Cobb-Douglas-type production function relating to labor and capital. The production function defined for IO II is $F_P^2(v_2) = 3{,}015 * v_2$. This production function is characterized by constant marginal returns ($F_P^{2''}(v_2) = 0$). For IO I we assume a production function of $F_P^1(v_1) = 3{,}120 * v_1 - 29 * v_1^2$. This production function is characterized by decreasing marginal returns ($F_P^{1''}(v_1) = -58$). Based on the values of $Profit$ and $Loss$ defined in equations 13a and 13b above, we may link profits and losses of the investment objects (IO I, and IO II) by a factor of approximately $-\frac{2}{3}$ (e.g. $F_L^1(v_1) = -\frac{2}{3} * F_P^1(v_1)$).

Where formula apportionment is applied, we take account of a minimal five year period of commitment. Although the proposed CCCTB does not require such period of commitment the provisions regarding 'entering and leaving the group' (Chapter X, in particular Articles 61, and 68 of the proposed CCCTB directive), and 'business reorganization' (Chapter XI, in particular Article 70.2 of the proposed CCCTB directive) suggest such a period of application is required, in order for the multinational enterprise to make full use of potential tax advantages resulting from a possible allocation

[6] According to the AMADEUS database the ratio of loss-making and profit-making corporate enterprises is one to four.

of production factors to low-tax countries. By the same token, German tax law also prescribes a minimum commitment period of five years (Sec. 14 CIT).

As mentioned above the use of tax-planning strategies may not be free of charge. For profits shifted between IO II and IO I, a detection probability (d_1) of 0.00002 is assumed. Profits shifted to the additional investment object Z is taken into account with a probability (d_z)of 0.0001.[7] As far as additional payments are concerned, reference is made to tax practice in Germany, leading us to a "penalty factor" c of 1.25 (Section 3.2 and 3.3 above, equations 3 and 10).[8] In terms of expected values, if profit shifting is disregarded, the benefits of an immediate intra-group loss-offset render formula apportionment the predominant element in multinational enterprises' choice of tax regime. However, since several requirements need to be fulfilled (e.g., formal requirements associated with the application process, legal requirements, or additional tax burden resulting from consolidating profits and losses) the formation of a tax group is by no means free of cost. In the experiment we impose a once-only cost for the first-time application of formula apportionment. We determine the cost level assuming this cost to equal the expected benefit resulting from the application of formula apportionment over a period of three years. This means that the expenses associated with the introduction of formula apportionment are amortized after 60 per cent of the commitment period has elapsed.

4.2 Treatments

We use a basic 2-by-2 treatment design. The first treatment variable is the tax-rate differential; we consider differentials of five percent and 15 percent. These tax-rate differentials are designed such that positive returns in IO I and Z are always subject to a tax burden of 15 percent, whereas in the case of a *high* tax-rate differential (15 percent) positive returns of IO II are taxed at a rate of 30 percent and in the case of a *low* tax-rate differential (five percent) they are subject to a tax-rate of 20 percent. These differences in corporate tax rates are based on the range of possible tax rates applicable to multinational enterprises within the European Union.

[7] i.e. the probability of detection increases by 0.1 per cent or 1 per cent, respectively, with each 100 units of profits transferred.

[8] According to Sec. 238 German tax code tax payments are charged at a rate of 0.5 percent. Interest is payable starting fifteen months after the end of the relevant tax year. Considering an average tax-audit period of five years (Deloitte , we arrive at a penalty of approximately 25 percent of saved taxes.

The second treatment variable is participant remuneration. Participants in the experiment are remunerated based on the profit made by way of investing in IO I, IO II, and Z. We distinguish between two scenarios: the decision makers are either owners or managers. In the manager scenario we take into account the fact that managers are commonly granted bonus payments only if a pre-determined level of profit is realized. Therefore, in the manager scenario, their remuneration relates to the return on investment exceeding a predefined (minimum) profit after tax (16,000 if the tax-rate of IO II is 30 percent and 18,000 if the tax-rate of IO II is 20 percent) or is otherwise zero. The owner scenario reflects the situation that a transparent entity is managed by its owners and takes into consideration the risk of a potential loss.[9] Therefore, in this scenario, the design of our experiment is based on the assumption that the participants in the experiment receive remuneration linked to the (positive or negative) profit made from investing in IO I, IO II, and Z.

In order for us to identify the impact of information accessibility, besides variation in remuneration and tax-rate differential, we control for the form in which information on possible extra costs associated with profit shifting is presented to the participants. While the calculation functions of probability and size of an additional payment as well as tables showing probability and size of predefined profit shifting activities (see Tables A.3, A.4 and A.6 of Appendix A) are presented in the "equation + table" treatments, we do not present these tables in the (additional) "equation" treatment.

The conversion factor from profit to remuneration is determined such that the expected distribution of the remuneration is similar in all treatments.

Table 1 presents the treatment labels of the eight treatments.

9 Note that our theoretical considerations in Section A3 are based on the assumption of a multinational enterprise seeking to maximize expected profits after tax and bearing the risk of the actual occurrence of a loss. For companies managed by employees, it cannot be excluded that different objectives come into play. It is not uncommon for managers to receive remuneration that is geared to profit. However, it is unusual for the remuneration scheme to make employed managers liable for losses incurred by the company (see e.g., Andreas et al. (2012)).

Table 1: Treatment design

	Remuneration function	Tax-rate differential	Presentation of possible extra costs
Owner 15_1	Owner	15	Equation + table
Owner 15_2	Owner	15	Equation
Owner 5_1	Owner	5	Equation + table
Owner 5_2	Owner	5	Equation
Manager 15_1	Manager	15	Equation + table
Manager 15_2	Manager	15	Equation
Manager 5_1	Manager	5	Equation + table
Manager 5_2	Manager	5	Equation

4.3 Decision-making process

After presenting the instructions (see a translated version of the "Instructions Manual" in the Appendix A to this paper) to the participants and clarifying any questions, participants were seated at a computer in the Göttingen Laboratory of Behavioral Economics and asked to make their individual decisions over the course of fifteen periods. In each period, the participants had to decide in a *first step* whether they wished to opt for separate taxation of the investment objects or group taxation. Group taxation runs over a sequence of five years. This means that if a participant had opted for group taxation the choice-of-tax-regime step was unavailable in the four following periods. After five periods, separate accounting again became an option.

In the *second step*, depending on their individual choice of tax regime, the participants were asked to make an investment decision (allocation of production factors) and decide whether, and if so, how they wished to make use of accounting leeway.

Allocation of production factors: participants have to allocate $N = 15$ available production factors among IO I and IO II. A minimum of one production factor has to be invested in each of the two alternative investments objects. A table presenting profits and losses depending on the allocation of production factors was included in the experimental instructions (which were also read aloud to the participants) and are also displayed on screen.[10]

[10] Instructions for the treatment "Manager15" are given in Appendix A.

Profit shifts: Where the participants opted for separate taxation of the investment objects, they had to decide on the profit amount they wished to shift from IO II to IO I, and on the profit amount they wished to shift from IO II to the additional investment object. Where the participants opted for formula apportionment, they were asked to decide on the profit amount they wished to shift from "the group" (IO I and IO II) to the additional investment object.

Both the probability of being subject to a tax audit and the amount of additional payment depend on the extent of profits shifted. Relating to selected probabilities of being subject to a tax audit (in steps of five percent between five and 100 percent), in the first series of the sessions, we include the equation determining probability and amount of an additional payment as well as tables showing the possible additional costs in the instructions manual (see Appendix A, Tables A.3, A.4 and A.6). These tables were also visible on the computer screen. In the second series of sessions, the tables were not presented. Participants could only see the equation determining probability and size of a possible extra cost and work out the probability and size of the possible additional payment by making their own calculations.

Any profit shift was limited by the potential profit in IO II, or, if group taxation was used, the sum of potential profits in both IOs, given the allocation of production factors in the first step.

Having entered an investment decision, participants were given the opportunity to obtain a summary and consequences of their entries by clicking the button "show consequences". For the four possible profit-and-loss situations in IO I and IO II (profit-profit, profit-loss, loss-profit, and loss-loss), depending on their factor allocation, participants could see the resulting pre-tax results, the amount(s) of profit shifted, and the corresponding probability and amount of an additional tax payment. Participants were allowed to revise their investment decisions until they pressed the "ENTER" button. By pressing the button "See results of previous rounds" they had the opportunity to view their profits and losses accrued in the previous periods.

At the end of each period, participants were informed of their individual profit-loss situation, any detection of profit shifted, and related additional payment to tax authorities, their net result, and remuneration of the period just completed (in Eurocent), and a detailed calculation of net result. Loss carry-forwards in an investment

object are utilized if a profit is accrued in a current period. The amount of losses to be carried forward was shown on screen throughout.

5. Results

5.1 Generating data

Our results are based on computerized experiments conducted at the *Göttingen Laboratory of Behavioural Economics (GLOBE)*. The experiment was programmed and conducted with the experiment software z-Tree (Fischbacher 2007). A total of 166 students participated in our experiment. Table 2 shows the distribution of participants over the course of the treatments.

Table 2: Distribution of participants

	Number of participants
Owner 15_1	23
Owner 15_2	19
Owner 5_1	18
Owner 5_2	22
Manager 15_1	20
Manager 15_2	22
Manager 5_1	22
Manager 5_2	20

Most of the participants attend programs in business administration and business economics. We count 61 female participants are female and 105 male. They were randomly selected out of a pool of students who had signed up for potential participation in experiments (upon invitation). The student participants earned between 11.00 euros and 22.10 euros, the average being 19,13 euros.[11]

5.2 Econometric setting

The analyses of the choice of tax regime (Hypothesis 1), the allocation of production factors (Hypothesis 2), and amount of profit shifed (Hypotheses 3 and 4) are based on three econometric models. The explanatory variables are described in Table 2.

[11] The numbers differ because some participants failed to show up.

Regression model 1: Since the choice of tax regime (Hypothesis 1) is binary, it is analysed by way of probit regression including cluster robust standard errors relating to single individual participants. We use cluster robust standard errors because our dataset includes several observations for each individual. It can be expected that standard errors are correlated on an individual basis.[12]

Regression model 2: The allocation of production factors (Hypothesis 2) is investigated by way of a zero-truncated negative binomial regression model. Again, cluster robust standard errors are used. A zero truncated regression model is appropriate because participants are free to allocate between one and fourteen countable production factors to IO I or IO II. We used a negative binomial model instead of the regular poisson model because a test of equidispersion rejects the 'null' hypothesis at a one-percent level.[13]

Regression model 3: The econometric examination of profits shifted to IO I (Hypothesis 3) or Z (Hypothesis 4), respectively, is based on a linear panel data model. We employ the natural logarithm of profit shifts in order to reduce the influence of outliers. Again, cluster robust standard errors are used in respect of each individual. Use of such a model produces biased results if time-invariant unobservable individual effects are correlated to other explanatory variables (omitted variable bias). To prevent such distortions we control for a number of individual characteristics. These were collected via an ex-post questionnaire following the decision-making part of the experiment. The control variables included, which are intended to absorb distortions resulting from unobserved individual effects or explain individual behavior, are presented in Table 3. This table also provides a description of independent variables used in the regressions.

[12] The Wooldridge test Wooldridge (2010) for autocorrelation indicates the existence of autocorrelation at a ten-percent level.

[13] The existence of overdispersion is tested in an analogous way, following Cameron and Trivedi (2010).

Table 3: Description of independent variables

Variable	Description	Explanatory statement
FA	0 = SA / 1 = FA	Selected tax regime might influence the amounts of profits shifted or allocation of production factors
Transfer to IO I	Amount shifted to IO I scaled in units of 1,000	Volume of profit-shifting activities to IO I might have an effect on the allocation of production factors or profit shifting to Z
Transfer to Z	Amount shifted to Z scaled in units of 1,000	Volume of profit-shifting activities to Z might have an effect on the allocation of production factors or profit shifting to IO I
Investment in IO II	Production factors allocated at IO II	Amount invested in IO II might influence profit-shifting to IO I and / or Z
LCF at IO I, IO II or group level	Amount of losses carried forward at the level of IOI, IO II or scaled in units of 10,000	Existing loss carry-forwards might prevent a switch in tax regime, reduce amount of profit shifting or change the allocation of production factors to reduce loss carry forwards
TD15	0 = Tax-rate differential of 5% / 1 = Tax-rate differential of 15%	Treatment variable
Equation	1 = Probability and extent of potential extra costs associated with profit shifting is provided to participants in the instructions manual and on the computer screen; 0 = Probability and extent of potential extra costs are not provided to participants, but can be calculated.	The way in which information on possible extra costs associated with profit shifting might have an effect on profit shifting activities.
Time	Decision-making time	Longer time of investment represents more detailed tax planning and therefore influences decision-making process
Period	1 to 15	Control for time effects, e.g., more conservative decisions in later periods
Manager	0 = Owner / 1 = Manager	Treatment variable
Detection of transfer(s) in prior period	0 = no detection in prior period / 1 = detection in prior period	Regarding prior research (Mittone, 2006) detection of tax planning in prior period influences tax planning in the current period
Master	0 = Bachelor 1 = Master	Control for different levels of experience
Gender	0 = Male/ 1 = Female	Control for gender differences
Business experience	0 = No / 1 = Yes	Control for different levels of experience
Tax return prepared	0 = No / 1 = Yes	Control for different levels of experience
Risk level	0 = Low up to 7 = High	Control for self-estimated risk-taking
Impulsivity	0 = Low up to 7 = High	Because of a highly complex setting, this variable is intended to control for spontaneous decisions
Age	Age of participant	Control for different levels of experience
Program of study (business administration, economics, other)	Dummy variables equal 1 if participants take part in programs mentioned	Control for different levels of experience in the case of investment decision

5.3 Tax group of choice (Hypothesis 1)

Table 4 indicates how often formula apportionment was selected as a fraction of all selections made over the course of the four treatments, as well the fraction of rounds in which participants were taxed under formula apportionment. This distinction is important since, once selected, participants had to stay in the formula apportionment regime for at least five rounds.

Table 4: Portion of formula apportionment selected and actually applied

	Owner 15	Owner 5	Manager 15	Manager 5
Selected	0.23	0.17	0.32	0,23
Applied	0.42	0.42	0.48	0,40

To gain a better understanding of the factors driving the choice of formula apportionment, we consider the results of Regression model 1. The key factors on the choice are presented in Table 5. The overall evaluation is reported in Table B.1 in Appendix B.

Table 5: Influencing factors on the selection of FA

Variables	Proportion of FA
LCF at IO I	-0.180***
	(0.0693)
LCF at IO II	-0.231***
	(0.0508)
LCF at group level	0.268***
	(0.0639)
TD15	0.136
	(0.171)
Manager	-0.0652
	(0.171)
Equation	0.199
	(0.177)
Pseudo R^2	0.202
Observation	1,816

Statistical significance at the 1%, 5% and 10% level are denoted by ***, ** and *, respectively.

We observe that the treatment variables (TD15, Manager) do not significantly affect the choice of formula apportionment. A significant negative coefficient of losses carried forward at the level if IO II indicate that losses carried forward in IO II decrease the probability of switching the tax regime and choosing formula apportionment. A similar influence of losses carried forward can be observed for switches from formula apportionment to separate accounting.

To summarize, participants show a slight, though not significant, preference for separate accounting. Nonetheless, formula apportionment was considered a relevant

option. Neither the tax-rate differential nor the compensation scheme is shown to drive the choice of tax regime. Losses carried forward prevent switching between tax regimes.

What novel insights can be derived from these results? From the perspective of the authors, the results indicate that formula apportionment provides an equivalent alternative tax regime if risk of investment ending up in a loss is taken into account. When interpreting this result, we should bear in mind the fact that empirical literature reveals transfer pricing to provide an avenue for profit shifting to lower taxing jurisdictions. What is more, looking at profitable companies empirical studies have shown that the tax-rate differential encourages profit-shifting activities available under separate accounting. In contrast, under formula apportionment companies optimize the distribution of factors entering the allocation formula across the individual tax jurisdictions. This latter planning route is, however, thought to be more expensive and may also distort investment decisions. Separate accounting is therefore considered to be more flexible, with the result that the literature raises expectations for separate accounting to be more advantageous where the tax-rate differential is larger. On this note, Mintz and Smart (2004) find that taxable income of companies under separate accounting varies with tax rates to a significantly larger extent than taxable income of entities using formula apportionment. The lacking influence of the tax-rate differential in the regression suggests that above mentioned advantages of separate accounting are diminished in the presence of uncertainty. This may be due to the possibility of offsetting losses against profits between investment alternatives under formula apportionment and the corresponding non-debt tax shield representing an equivalent to the potential tax-planning advantages under separate accounting. These findings are supported by the observations in Oestreicher and Koch (2010), Mintz and Weichenrieder (2010), and Buettner et al. (2011b).

The negative influence of losses carried forward on switches between tax regimes comes as no surprise because a switch would delay offsetting losses against future profits at least temporarily, and thus be accompanied by negative tax effects.

To conclude, in the presence of an optional formula apportionment, the choice of tax regime depends neither on the remuneration function nor on the tax-rate differential, but is driven by individual possibilities to offset losses. Thus, the hypothesis that the two tax regimes are equivalent (Hypothesis 1) is confirmed. However, it cannot be proven that managers have a slight preference for separate accounting.

5.4 Tax-rate differential and factor allocation (Hypothesis 2)

Table 6 provides the mean values of investments in the higher taxed IO II observed in each of the four treatments.[14] Obviously, in the case of a low tax-rate differential participants allocate a larger number of production factors to IO II than in the case of a high tax-rate differential. These differences are statistically significant under both separate accounting and formula apportionment, and are independent of manager or owner compensation (for each pairwise comparison, a Wilcoxon-Mann-Whitney test[15] shows significant differences on a five-percent level).

Table 6: Investments in IO II (mean)

	Owner 15	Owner 5	Manager 15	Manager 5
Separate accounting	6.17	8.51	6.32	9.54
Formula apportionment	4.91	9.10	6.77	7.46

Table 6 also indicates that under formula apportionment the tax rate difference shows different effects on managers and owners. For owners, a high (low) tax rate differential is associated with less (more) investments, while the opposite is true for managers. However, the difference is statistically significant only in the case of formula apportionment and the high tax-rate differential (Wilcoxon-Mann-Whitney test, five-percent significance required).

The main results of a regression analysis (Regression model 2) are shown in Table 7 (the complete results are reported in Table B.2 in Appendix B). They indicate a significantly negative coefficient of the tax-rate differential, implying that a higher tax-rate differential leads to a significantly lower investment in the higher taxed IO II, under both separate accounting and formula apportionment. It can be seen that under formula apportionment participants remunerated as managers invest significantly more production factors in IO II than owners. In the case of owner-based compensation, the use of formula apportionment leads to significantly lower investment in IO II than under separate accounting.

The results also make it clear that profit shifting to IO I and Z is accompanied by larger investments in IO II (significantly positive coefficients). To summarize, the

[14] There is no need to consider separately the investment in IO I, since $v_1 = 15 - v_2$.

[15] Due to the requirement of independence between observations, we based the Wilcoxon-Mann-Whitney tests on the individual averages of the number of factors allocated to IO II.

allocation of production factors is a function of the tax-rate differential, under both separate accounting and formula apportionment. Furthermore, the allocation of production factors is driven by the remuneration function. Under formula apportionment, managers invest higher amounts in the higher-taxed investment object IO II than owners. Thus, Hypothesis 2 is fully confirmed. Besides, the results show that a more extensive use of tax-planning alternatives goes along with larger investments in high tax countries.

Table 7: Investments in IO II

Variables	Overall	SA	FA
LCF at IO I	-0.0673**	-0.120***	
	(0.0304)	(0.0355)	
LCF at IO II	0.0254**	0.032***	
	(0.0119)	(0.0121)	
LCF at group level	0.0122		0.0201
	(0.0151)		(0.0171)
TD15	-0.370***	-0.376***	-0.347***
	(0.0656)	(0.0829)	(0.0936)
Manager	0.0360	0.0178	0.267***
	(0.0759)	(0.0734)	(0.0948)
FA	-0.147**		
	(0.0751)		
Equation	-0.0224	0.0323	-0.0498
	(0.0593)	(0.0724)	(0.0819)
FA * Manager	0.246**		
	(0.111)		
Transfer to IO I	0.021***	0.0199***	
	(0.00354)	(0.00318)	
Transfer to Z	0.0187***	0.0241***	0.0178***
	(0.0039)	(0.00585)	(0.00501)
Observation	2,490	1,416	1,074

Statistical significance at the 1%, 5% and 10% level are denoted by ***, ** and *, respectively.

What conclusions may be drawn from these observations? One is that investment is sensitive to the tax rate or a tax-rate differential also under the separate accounting tax regime. A second conclusion is that this sensitivity depends on whether the entity is driven by owners (the SME or family business) or managers (the business of large enterprises). Although the first result is well documented by empirical studies looking at the impact of taxation on foreign direct investment (see, in particular, Feld et al. (2013)) when focusing on profit or the profitability of companies in low taxed jurisdictions, the corresponding literature on profit shifting is unable to distinguish between the shifting of 'paper profits' and the international allocation of highly profitable, in particular intangible, assets. Our study reveals that under separate accounting, profit shifting is facilitated to a large extent by attribution of assets. Although this

should be clear when taking on board the fact that arm's length pricing is based on comparability factors, including in particular the allocation of functions, assets, and risks, empirical literature does not make this clear. Hence, the option between separate accounting and formula apportionment does not bring with it the alternative of shifting profit or shifting assets. The difference is in the intensity to which assets are shifted to low tax countries.

In this context, we observe that the effect of the tax-rate differential is greater under formula apportionment than under separate accounting. From a policy perspective, this greater influence is important because a change in the allocation of production factors means changing the allocation formula (in our experiment the numbers of employees as required by the technology underlying the production function). Regarding an optional formula apportionment regime this would suggest that the economic values underlying the allocation formula will be allocated to low tax countries.

With respect to the difference between decisions made from the manager or owner perspective, the more intensive investment in the higher taxed IO II by managers as compared with owners might be traced back to the different tax rates applicable in the separate-accounting and formula-apportionment contexts. Profits in IO II are taxed at a lower combined tax rate under formula apportionment than under separate accounting. In the case that IO II incurs losses the amount of these losses increases with the number of production factors invested. In contrast to owners, managers do not have to bear any loss. This leads to larger investments by managers than by owners in the more productive investment object IO II. Owners tend to allocate production factors in a more risk-avoiding manner, splitting available production factors more equally between IO I and IO II because making losses would directly reduce their compensation.

The positive relationship observed between profit shifting and investments in IO II suggests that corporations deal with the tradeoff between productivity and taxation by making use of tax-planning activities. This can have interesting political implications: by "turning a blind eye" to profit shifting, legislators are able to attract additional investment.

5.5 Transfer to IO I (Hypothesis 3)

This kind of intra-group transfer applies only to separate accounting. We expect that the amount of profits shifted between group companies is positively correlated with the tax-rate differential (Hypothesis 3).

Table 8 provides the average amounts of profit shifted to IO I over the course of the four treatments. We observe that participants do shift profits to the lower taxed investment object. Applying the Kruskal-Wallis test we may conclude that these differences are statistically not significant. Taking into account that the Kruskal-Wallis test is highly conservative, we carry out Regression model 3.

Table 8: Amounts of profits shifted to IO I

	Amount	
	SA	FA
Owner 15_1	2,441	n/a
Owner 15_2	949	n/a
Owner 5_1	5,904	n/a
Owner 5_2	2,867	n/a
Manager 15_1	5,779	n/a
Manager 15_2	3,779	n/a
Manager 5_1	5,781	n/a
Manager 5_2	2,030	n/a

The main findings are presented in Table 9 (see also Table B.3 in Appendix B for the overall results).

We observe that managers do not make greater use of accounting leeway than owners. The significant positive coefficient of the investment in IO II indicates that larger investments in IO II are associated with higher profit shifting activities. The multivariate analysis makes it clear that how, and to what extent, information is supplied on possible extra costs associated with profit shifting significantly affects tax-planning activities. Due to this result, it appears that the less concrete the information supplied, the more aggressive participants are in their tax planning activities.

Table 9: Profit shifts to IO I

Variables	LN profit shift to IO I
LCF at IO I	-0.131**
	(0.0651)
LCF at IO II	-0.285***
	(0.0686)
TD15	-0.255
	(0.520)
Manager	0.530
	(0.486)
Investment in IO II	0.153***
	(0.0375)
Transfer to Z	0.141
	(0.103)
Detection of transfer to IO I	0.778**
	(0.359)
Detection of transfer to Z	-0.457
	(0.424)
Equation	-1.214**
	(0.500)
R2	0.1733
Observation	1,416

Statistical significance at the 1%, 5% and 10% level are denoted by ***, ** and *, respectively.

Intra-group transfers are also influenced by conducted tax audits in prior periods. Furthermore, compared to owners, managers tend to transfer higher amounts intra-group. The detection of profit shifting from IO II to IO I is linked with higher tax-planning activities in the following periods, whereas the detection of profit shifts to Z in the prior period leads to the opposite result. Finally, higher investments in high tax countries give rise to larger transfer pricing activities.

Moreover, the possibility of shifting profits from IO II to IO I depends on the number of production factors previously allocated to IO II (see Section 5.4). Besides the simple relationship that the more profits accrue to the high-taxed jurisdiction, the more profits can be allocated to the lower-taxed jurisdiction, this result also indicates that under separate accounting participants make use of both avenues for profit shifting, i.e., allocating assets to the low-taxed investment alternative and shifting 'paper' profits. In the latter planning alternative, the participants anticipate the higher productivity and pre-tax earnings of IO II (instead of making the investment decision on the basis of post-tax earnings as was shown in Section 5.4) and shift this additional pre-tax profit to the lower-taxed investment object IO I. This means that the tradeoff effect between productivity and tax is reduced by intra-group profit shifting. The negative correlation between intra-group profit shifting and losses carried forward shows that the reduction of loss carry-forwards is preferred to profit shifting activities. This behavior is understandable because offsetting a gain against losses carried forward

generates an immediate reduction of tax payments without the risk of being detected by the tax authorities, if profit shifting is carried out.

The positive influence of the detection of profit shifting to IO I in the prior period is in line with the effect identified by Mittone (2006) in experiments on tax evasion behavior that where tax evasion is detected in a previous period, tax evasion is carried out to an even greater extent in the following period ("bomb crater effect") . This effect is similar to the so-called gamblers' fallacy often reported with respect to decisions made under uncertainty (e.g., in the insurance literature). The negative influence of detection of profit shifting to the additional investment object Z could relate to the so-called availability hypothesis: the observation of a detection in one area could increase the perceived probability of being audited in the other next time.

5.6 Transfer to additional investment object (Hypothesis 4)

Table 10 indicates the average amounts of profits shifted to the additional investment object Z in the four treatments. We find that the amounts of profits shifted vary as a function of the tax regime, the tax-rate differential, and partially the remuneration scheme. However, based on a Kruskal-Wallis test, the comparison of these amounts of profit shifted to the additional investment object Z shows no significant differences, either for separate accounting or for formula apportionment. Again, taking into account the fact that the Kruskal-Wallis test is highly conservative, we carry out Regression model 3, see Table 11 (for complete results see also Table B.4 in Appendix B).

Table 10: Amounts of profits shifted to Z

	Amount	
	SA	FA
Owner 15_1	1,828	2,689
Owner 15_2	372	839
Owner 5_1	843	2,747
Owner 5_2	549	1,783
Manager 15_1	1,296	1,616
Manager 15_2	588	712
Manager 5_1	969	1,784
Manager 5_2	1,123	2,914

The regression results make it clear that the compensation scheme does not influence profit shifting to Z. What is more, the analysis shows that loss carry-forwards reduce transfers to Z. Use of formula apportionment rather than separate accounting increases profit shifting to Z.

Again, the results suggest that the absence of tables showing probability and extent of possible extra costs (Equation = 0) is associated with more aggressive tax planning activities.

To summarize, the results indicate that even where the tax-rate differential is low, participants shift relevant amounts to Z. The difference in tax rates has no influence on the transfer to Z under formula apportionment and separate accounting , while according to Hypothesis 4, regardless of the remuneration function this relationship should be positive. High impact can be observed with respect to the tax regime. Under formula apportionment the amount of profits shifted increases substantially. Again, this is in contrast to Hypothesis 4. In cases where there are loss carry-forwards, profit shifting to Z is reduced.

Table 11: Profit shifting to Z

Variables	Overall	SA	FA
LCF at IO I	-0.179***	-0.123***	
	(0.0447)	(0.0396)	
LCF at IO II	-0.126**	-0.129***	
	(0.0516)	(0.0481)	
LCF at group level	-0.266***		-0.293***
	(0.0787)		(0.0914)
TD15	-0.101	-0.550	-0.0963
	(0.395)	(0.433)	(0.515)
Manager	0.530	0.330	1.151**
	(0.376)	(0.403)	(0.537)
FA	1.700***		
	(0.272)		
Transfer to IO I	0.0471**	0.0411	0.0458
	(0.0240)	(0.0305)	(0.0289)
Investment in IO II	0.0407	0.0561*	
	(0.0291)	(0.0328)	
Equation	-1.204***	-1.067**	-1.065*
	(0.401)	(0.434)	(0.576)
Detection of transfer to IO I	0.0860	-0.0603	
	(0.279)	(0.278)	
Detection of transfer to Z	0.910***	0.844**	0.652*
	(0.246)	(0.353)	(0.365)
R^2	0.1982	0.1955	0,2337
Observation	2,490	1,416	1,074

Statistical significance at the 1%, 5% and 10% level are denoted by ***, ** and *, respectively.

Given the non-existent or at least minor influence of the remuneration function and the tax-rate differential, we interpret these results as showing that participants make the transfer decision dependent on variable factors such as the current tax regime or loss carry-forwards, rather than on fixed factors relating to the treatment parameters. Lower profit-shifting activities (under separate accounting) in the case of a high tax-rate differential might again reveal an intention to avoid tax audits and subsequent additional payments as these are higher than in the case of a low tax-rate differential (see Section 5.5). An additional point of relevance may be the fact that the probability and, hence, the risk that 'paper' profit shifting is detected in a subsequent tax audit is higher in the case of transfers to Z as compared to transfers intra-group.

Moreover, the results indicate that participants shift profits more intensively to the additional investment object Z if formula apportionment is used. This extensive use of accounting leeway is particularly interesting since, according to our simulation results, profit shifting to Z should be lower if formula apportionment is used. This finding implies that under the facts and circumstances of the case at hand the tax-saving effect of transferring profits to investment alternatives outside the consolidated group is overestimated. The observation, however, that decision makers exploit such profit-shifting opportunities that arise from statutory tax-rate differentials within the group (i.e., shifting profit to companies that are excluded from consolidation) is in line with the literature (Buettner et al. 2011b). We can conclude that, in the case of optional formula apportionment and the existence of affiliated companies outside the tax group, profit shifting to affiliated companies will continue to take place as a tax-planning measure among multinational enterprises.

Participants reduce the use of accounting leeway if a loss carry forward exists. This effect is independent of the tax regime selected. Obviously, when possible, participants prefer to reduce the tax burden of the actual period by profit-loss offsets rather than risky profit-shifting activities.

Moreover, it has taken into account that the number of tax-planning strategies varies between formula apportionment and separate accounting. In contrast to separate accounting, profit shifting to Z is the only available option to increase the after-tax profit by using profit shifting under formula apportionment. Participants might use profit shifts to Z to a larger extent if formula apportionment in order to compensate for the missing second profit-shifting alternative that they would have under separate accounting.

5.7 External validity

A transfer of our results to real-life decision-making processes has to be handled with care (e.g., Plott (1982) or Levitt and List (2007)). In our case it is particularly important to consider that professional decision makers might behave differently from our student participants. There are only few experimental studies that investigate whether there are differences in behavior, and if so what kind, between professionals and students (e.g., Burns (1985), Dyer et al. (1989) or Anderson and Sunder (1995) in auctions, Potters and van Winden (2000) in lobbying). Where differences have been found, they provide valuable complementary insights into decision-making behavior.

To check the robustness of our results, in a slightly different version of the Manager 15 treatment[16] we carried out additional experiments in parallel with 22 students and twelve professional tax consultants (senior managers and partners)[17] of a large international tax consultancy firm[18]. The mean values of individual (decision and control) variables for students and professionals are presented in Table 12.

Our results show that the decisions and attitudes of students and professionals differ slightly. Professional tax consultants are more likely to have a practical training in business, are familiar with preparing tax returns, and are on average of higher age. On the other hand, the self-evaluation of risk preferences shows that they consider themselves to be more risk averse than students. It seems that professionals use formula apportionment more often and that they tend to invest a higher amount in the higher taxed (but more pre-tax productive) investment object IO II. With the exception of profit shifting to Z under separate accounting it seems that professionals make use of accounting leeway to a greater extent.

[16] The experiment differs from Manager 15 in the compensation function: Participants receive an additional payment of 2.50 Euro if the market share has increased by at least four percent over the fifteen periods. Rises in market share can be achieved by larger investments in IO II.

[17] Instead of compensation in cash the profit of each professional was transferred into lottery tickets and the winner received a bottle of Champagne.

[18] After participating in the experiment, the professionals gave us feedback that the design of our experiment constitutes an accurate picture of what professional tax consultants have to deal with regularly.

Table 12: Average of decision and control variables in additional experiments "Manager 15 growth"

Variable	Student average	Professional average
FA	0.3939	0.4944
Investment in IO II (SA)	9.43	10.32
Investment in IO II (FA)	9.38	9.94
Transfer to IO I	5,376	7,256
Transfer to Z (SA)	1,903	727
Transfer to Z (FA)	1,955	2,078
Female	0.2727	0.3333
Commercial education	0.1818	0.8333
Risk level (self-evaluation)	3.591	2.500
Impulsivity (self-evaluation)	3.136	3.417
Age	23.163	37.333
Tax return prepared	0.3182	1.0000
Business administration	0.5454	0.9117

To scrutinize whether professionals show a significantly different behavior from students we ran regressions similar to those in Section 5.2 but with a dummy variable for the professionals.[19] This dummy variable turned out to be insignificant in all regressions. The regression results are presented in Table B.5 in Appendix B. They make it clear that professionals and students do not behave differently in our experiment.

These findings are in principle in line with our expectations, because such a decision-making process is unique, i.e. the circumstances in which a professional tax consultant has to decide either separate accounting or formula apportionment might be the optimal tax regime depend heavily on the company concerned. Against this background we believe that even for professional tax consultants, recommending a particular tax regime under consideration of investment and tax planning is always a new situation which requires extensive reflection. Even the pros and cons of both tax regimes have to be discussed for every single case anew. On the other hand, it goes without saying that tax consultants are more familiar with the varying impacts of taxation under separate accounting and formula apportionment, so that minor differences come as no surprise.

[19] Since for "Practical business training", "Business administration" and "Tax return prepared" the values are close to 1 for professionals we have omitted them from the regression analysis.

6. Conclusion

The aim of the present paper is to research experimentally the choice of tax regime (separate accounting or formula apportionment) in the presence of uncertain returns on investment, varied tax-rate differentials, and differing compensation schemes. In addition the effect of providing information in differing forms on possible extra costs in the event of detected profit shifting is scrutinized. In this context, we look into the impact of the tax-regime choice on profit shifting and possible losses to be carried forward. In addition, the effect of the tax regime on tax-planning activities, in particular the allocation of production factors is investigated. Our results should provide indications as to companies' behavior if an optional formula apportionment regime were to be introduced in Europe.

In line with the hypotheses derived from our model-based view, the results of our experiment indicate no significant differences in the choice of the tax regime as a function of both the tax-rate differential and the remuneration (Hypothesis 1). However, our results show that, despite the fact that separate accounting is considered to be more flexible in terms of profit shifting, an optional regime of group taxation is a relevant option that will be exploited by multinationals. Lacking influence of the tax-rate differential suggests that said advantages of separate accounting are diminished in the presence of uncertainty. The main reason for the resulting equivalence of separate accounting and formula apportionment could be the fact that formula apportionment offers intra-group loss-offset, cushioning expected cash flow disadvantages in the case that investment runs the risk of culminating in a loss.

We demonstrate that in both tax regimes the allocation of production factors is dependent upon the tax-rate differential, and that higher tax rates lead to lower amounts of investment (Hypothesis 2). However, the tax-rate differential between countries becomes much more important if formula apportionment is used. What is more, the choice of tax regime influences the allocation of production factors in such a way that owners tend to invest less in high taxing countries, while managers do the reverse if formula apportionment is used. These results show that investments are sensitive to the tax rate or the tax-rate differential, also under the separate-taxation regime. Moreover, it becomes clear that this sensitivity depends on whether the investment is carried out by owners or managers of the business.

Regarding profit shifts, we observe that more are shifted where the tax-rate differentials are large. This result, however, is subject to the extent to which information is given on possible extra costs arising in the event of profit shifting being detected. Furthermore, we are able to demonstrate that managers tend to use accounting leeway to a greater extent compared to owners. This leads us to assume that for managers, the negative influence of additional subsequent payments on the compensation function is limited.

Interestingly, we find that profit shifts to Z are significantly higher under formula apportionment than under separate accounting. With a view to the planned CCCTB, this observation suggests that unless further measures are introduced to protect the common corporate tax-base (European Commission 2015), multinational enterprises taxed on a consolidated basis are likely to use alternative investment locations and shift profits outside the European Union.

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Appendix A - Instructions manual (Manager 15)

Over the course of 15 periods, you will make individual decisions as the responsible representative of a group of companies. At the beginning of the experiment you will have the chance to practice your decision-making in three trial runs. The decisions concerned involve periodical investment decision and selection among alternatives for action in the context of taxation.

The investment alternatives

You can allocate production factors to two investment objects, IO I and IO II. Each investment object must be allocated at least one production factor. A total of **15 production** factors are available and you are requested, please, to allocate them all to IO I and IO II.

IO I and IO II yield returns which are uncertain and differ in amount. Each investment object yields positive returns ("profit") with 70 percent probability (i.e. in seven out of ten cases). In 30 percent of cases (i.e. three out of ten), each investment object yields a negative return ("loss"). These probabilities apply for both IO I and IO II.

Table A.1, column (1) to (6), shows the profits or losses of IO I and IO II depending on the allocation of the production factors to the two investment objects. We take account of the fact that if you attribute "n" production factors to IO I, exactly "15 - n" production factors are left for IO II. Columns (7) to (10) show the total profit or loss resulting in each case from the allocation of the production factors in the four possible profit and loss situations (ranging from profit in both investment objects to loss in both investment objects).

Taxation of the investment objects

Profits are taxed. The **tax rate applicable to IO I is 15 percent** and that for **IO II is 30 percent**. Losses are ***not*** taxed.

Alternatives for action in the taxation context

You have several alternatives for action in order to influence your tax burden.

1. Separate taxation of the investment objects

1.1. Basics

The profits made depending on the number of production factors allocated are taxed at the given rates of 15 to 30 percent respectively. A loss incurred in an investment object is not taxed and can be carried forward to future periods. This loss carry-forward can be set off against future positive income from this investment object, thereby reducing the **future** tax burden.

You can influence the tax burden of IO I and IO II by changing the allocation of production factors.

Table A.2 shows the overall profits and losses for IO I and IO II and the total return (before and after tax) depending on the allocation of the production factors to the two investment objects in the four possible profit and loss situations (columns (7) to (10)).

You can decrease the pre-tax returns made by one of the two investment objects by lowering the amount you report. To do this, you have two possible courses of action available which you can also use in combination.

1.2. Making use of accounting leeway

To do this, you have two possible courses of action available which you can also use in combination.

1.2.1. Shifting of profit from IO II to IO I

You have the option of determining an amount which lowers the pre-tax return of IO II (tax rate 30 percent). This amount increases IO I's pre-tax returns correspondingly (tax rate 15 percent). You have a free hand in choosing the sum you shift up to the amount of any (positive) pre-tax profit generated by IO II (depending on your allocation of production factors).

The tax consequences of a reported shift depend on the profit and loss situations that emerge. They are explained below.

- **Profit I / Profit II:** Looking at the pre-tax returns, the amount that you have shifted from IO II to IO I is taxed at a rate of 15 percent (instead of 30 percent). This means that there is a tax reduction amounting to 15 percent of the reporting difference.

- **Profit I / Loss II:** The amount you shift from IO II to IO I increases the pre-tax profit of IO I and is taxed at a rate of 15 percent. At the same time the loss incurred by IO II decreases. This means the tax burden of this period increases by 15 percent of the amount you shift. The loss carry-forward associated with **IO II** is raised in the amount of the reporting difference. In the following periods the loss carry-forward can be set off against IO II's future profits which would normally be subject to a tax rate tax rate of 30 percent.

- **Loss I / Profit II:** The amount you shift from IO II to IO I can be set-off immediately against the loss incurred by IO I. This means there is an immediate tax reduction of up to 30 percent of the reporting difference (provided that the shifted amount is lower than the loss incurred by IO I. Otherwise the amount exceeding this loss is taxed at a rate of 15 percent). Due to the profit shift, IO I's loss carry-forward is **reduced** by the reporting difference and in subsequent periods can no longer be offset against IO I's future profits (tax rate 15 percent).

- **Loss I / Loss II:** In this case no immediate tax consequences arise. Your overall **pre-tax** result is identical to the **after-tax** overall result. The only consequences that arise concern the amount of loss carry-forwards. Due to the profit shift, IO II's loss carry-forward is **raised** by the reporting difference. It can be offset against future profits of **IO II** (tax rate 30 percent). At the same time IO I's loss carry-forward is **reduced** by the reporting difference and in subsequent periods can no longer be offset against future profits of **IO I** (tax rate 15 percent).

This use of accounting leeway is subject to audit by the tax authorities and is therefore not necessarily free of charge. An additional tax payment **can** be assessed, the

amount of which depends on the shifted amount. This payment is calculated from the tax rate of 0.15 (30 percent minus 15 percent), the shifted amount and a 1.25 "penalty factor". The probability of an additional subsequent payment equals the shifted amount times 0.00002. This means the probability of an additional payment arising increases by 0.2 percent with every additional 100 units you shift. For purposes of orientation Table A.3 shows the probability of an additional subsequent payment and its amount, for selected amounts you might choose to shift.

1.2.2. Shifting of profit from IO II to an additional investment object

You have the option of shifting amounts from **IO II** to an additional investment object. This reduces the IO II returns. If IO II shows profits, the tax burden is reduced by 30 percent of the shifted amount. At the same time, the shifted amount is added to the additional investment object and is taxed at a rate of 15 percent (instead of 30 percent at the level of IO II). You have a free hand in choosing the sum you shift up the amount of any (positive) pre-tax profit of IO II (depending on your allocation of production factors). **Please also bear in mind that the sum of the shifted amount (shifting from IO II to IO I and shifting from IO II to the additional investment object may not exceed any pre-tax profit of IO II (depending on your allocation of production factors).**

This use of accounting leeway is subject to audit by the tax authorities and is therefore not necessarily free of charge. An additional tax payment **can** be assessed, the amount of which depends on the shifted amount. This payment is calculated from the tax-rate differential of 0.15 (30 percent minus 15 percent), the shifted amount and a 1.25 "penalty factor" (the additional payment equals 15 percent multiplied by the shifted amount multiplied by 1.25). The probability of an additional subsequent payment equals the shifted amount times 0.0001. This means the probability of an additional payment arising increases by 1 percent with every additional 100 units you shift. For purposes of orientation, Table A.4 shows the probability of an additional subsequent payment, and its amount, for selected amounts you might choose to shift.

2. Group taxation

2.1. Basics

Under group taxation, the **pre-tax** returns made by IO I und IO II are totaled. By totaling profits, any losses incurred by one investment object can be offset against losses of the other. The totaled return is taxed at a combined tax rate (Table A.5, column (5)) which depends on the share of payroll costs associated with the investment objects. These payroll shares depend directly on the pre-tax returns of IO I and IO II. The payroll shares are presented in Table 4, column (3) and (4). Moreover, Table A.5, columns (7), (9), (11) and (13) presents the after-tax return in the four possible profit and loss situations (ranging from profit in both investment objects to loss in both investment objects)

Should a loss be incurred, this can be carried forward to future periods (loss carry-forward). This loss carry-forward can be set-off against future positive returns, thereby reducing the future tax burden.

Implementation of the group taxation regime is not free of charge. It gives rise to one-off fixed expenses in the amount of 3.300. If you opt for this alternative tax regime you are required to stay within it for five periods. In the case that loss carry-forwards exist at the level of IO I and/or IO II the group taxation regime leads to the consequence that for this period pre-consolidated losses to be carried forward are “frozen” for the period of application. This means that they can be used only when the group taxation regime has finished, at which point they can be set-off again against profits of IO I and/or IO II. Should a loss carry-forward exist for the group when use of group taxation is ended, this is irrevocably lost.

2.2. Change in deployment ratio of production factor

In order to make an impact on tax burden you can change the ratio of production factor. The allocation influences the returns and combined tax rate depending on the shares of payroll.

2.3. Shifting of profit to an additional investment object

You have the option of reducing the overall pre-tax returns of IO I and IO II by shifting an amount to the benefit of an additional investment object. You have a free hand

in choosing the amount shifted up to the amount of any (positive) of IO an IO II pre-tax profit (depending on your allocation of production factors). This shift has the consequence that the total profit subject to group taxation is reduces by this reporting difference. The shifted return is subject to a tax rate of 15 percent at the level of the additional investment object (instead of the combined payroll allocation dependent tax rate relevant in the group context.

This utilization of accounting leeway is subject to audit by the tax authorities and is, hence, not necessarily free of charge. An additional tax payment can be charged, the amount of which depends on the reporting difference. This payment is calculated from the tax-rate differential (combined tax rate minus 15 percent), the shifted amount and a 1.25 "penalty factor" (the additional payment equals 15 percent multiplied by the shifted amount multiplied by 1.25). The probability of an additional subsequent payment equals the shifted amount times 0.0001. This means the probability of an additional payment arising increases by 1 percent with every additional 100 units you shift. For purposes of orientation, Table A.6 shows the probability of an additional subsequent payment for selected amounts you might choose to shift. The size of the additional subsequent payment depends on your allocation of production factors, and can be viewed by clicking the button "show consequences".

The decision making process

1. You decide whether you wish to opt for separate taxation of the investment objects or group taxation. If you opt for group taxation (see section 2.1) this step is not applicable during the subsequent four periods following the first period of group taxation. After these five periods the separate accounting option becomes available again.

2. Depending on your choice of tax regime you make the investment decision (allocation of production factors) and decide whether or not you wish to make use of accounting leeway

   - **If you have opted for separate taxation of the investment objects**, please note that your investment decision has an impact on your after-tax result.

     Moreover you have to decide,

- what profit amount you wish to shift from IO II to IO I. Should you decide not to make a transfer, enter the value "0".

- what profit amount you wish to shift from IO II to an additional object. Should you decide not to make a transfer, enter the value "0".

➢ **If you have opted for group taxation**, please note that your investment decision has consequences for the taxation of the relevant share in payroll cost under group taxation

Moreover you have to decide,

- what profit amount you wish to shift from IO I and IO II to an additional object. Should you decide against making any transfer please enter a value of "0".

Please note that having entered your investment decision you can obtain a summary of your entries by clicking the button "show consequences". For the four possible profit-and-loss-situations arising from your factor allocation you will see the resulting pre-tax results, the profit amount(s) you shifted **and** the corresponding probability of an additional tax payment. You can revise your investment decisions until you press the "ENTER" button. By pressing the button "See results of previous rounds" you can view your profits and losses actually accrued in previous periods.

At the end of each period you will be informed of the following information

- Profit-loss-situation
- Shift detected by tax authorities (if any)
- Loss carry-forwards
- Your net result
- Remuneration for the period (in Eurocent)
- Detailed calculation of net result

Then the next period begins. Again you make decisions concerning alternatives for investment and action. However, you cannot enter the next round until all participants have completed the round concerned.

Please note that any loss carry-forward and group taxation run for five periods. This means that if you have opted for group taxation in one of the last four periods you automatically enter case (2.1). In this case it is also indicated how many rounds group taxation has already been used. After these five periods the separate accounting option becomes available again.

Loss carry-forwards in an investment object are utilized if a profit is accrued in a current period. The amount of losses to be carried forward is shown on screen at all times.

Please also note that any profit shifts made via use of accounting leeway **must always fall below** the profit of IO II, or if group taxation is used of both IO's, resulting from the allocation of production factors as chosen.

Your **remuneration for the period** results from the net profit (total after-tax return minus any additional tax payments) that you have produced. In each period the return you achieved in excess of 16,000 is converted into Euro at a fixed exchange rate. 110 units of the difference to 16.000 correspond of one cent. If you achieved 16,000 or less or even a loss your compensation for this period is zero.

Table A.1: Pre tax returns of IO I and IO II

	IO I			IO II		Overall profit			
Number	Profit	Loss	Number	Profit	Loss	Profit I/Profit II	Profit I/Loss II	Loss I/Profit II	Loss I/Loss II
of factors	(p = 70%)	(p = 30%)	of factors	(p = 70%)	(p = 30%)	(p = 49%)	(p = 21%)	(p = 21%)	(p = 9%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	3.091	-2.061	14	42.21	-28.14	45.301	-25.049	40.149	-30.201
2	6.124	-4.084	13	39.195	-26.13	45.319	-20.006	35.111	-30.214
3	9.099	-6.069	12	36.18	-24.12	45.279	-15.021	30.111	-30.189
4	12.016	-8.016	11	33.165	-22.11	45.181	-10.094	25.149	-30.126
5	14.875	-9.925	10	30.15	-20.1	45.025	-5.225	20.225	-30.025
6	17.676	-11.796	9	27.135	-18.09	44.811	-414	15.339	-29.886
7	20.419	-13.629	8	24.12	-16.08	44.539	4.339	10.491	-29.709
8	23.104	-15.424	7	21.105	-14.07	44.209	9.034	5.681	-29.494
9	25.731	-17.181	6	18.09	-12.06	43.821	13.671	909	-29.241
10	28.3	-18.9	5	15.075	-10.05	43.375	18.25	-3.825	-28.95
11	30.811	-20.581	4	12.06	-8.04	42.871	22.771	-8.521	-28.621
12	33.264	-22.224	3	9.045	-6.03	42.309	27.234	-13.179	-28.254
13	35.659	-23.829	2	6.03	-4.02	41.689	31.639	-17.799	-27.849
14	37.996	-25.396	1	3.015	-2.01	41.011	35.986	-22.381	-27.406

Table A.2: After tax returns of IO I and IO II

IO I (tax rate 15%)			**IO II** (tax rate 30%)			**Overall profit**			
Number of factors	Profit (p = 70%)	Loss (p = 30%)	Number of factors	Profit (p = 70%)	Loss (p = 30%)	Profit I/Profit II (p = 49%)	Profit I/Loss II (p = 21%)	Profit I/Loss II (p = 21%)	Loss I/Loss II (p = 9%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	2.627	-2.061	14	29.547	-28.14	32.174	-25.513	27.486	-30.201
2	5.205	-4.084	13	27.437	-26.13	32.642	-20.925	23.353	-30.214
3	7.734	-6.069	12	25.326	-24.12	33.06	-16.386	19.257	-30.189
4	10.214	-8.016	11	23.216	-22.11	33.429	-11.896	15.2	-30.126
5	12.644	-9.925	10	21.105	-20.1	33.749	-7.456	11.18	-30.025
6	15.025	-11.796	9	18.995	-18.09	34.019	-3.065	7.199	-29.886
7	17.356	-13.629	8	16.884	-16.08	34.24	1.276	3.255	-29.709
8	19.638	-15.424	7	14.774	-14.07	34.412	5.568	-651	-29.494
9	21.871	-17.181	6	12.663	-12.06	34.534	9.811	-4.518	-29.241
10	24.055	-18.9	5	10.553	-10.05	34.608	14.005	-8.348	-28.95
11	26.189	-20.581	4	8.442	-8.04	34.631	18.149	-12.139	-28.621
12	28.274	-22.224	3	6.332	-6.03	34.606	22.244	-15.893	-28.254
13	30.31	-23.829	2	4.221	-4.02	34.531	26.29	-19.608	-27.849
14	32.297	-25.396	1	2.111	-2.01	34.407	30.287	-23.286	-27.406

Table A.3: Probability and amount of additional subsequent payments for profit shifts from IO II to IO I

shifted amount	Probability of additional subsequent payment (percent)	Amount of additional subsequent payment
(1)	(2)	(3)
	(1) × 0.00002	(1) × 0.15 × 1.25
0	0	0
2,500	5	469
5,000	10	938
7,500	15	1.406
10,000	20	1,875
12,500	25	2,344
15,000	30	2,813
17,500	35	3,281
20,000	40	3,750
22,500	45	4,219
25,000	50	4,688
27,500	55	5,156
30,000	60	5,625
32,500	65	6,094
35,000	70	6,563
37,500	75	7,031
40,000	80	7,500
42,500	85	7,969
45,000	90	8,438
47,500	95	8,906
50,000*	100	9,375

* Please note that the additional subsequent payment will be charged with certainty if the shifted amount is higher.

Table A.4: Probability and amount of additional subsequent payments for profit shifts from IO II to an additional object

shifted amount	Probability of additional subsequent payment (percent)	Amount of additional subsequent payment
(1)	(2)	(3)
	(1) × 0.0001	(1) × 0.15 × 1.25
0	0	0
500	5	94
1,000	10	188
1500	15	281
2000	20	375
2,500	25	469
3000	30	563
3500	35	656
4,000	40	750
4500	45	844
5000	50	938
5,500	55	1,031
6000	60	1,125
6500	65	1,219
7,000	70	1,313
7500	75	1,406
8000	80	1,500
8,500	85	1,594
9000	90	1,688
9500	95	1,781
10,000*	100	1,875

* Please note that the additional subsequent payment will be charged with certainty if the shifted amount is higher.

Table A.5: Results of group taxation

Number of factors		Payroll share (percent)		Combined tax rate (percent)	Overall profit							
					Profit I/Profit II (p = 49%)		Profit I/Loss II (p = 21%)		Loss I/Profit II (p = 21%)		Loss I/Loss II (p = 9%)	
IO I	IO II	IO I	IO II		Pre tax	After tax	Pre tax	After tax	Pre tax	After tax	Pre tax	After tax
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
				(0,15×(3) +0,3×(4))		(6)×(1-(5)/100)		(8)×(1-(5)/100)		(10)×(1-(5)/100)		(12)×(1-(5)/100)
1	14	6.9	93.1	29.0	45,301	32,178	-25,049	-25,049	40,149	28,519	-30,201	-30,201
2	13	13.6	86.4	28.0	45,319	32,649	-20,006	-20,006	35,111	25,295	-30,214	-30,214
3	12	20.2	79.8	27.0	45,279	33,071	-15,021	-15,021	30,111	21,992	-30,189	-30,189
4	11	26.8	73.2	26	45,181	33,442	-10,094	-10,094	25,149	18,615	-30,126	-30,126
5	10	33.2	66.8	25.0	45,025	33,763	-5,225	-5,225	20,225	15,166	-30,025	-30,025
6	9	39.7	60.3	24.0	44,811	34,034	-414	-414	15,339	11,650	-29,886	-29,886
7	8	46.1	53.9	23.1	44,539	34,256	4,339	3,337	10,491	8,069	-29,709	-29,709
8	7	52.5	47.5	22.1	44,209	34,428	9,034	7,035	5,681	4,424	-29,494	-29,494
9	6	58.9	41.1	21.2	43,821	34,550	13,671	10,779	909	717	-29,241	-29,241
10	5	65.5	34.5	20.2	43,375	34,622	18,250	14,567	-3,825	-3,825	-28,950	-28,950
11	4	72.1	27.9	19.2	42,871	34,644	22,771	18,401	-8,521	-8,521	-28,621	-28,621
12	3	78.8	21.2	18.2	42,309	34,616	27,234	22,282	-13,179	-13,179	-28,254	-28,254
13	2	85.7	14.3	17.2	41,689	34,539	31,639	26,212	-17,799	-17,799	-27,849	-27,849
14	1	92.7	7.3	16.1	41,011	34,411	35,986	30,195	-22,381	-22,381	-27,406	-27,406

Table A.6: Probability of additional subsequent payments for profit shifts from the group to an additional object

Shifted amount	Probability of additional subsequent payment
(1)	(2)
	(1) × 0.0001
0	0
500	5
1,000	10
1,500	15
2,000	20
2,500	25
3,000	30
3,500	35
4,000	40
4,500	45
5,000	50
5,500	55
6,000	60
6,500	65
7,000	70
7,500	75
8,000	80
8,500	85
9,000	90
9,500	95
10000*	100

* Please note that the additional subsequent payment will be charged with certainty if the shifted amount is higher.

Appendix B - Regression Results

Remarks:

Table B.1: Choice of formula apportioment as the tax regime (FA = 1) (Regression model 1)

Variables	Old	New	Overall
LCF at IO I	-0.0999	-0.259**	-0.180***
	(0.0954)	(0.105)	(0.0693)
LCF at IO II	-0.371***	-0.167***	-0.231***
	(0.0704)	(0.0600)	(0.0508)
LCF at group level	0.239***	0.243***	0.268***
	(0.0827)	(0.0830)	(0.0639)
TD15	0.308	-0.0162	0.136
	(0.253)	(0.269)	(0.171)
Manager	0.0630	-0.162	-0.0652
	(0.265)	(0.278)	(0.171)
Equation			0.199
			(0.177)
Female	-0.313	-0.496*	-0.400**
	(0.271)	(0.302)	(0.193)
Business Experience	-1.130***	-0.091	-0.474
	(0.335)	(0.303)	(0.219)
Risk level	-0.0677	-0.150**	-0.0828
	(0.0774)	(0.0751)	(0.0522)
Time	-0.00854*	-0.0136	-0.00992*
	(0.00508)	(0.00877)	(0.00530)
Period	0.0472***	0.0453***	0.0429***
	(0.0124)	(0.0116)	(0.00833)
Master	0.979***	0.241	0.552***
	(0.290)	(0.327)	(0.202)
Impulsivity	0.134*	-0.0717	0.0149
	(0.0807)	(0.0829)	(0.0560)
Age	-0.00417	-0.0222	-0.00956
	(0.00910)	(0.0706)	(0.0112)
Business Administration	-0.446	0.186	-0.190
	(0.360)	(0.442)	(0.305)
Economics	-0.527	-0.121	-0.266
	(0.396)	(0.490)	(0.315)
Tax return prepared	0.408	0.727**	0.466**
	(0.288)	(0.283)	(0.203)
Constant	-0.830	0.518	-0.281
	(0.675)	(1.636)	(0.496)
Pseudo R^2	0.280	0.202	0.202
Observation	982	834	1,816
Standard errors	cluster robust	cluster robust	cluster robust

Statistical significance at the 1%, 5% and 10% are denoted by ***, ** and *, respectively.

Table B.2: Allocation of production factors (Regression model 2)

	Overall			SA			FA		
Variables	Old	New	All	Old	New	All	Old	New	All
LCF at IO I	-0.0546	-0.0759**	-0.0673**	-0.0983*	-0.115***	-0.120***			
	(0.0434)	(0.0361)	(0.0304)	(0.0513)	(0.0397)	(0.0355)			
LCF at IO II	0.0231*	0.0299	0.0254**	0.0249**	0.0360	0.032***			
	(0.0126)	(0.0190)	(0.0119)	(0.0119)	(0.0229)	(0.0121)			
LCF at group level	0.00957	0.0224	0.0122				0.0105	0.0295	0.0201
	(0.0215)	(0.0218)	(0.0151)				(0.0252)	(0.0218)	(0.0171)
TD15	-0.343***	-0.381***	-0.370***	-0.240**	-0.517***	-0.376***	-0.546***	-0.133	-0.347***
	(0.0933)	(0.0981)	(0.0656)	(0.108)	(0.124)	(0.0829)	(0.147)	(0.104)	(0.0936)
Manager	-0.126	0.178*	0.0360	-0.106	0.152	0.0178	0.498***	0.0212	0.267***
	(0.0860)	(0.108)	(0.0759)	(0.0777)	(0.113)	(0.0734)	(0.174)	(0.134)	(0.0948)
FA	-0.237*	-0.0817	-0.147**						
	(0.122)	(0.0912)	(0.0751)						
Equation			-0.0224			0.0323			-0.0498
			(0.0593)			(0.0724)			(0.0819)
FA * Manager	0.595***	-0.00364	0.246**						
	(0.169)	(0.153)	(0.111)						
Transfer to IO I	0.026***	0.0195***	0.021***	0.023***	0.0181***	0.0199***			
	(0.00532)	(0.005)	(0.00354)	(0.0045)	(0.00525)	(0.00318)			
Transfer to Z	0.025***	0.0165***	0.0187***	0.033***	0.0220**	0.0241***	0.0257***	0.0197***	0.0178***
	(0.0057)	(0.0059)	(0.0039)	(0.00786)	(0.0101)	(0.00585)	(0.00877)	(0.00529)	(0.00501)
Detection of transfer to IO I	0.00273	0.123	0.0225	-0.0178	0.126	0.00822			
	(0.0622)	(0.0952)	(0.0587)	(0.0548)	(0.0937)	(0.0545)			
Detection of transfer to Z	-0.0156	-0.0166	-0.0216	0.0392	0.000951	0.0331	-0.101	-0.0453	-0.0941
	(0.0742)	(0.0687)	(0.0531)	(0.0663)	(0.0994)	(0.0548)	(0.138)	(0.102)	(0.0925)
Gender	-0.0333	-0.163**	-0.0896	-0.0512	-0.0831	-0.0821	0.00769	-0.110	-0.100
	(0.0926)	(0.0679)	(0.0595)	(0.114)	(0.116)	(0.0818)	(0.149)	(0.0893)	(0.0723)
Business Experience	0.0528	0.0902	0.0121	-0.0107	0.188	0.0507	0.224	0.0700	-0.0726
	(0.124)	(0.0918)	(0.0693)	(0.141)	(0.124)	(0.0942)	(0.268)	(0.148)	(0.0913)
Risk level	-0.0338	-0.00878	-0.0145	-0.0431	-0.00217	-0.0183	0.0137	-0.0192	-0.0157
	(0.0261)	(0.0262)	(0.0187)	(0.0316)	(0.0333)	(0.0222)	(0.0421)	(0.0377)	(0.0290)
Time	0.00112	-9.06e-05	0.000358	-0.00044	-0.00059	-0.00029	0.00380	-0.00142	0.00116
	(0.00106)	(0.00102)	(0.00077)	(0.0009)	(0.00124)	(0.0007)	(0.0023)	(0.00131)	(0.00167)
Period	0.000146	-0.00037	4.53e-05	0.00748	0.00357	0.00502	-0.0109	-0.00431	-0.00619
	(0.00557)	(0.00479)	(0.0035)	(0.00599)	(0.0070)	(0.0045)	(0.0109)	(0.00549)	(0.00575)
Master	-0.108	0.201**	0.0642	-0.114	0.109	0.0113	-0.175	0.180**	0.0704
	(0.105)	(0.0971)	(0.0699)	(0.134)	(0.169)	(0.0911)	(0.157)	(0.0818)	(0.0965)
Impulsivity	-0.0228	-0.0111	-0.00907	-0.0191	-0.0299	-0.00556	-0.0480	0.0407	-0.00439
	(0.0269)	(0.0280)	(0.0186)	(0.0331)	(0.0441)	(0.0228)	(0.0387)	(0.0309)	(0.0258)
Age	-0.011***	-0.0432**	-0.014***	-0.00767	-0.0303*	-0.0099*	-0.0086*	-0.0793**	-0.0137**
	(0.0035)	(0.0189)	(0.00441)	(0.0054)	(0.0179)	(0.00562)	(0.0049)	(0.0346)	(0.00641)
Business Administration	-0.0182	0.0464	0.00352	-0.116	0.104	0.0123	0.262	-0.107	0.0164
	(0.152)	(0.126)	(0.0963)	(0.134)	(0.251)	(0.158)	(0.305)	(0.0990)	(0.118)
Economics	0.0948	-0.0708	-0.0291	0.108	0.117	0.0946	0.180	-0.352**	-0.151
	(0.165)	(0.154)	(0.111)	(0.142)	(0.247)	(0.163)	(0.264)	(0.166)	(0.152)
Tax return prepared	-0.0145	0.0474	0.0324	0.00886	0.127	0.0970	-0.127	-0.152	-0.0700
	(0.104)	(0.0755)	(0.0584)	(0.101)	(0.119)	(0.0749)	(0.207)	(0.109)	(0.0826)
Constant	2.591***	3.069***	2.516***	2.457***	2.695***	2.291***	2.278***	3.900***	2.491***
	(0.228)	(0.454)	(0.174)	(0.259)	(0.484)	(0.229)	(0.441)	(0.810)	(0.231)
Lnalpha	-1.495***	-1.655***	-1.487***	-1.943***	-1.525***	-1.625***	-1.172***	-2.350***	-1.468***
	(0.273)	(0.324)	(0.207)	(0.405)	(0.376)	(0.263)	(0.387)	(0.590)	(0.308)
Observation	1,245	1,245	2,490	738	678	1,416	507	567	1,074
Standard errors	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust

Statistical significance at the 1%, 5% and 10% are denoted by ***, ** and *, respectively.

Table B.3: Profit shifts to IO I (LN profit shift to IO 1) (Regression model 3)

Variables	Old	New	Overall
LCF at IO I	-0.127	-0.105	-0.131**
	(0.0863)	(0.0941)	(0.0651)
LCF at IO II	-0.256***	-0.338***	-0.285***
	(0.0750)	(0.125)	(0.0686)
TD15	-1.265*	0.592	-0.255
	(0.742)	(0.705)	(0.520)
Manager	1.183*	-0.160	0.530
	(0.669)	(0.660)	(0.486)
Investment in IO II	0.127**	0.190***	0.153***
	(0.0498)	(0.0503)	(0.0375)
Transfer to Z	0.0993	0.137	0.141
	(0.158)	(0.125)	(0.103)
Detection of transfer to IO I	0.713*	0.843	0.778**
	(0.392)	(0.886)	(0.359)
Detection of transfer to Z	-1.134**	0.536	-0.457
	(0.512)	(0.670)	(0.424)
Equation			-1.214**
			(0.500)
Gender	-1.450**	-1.449**	-1.140**
	(0.736)	(0.706)	(0.553)
Business Experience	-1.719*	0.737	-0.631
	(0.912)	(0.781)	(0.577)
Risk level	0.386*	0.208	0.176
	(0.205)	(0.207)	(0.148)
Time	-0.00985	-0.00218	-0.00814
	(0.00724)	(0.00824)	(0.00528)
Period	-0.0437	0.000147	-0.0169
	(0.0397)	(0.0303)	(0.0247)
Master	2.403***	1.548*	0.924
	(0.791)	(0.829)	(0.566)
Impulsivity	0.197	-0.0197	0.00720
	(0.221)	(0.223)	(0.162)
Age	0.00849	-0.352**	-0.0115
	(0.0352)	(0.143)	(0.0538)
Business Administration	-0.971	-0.429	-0.812
	(0.987)	(1.459)	(0.944)
Economics	-2.879**	-0.789	-1.565
	(1.133)	(1.518)	(0.977)
Tax return prepared	-1.450**	-1.449**	-1.140**
	(0.736)	(0.706)	(0.553)
Constant	-1.719*	0.737	-0.631
	(0.912)	(0.781)	(0.577)
R^2	0.2645	0.1589	0.1733
Observation	738	678	1,416
Standard errors	cluster robust	cluster robust	cluster robust

Statistical significance at the 1%, 5% and 10% are denoted by ***, ** and *, respectively.

Table B.4: Profit shifts to the additional investment object Z (LN transfer to Z) (Regression model 3)

	Overall			SA			FA		
Variables	Old	New	All	Old	New	All	Old	New	All
LCF at IO I	-0.110**	-0.196***	-0.179***	-0.0875	-0.114*	-0.123***			
	(0.0516)	(0.0688)	(0.0447)	(0.0556)	(0.0602)	(0.0396)			
LCF at IO II	-0.146**	-0.0953	-0.126**	-0.135*	-0.136***	-0.129***			
	(0.0739)	(0.0685)	(0.0516)	(0.0702)	(0.0500)	(0.0481)			
LCF at group level	-0.262**	-0.274***	-0.266***				-0.289**	-0.289***	-0.293***
	(0.123)	(0.0919)	(0.0787)				(0.143)	(0.106)	(0.0914)
TD15	-0.642	0.350	-0.101	-1.259*	0.0304	-0.550	-0.118	-0.390	-0.0963
	(0.610)	(0.513)	(0.395)	(0.655)	(0.529)	(0.433)	(0.801)	(0.734)	(0.515)
Manager	0.299	0.685	0.530	0.328	0.301	0.330	0.241	2.411***	1.151**
	(0.573)	(0.477)	(0.376)	(0.636)	(0.453)	(0.403)	(0.813)	(0.766)	(0.537)
FA	1.811***	1.487***	1.700***						
	(0.420)	(0.350)	(0.272)						
Transfer to IO I	-0.00663	0.111***	0.0471**	-0.0304	0.125***	0.0411	0.0187	0.102**	0.0458
	(0.0313)	(0.0342)	(0.0240)	(0.0420)	(0.0391)	(0.0305)	(0.0389)	(0.0417)	(0.0289)
Investment in IO II	0.0405	0.0478	0.0407	0.0600	0.0419	0.0561*			
	(0.0396)	(0.0412)	(0.0291)	(0.0451)	(0.0410)	(0.0328)			
Equation			-1.204***			-1.067**			-1.065*
			(0.401)			(0.434)			(0.576)
Detection of transfer to IO I	0.0214	0.264	0.0860	-0.151	0.0386	-0.0603			
	(0.313)	(0.544)	(0.279)	(0.306)	(0.515)	(0.278)			
Detection of transfer to Z	0.421	1.609***	0.910***	0.112	1.896***	0.844**	0.354	0.993	0.652*
	(0.298)	(0.412)	(0.246)	(0.490)	(0.433)	(0.353)	(0.398)	(0.673)	(0.365)
Gender	-1.179*	-0.749	-0.933**	-1.162	-0.498	-0.590	-0.972	-0.925	-0.910
	(0.631)	(0.561)	(0.422)	(0.723)	(0.552)	(0.468)	(0.868)	(0.746)	(0.566)
Business Experience	0.177	0.610	0.353	0.324	1.684**	0.849*	-1.992**	-1.387*	-1.202**
	(0.666)	(0.742)	(0.484)	(0.757)	(0.680)	(0.497)	(0.929)	(0.807)	(0.567)
Risk level	0.336**	0.102	0.140	0.340*	0.365**	0.250**	0.0752	-0.183	-0.0567
	(0.160)	(0.149)	(0.103)	(0.185)	(0.150)	(0.117)	(0.203)	(0.234)	(0.151)
Time	-0.009***	-0.00247	-0.0073**	-0.00583	-0.00068	-0.00449	-0.0147*	0.00381	-0.00929
	(0.0035)	(0.00591)	(0.00312)	(0.00474)	(0.00521)	(0.0036)	(0.00791)	(0.0126)	(0.00717)
Period	-0.00917	-0.0128	-0.00904	-0.0164	-0.0124	-0.0118	-0.0130	-0.0134	-0.00807
	(0.0233)	(0.0197)	(0.0156)	(0.0278)	(0.0259)	(0.0203)	(0.0403)	(0.0325)	(0.0261)
Master	0.158	0.570	0.0544	0.996	1.609**	0.591	-0.0592	0.199	-0.270
	(0.735)	(0.689)	(0.474)	(0.950)	(0.753)	(0.571)	(0.914)	(0.694)	(0.552)
Impulsivity	0.283	0.0271	0.194	0.0543	-0.226	-0.0719	0.610**	0.205	0.516***
	(0.196)	(0.154)	(0.120)	(0.219)	(0.143)	(0.119)	(0.291)	(0.243)	(0.191)
Age	0.0240	-0.111	0.0101	0.0149	-0.256**	0.00288	0.0259	0.141	0.0290
	(0.0305)	(0.121)	(0.0408)	(0.0429)	(0.117)	(0.0611)	(0.0273)	(0.192)	(0.0221)
Business Administration	0.277	0.970	0.592	-0.373	1.364	0.474	-0.744	1.519**	0.362
	(1.059)	(0.739)	(0.612)	(1.323)	(0.904)	(0.779)	(1.243)	(0.753)	(0.698)
Economics	0.251	1.284	0.933	-1.129	1.488	0.284	0.126	2.275**	1.420*
	(1.107)	(0.801)	(0.647)	(1.330)	(0.967)	(0.782)	(1.261)	(0.988)	(0.825)
Tax return prepared	0.895	-0.587	0.0386	1.274	-1.352***	-0.143	1.071	0.470	0.278
	(0.753)	(0.531)	(0.460)	(0.849)	(0.520)	(0.493)	(1.175)	(0.689)	(0.586)
Constant	-0.207	1.590	0.169	1.996	4.700*	1.246	1.501	-3.203	0.784
	(1.722)	(2.759)	(1.294)	(2.121)	(2.746)	(1.765)	(2.125)	(4.461)	(1.241)
R^2	0.1948	0.2008	0.1982	0.1789	0.3116	0.1955	0.2134	0.2426	0.2337
Observation	1,245	1,245	2,490	738	678	1,416	507	567	1,074
Standard errors	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust	cluster robust

Statistical significance at the 1%, 5% and 10% are denoted by ***, ** and *, respectively.

Table B.5: External validity

Variable	FA	Investment in IO II (Overall)	Investment in IO II (SA)	Investment in IO II (FA)	Profit shift to IO I	Profit shift to Z (Overall)	Profit shift to Z (SA)	Profit shift to Z (FA)
LCF at IO I	-0.189	-0.118*	-0.116*		-0.788**	-0.388	-0.296	
	(0.141)	(0.0668)	(0.0688)		(0.394)	(0.294)	(0.289)	
LCF at	-0.104	0.0146	0.0262*		-0.664***	-0.458***	-0.508***	
IO II	(0.0713)	(0.0139)	(0.0152)		(0.154)	(0.111)	(0.145)	
LCF at	0.307**	-0.000750		-0.0250		-0.602***		-0.768***
group level	(0.125)	(0.0415)		(0.0473)		(0.170)		(0.192)
Professional	-0.0985	0.0429	0.0367	0.0339	-1.042	-1.553	-1.879	-1.109
participant	(0.608)	(0.125)	(0.152)	(0.217)	(1.725)	(1.458)	(1.398)	(1.807)
FA * professional						0.381		
						(1.123)		
FA		0.116				1.585***		
		(0.0762)				(0.508)		
Transfer		0.00771*	0.00745**			0.0862	0.100	
To IO I		(0.00405)	(0.00351)			(0.0598)	(0.0627)	
Transfer		0.00359	0.0147	-0.00772	0.0499			
To Z		(0.0119)	(0.0115)	(0.0158)	(0.153)			
Detection of Transfer to		0.00509	0.00591		0.821	0.0618	0.142	
IO I		(0.0425)	(0.0518)		(0.820)	(0.502)	(0.538)	
Detection of		-0.0589	-0.129*	0.167*	2.054**	1.728***	1.649***	1.770**
Transfer Z		(0.0578)	(0.0767)	(0.0935)	(0.873)	(0.396)	(0.592)	(0.722)
Investment					0.105	0.0584	0.0197	0.0629
in IO II					(0.0979)	(0.0685)	(0.0910)	(0.0793)
Gender	0.251	0.174*	0.199	0.185**	0.124	0.594	0.820	0.718
	(0.428)	(0.101)	(0.170)	(0.0910)	(1.170)	(0.901)	(1.101)	(1.014)
Risk level	-0.305**	0.0974***	0.118**	0.0413	0.0873	0.251	0.0898	0.524
	(0.121)	(0.0325)	(0.0485)	(0.0260)	(0.383)	(0.293)	(0.290)	(0.381)
Time	-0.0052*	0.000458	0.000886	-0.000784	(0.873)	(0.396)	(0.592)	(0.722)
	(0.00298)	(0.000684)	(0.000751)	(0.000928)	0.000135	-0.00570	-0.00239	-0.019***
Period	0.0463**	0.00549	0.00365	0.00798	-0.00570	0.0513	-0.00823	0.169**
	(0.0200)	(0.00500)	(0.00541)	(0.00960)	(0.0621)	(0.0435)	(0.0509)	(0.0688)
Impulsivity	0.117	-0.0152	-0.0146	0.00279	-0.224	-0.259	-0.80***	0.00308
	(0.112)	(0.0209)	(0.0339)	(0.0245)	(0.264)	(0.254)	(0.305)	(0.292)
Age	-0.00556	0.00731	0.00916	0.00476	0.0450	0.0488	0.0180	0.0872
	(0.0310)	(0.00630)	(0.00842)	(0.0125)	(0.0851)	(0.0656)	(0.0661)	(0.0824)
Constant	-0.311	1.631***	1.502***	1.832***	4.161	0.739	4.779	-2.655
	(1.090)	(0.272)	(0.432)	(0.320)	(2.859)	(2.560)	(3.026)	(2.126)
Lnalpha		-2.766***	-3.248***	-2.560**				
		(0.691)	(1.011)	(1.052)				
R2	0,2154				0,1194	0,1863	0,2497	0,2791
Observation	391	510	291	219	291	510	291	219
Standard errors		cluster robust				cluster robust		

This table provides coefficients and standard errors for selected parameter estimates the main explanatory variables of all Regression models. Statistical significance at the 1%, 5% and 10% are denoted by ***,** and *, respectively.

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