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Diskussionsbeitrag Nr. B-30-17

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Tax Consultants' Incentives

A Game-Theoretic Investigation into the Behavior of Tax Consultants, Taxpayers, and the Tax Authority in a Setting of Tax Complexity*

Markus Grottke† Johannes Lorenz‡

November, 2017

Abstract

We propose a game-theoretic investigation to capture the interplay between the behavior of tax consultants, taxpayers, and the tax authority in a setting of tax complexity. Our purpose is to provide answers to two research questions: Which aspects of the strategic interaction between the players induce tax consultants to provide inaccurate consulting services? How can we change the incentive structure in order to improve tax consulting quality? We find that tax consultants can be best motivated to work accurately by exogenously increasing the probability of

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tax underpayment and by ensuring that the tax authority corrects both tax underpayment and tax overpayment.

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JEL classification: H2, M48, P48, K34

1. Introduction

A much-discussed research topic concerns the fact that taxpayers, because of the existence of tax complexity, face (too high) costs related to the self-preparation of their tax returns and therefore have their tax returns prepared by professional tax consultants (e. g. Beck, Davis, & Jung, 1996; Melumad, Wolfson, & Ziv, 1994).

However, a topic less often scrutinized relates to the fact that tax consultants themselves face cost-benefit considerations which could prevent them from carrying out their services accurately. Such considerations might arise because of the following obvious factors: tax consultants face high costs involved in carrying out their services accurately since the tax codes in most countries have a reputation for being complicated and subject to constant change. Therefore, tax consultants may opt to reduce these costs by simply "guessing" when confronted with ambiguous cases. Furthermore, tax professionals are organized in professional associations such as the "Chamber of Tax Consultants" in many countries. This limits competition and thus may make them confident that they will retain their clients irrespective of whether they carry out their services accurately or inaccurately. Finally, they may not face fines resulting from inaccurate consulting work that are high enough to motivate them to provide accurate services.

It seems, however, that there is also an even more interesting *strategic dimension* determining tax consultants' behavior: there is anecdotal evidence that consultants are aware of their clients' inability to estimate tax effects and, as a result, of the low probability of errors being detected. It might be *therefore* that they show little inclination to correct their own inaccuracies. In Germany, for example, tax courts have repeatedly imposed high fines on tax consultants for providing inaccurate consulting services.[1] This suggests that some of the

[1] E. g., Bundesgerichtshof, 15.04.2010—IX ZR 189/09 (BGH—German Federal Court of Justice); BGH, 23.10.2003—IX ZR 249/02.

obvious reasons mentioned above might not work out: in fact, tax consultants *do* face high fines and still work inaccurately. There must be, then, other reasons impeding tax consultants from providing accurate consulting services.

The two main research questions of this study are, therefore: (1) Which aspects of the strategic interaction between taxpayers, tax consultants and the tax authority induce tax consultants to provide inaccurate consulting services? (2) How could the incentive structure be changed so as to encourage tax consultants to provide accurate consulting services?

It is difficult to provide empirical evidence of this strategic interaction: In line with the incentives at hand, rational tax consultants can be expected to keep inaccuracies private as long as they anticipate that neither the tax authority nor the taxpayer will take a closer look at the outcome of their work. This is probably why—according to our knowledge—little empirical research on the topic has been carried out so far. The only empirical study we are aware of (Erard, 1993) addresses the relationship between tax compliance and tax consultants. However, his econometric implementation of tax compliance is based on decision theory: Erard (1993) compares optimal tax preparation from the viewpoint of the taxpayer when employing different consultant types (CPA, bookkeeper and self-preparation). Hence, his model cannot shed light on the factors that induce tax consultants to focus on the strategically induced incentives that arise beside their own costs and benefits.

While prior literature has focused several times on the role of tax consultants in resolving tax code uncertainty (Scotchmer, 1989) and on factors that induce taxpayers to hire tax consultants (Beck et al., 1996; Melumad et al., 1994; Reinganum & Wilde, 1991), strategic interactions have to our knowledge been studied only between taxpayers and tax authority (e. g. Reinganum & Wilde, 1986; Graetz, Reinganum, & Wilde, 1986; Sansing, 1993; Erard & Feinstein, 1994; Rhoades, 1999). The only studies investigating strategic behavior on the part of tax consultants are related to very specific settings of corporate taxpayers (Lipatov, 2012) or an entire tax consultant industry (Damjanovic & Ulph, 2010). So far, it has also not been taken into account that labor specialization and rising tax complexity might increasingly force taxpayers to outsource tax planning to professional tax consultants (for empirical evidence, refer to Long & Caudill, 1987; Christian, Gupta, & Lin, 1993) and that may leave them without a choice whether or not to employ a tax consultant.

Therefore, in this paper we develop a game theoretical model on the interaction between a tax consultant, a taxpayer and a tax authority. We construct a Nash equilibrium in mixed strategies and characterize its properties.

With respect to our first research question, our model reveals how the different actors' incentives complement each other in influencing the probability of the tax consultant providing accurate consulting services[2]. It emerges that in some cases the tax authority's incentives account for the consulting quality, while in others the taxpayer's incentives determine the consultant's accuracy. However, if both parties have few incentives to check for the accuracy of the tax consultant's work, tax consultants are increasingly willing to provide inaccurate services even if this is punishable by high fines. These insights point to the fact that the tax authority's materiality concerns and the taxpayer's limited knowledge of the tax code and therefore their inability to judge the accuracy of the tax consultant's work come at a certain cost, as they induce the tax consultant to compromise the accuracy of his work.

With respect to the second research question we carve out that, surprisingly, an increase in the willingness of taxpayers to underreport can cause tax consultants to increase their efforts to provide accurate tax consulting services. Consulting quality is also improved if the tax authority adjusts errors of tax consultants in both directions, namely, underreporting *and* overreporting.

Taken together, the results of our research offer valuable insights for taxpayers, tax authorities and tax consultants into how the players may react to the rules set in the tax game. For taxpayers, our research offers insights into how tax consultants might exploit their unawareness of tax consulting inaccuracy. For the tax authority the game highlights the complementary role of taxpayers in detecting tax inaccuracies of tax consultants.

We proceed as follows. In the subsequent section, we develop our basic model and characterize the Nash equilibrium. In Section 3, we present two possible solutions to our second research question: the invisible hand of the markets and institutional changes. Finally, in Section 4, we summarize our results, discuss their potential implications for tax legislation and highlight limitations of our analysis.

[2] Below, this probability will also be referred to as "consulting quality".

2. Model Setup

2.1. Basic Assumptions

Since our goal is to focus on the strategic incentives of the actors involved, we assume risk neutrality throughout this paper. This is a common practice also adopted in similar studies (e. g. Reinganum & Wilde, 1991; Phillips & Sansing, 1998). We define accurate tax consulting as a consulting service which results in the minimum amount of the client's legally required tax payment. By contrast, consulting inaccurately results in a tax payment that positively or negatively deviates from the accurate value.

Furthermore, we assume that it is only the intention of the involved parties that determines whether accurate consulting can be achieved; that is, we exclude the question to which extent a perfect consulting technology is available. This assumption allows us to isolate endogenous incentive effects from effects driven by the uncertainty arising from an imperfect consulting technology.

The timing of the game is as follows. First, the tax consultant[3] carries out his consulting service, i. e. he prepares the tax return, receiving a fee F.[4] He can decide whether to consult accurately or inaccurately. Consulting accurately, he determines his client's minimum legal tax payment with certainty, incurring an additional cost C.[5] Inaccurate consulting causes the amount of tax payable on the reported income, as identified by the tax consultant, to deviate from the minimum legal tax payment by $\pm D$ (this will henceforth be referred to as "tax deviation"). Whether this deviation is positive or negative will be determined by the player "Nature", who acts as a random mechanism: the deviation is positive (thus, resulting in a tax overpayment) with probability p. Whether a deviation has taken place can only be determined by the taxpayer and the tax

[3] For the sake of clarity, we refer to the tax consultant as being male, the taxpayer as "they" (singular), and the tax authority as "it" throughout the paper. It goes without saying that this attribution of gender is chosen arbitrarily.

[4] Thus, we do not elaborate on the question whether the taxpayer ought to use a tax consultant at all. See Appendix A for a brief discussion. Thereby, we also avoid mingling the effects of fee-related tax consulting accuracy (one might think of shrinking consulting accuracy with shrinking fees) from the strategic interaction. Furthermore—at least as far as Germany is concerned—, tax consultants may not choose their fee arbitrarily but instead are committed by the official tax consultants' fees schedule (Steuerberatervergütungsverordnung).

[5] Without loss of generality in the context of this model, we set the fixed costs that arise in the case of both consulting accurately and inaccurately to zero.

authority after carrying out an audit. Formally, the set of strategies available to the tax consultant is denoted by $\mathcal{S}_{TC} = \{a_a, a_{ia}\}$ where a_a and a_{ia} denote consulting accurately and inaccurately, respectively. The tax consultant's payoff arising from strategy $s_{TC} \in \mathcal{S}_{TC}$ is denoted by $u_{TC}(s_{TC}, s_{TA}, s_{TP})$. The tax consultant's problem is to weigh the additional cost from consulting accurately against the tax deviation that he has to refund or the fine that he has to pay to the tax authority if either the taxpayer realizes that the tax payment was too high or the tax authority finds out that tax payment was too low.[6]

Next, the tax authority decides on whether or not to audit the tax return. At this stage, the tax authority does not know whether the tax consultant worked accurately or not and, hence, cannot condition its choice of strategy on this information. Auditing is associated with cost A_{TA}. By contrast, if the tax authority accepts the tax return without any further inspection no cost is incurred. In many countries, it is common to have performance measurement systems in place that focus on maximizing the negative difference between the tax computation of the taxpayer / tax consultant and the outcome of the tax authority's subsequent audit when subtracting the latter from the former.[7] Therefore, we assume that the tax authority is interested in maximizing tax revenue: If the tax return turns out to be inaccurate in the sense that the tax payment is too high, the tax authority will neither correct the return nor take further action to inform the taxpayer about the inaccuracy. However, if the tax payment is too low, the tax authority will impose a fine for tax evasion H on the tax consultant.[8] The tax authority's strategies are denoted by the set $\mathcal{S}_{TA} = \{b_a, b_{na}\}$ where b_a and b_{na} denote audit and no audit, respectively. We use $u_{TA}(s_{TC}, s_{TA}, s_{TP})$ to denote the tax authority's payoffs arising from strategy $s_{TA} \in \mathcal{S}_{TA}$.

The taxpayer is endowed with a pre-tax income I drawn from some arbitrary income distribution, the exact shape of which is unknown by all players.[9] Upon

[6]The current IRC Section 6694 (a) includes a 50 % penalty for an understatement of taxpayer liability. Implicitly, we assume that the taxpayer can always successfully sue the tax consultant for consulting erroneous. Indeed, practically, one of the reasons to contract a tax consultant may be the possibility to hold him responsible for possible errors.

[7]In the context of Germany, e. g., Jahresbericht Leistungsvergleich, 2011 [annual report benchmarking].

[8]This is a common assumption (see, for example, Reinganum & Wilde, 1991; Melumad et al., 1994; Beck et al., 1996; Kaplow, 1998).

[9]Given this assumption the tax authority cannot condition its strategy on the existence of an error: Upon receiving an income report stating X it cannot infer whether $X = I_1$

receiving notice of assessment, the taxpayer can opt to accept and pay the tax T—which is due if the tax consultant worked accurately—or $T \pm D$—which is due if the tax consultant worked inaccurately. However, the taxpayer can also decide to audit the tax return, which incurs an additional cost A_{TP}.[10] While the taxpayer's possibility to audit the tax return is crucial for our analysis, one might consider this assumption rather unrealistic. To account for the fact that most taxpayers indeed will never audit their consultants' work (because of lack of knowledge, time, and so on), we introduce an exogenous probability ϑ that the taxpayer becomes suspicious for some or another reason that the tax consultant's work has been carried out inaccurately.[11] Typical reasons might be discussions among friends on tax refunds and factors that influence tax refunds, discussions of well-known tax court decisions against prominent people or recommendations on tax saving opportunities in the media. We assume that this review process unveils any potential inaccuracies in the work of the tax consultant. When such mistakes are revealed, the tax consultant has to compensate the monetary loss that was caused by his imperfect work, that is, tax overpayment D. We denote the taxpayer's strategies by the set $\mathcal{S}_{TP} = \{c_a, c_{na}\}$. c_a and c_{na} denote audit and no audit, respectively. The payoff to strategy $s_{TP} \in \mathcal{S}_{TP}$ is denoted by $u_{TP}(s_{TC}, s_{TA}, s_{TP})$. Note that, at this stage, the taxpayer does not know whether or not the tax consultant worked accurately and whether or not the tax authority audited the tax return beforehand. There is only one state in which the taxpayer are provided with information on which they can condition their strategy choice: if the tax consultant chooses strategy a_{ia} and this results in a tax payment which is too low and if this is detected by the tax authority during an audit (strategy b_a), the taxpayer will be given notice

(correct statement), $X = I_2 - D$ (underpayment), or $X = I_3 + D$ (overpayment) since I is unknown. In contrast, we assume that the very amount of deviation D is known by all players. This assumption can be justified by thinking of a group of comparable taxpayers who are heterogeneous with respect to their income but susceptible to the same kinds of mistakes. For example, teachers might or might not be allowed to deduct their home offices. Consider a tax rate of t. If this deduction is legal, the correct tax would be $T = t \times (I_1 - \text{“Costs of home office”})$, an incorrect (too high) tax would be $T + D = t \times I_1$. If, on the other hand, this deduction is illegal, the correct tax would be $T = t \times I_2$ whereas an incorrect (too low) tax would be $T - D = t \times (I_2 - \text{“Costs of home office”})$.

[10] A_{TP} may be interpreted as disutility from coping with tax law.

[11] It turns out that ϑ is not part of the equilibrium strategies of both the tax consultant and the tax authority. Thus, the probability of the taxpayer getting a chance to audit ϑ may be arbitrarily small without changing the main results of our article.

$\mathcal{S}_{TC} = \{a_a, a_{ia}\}$	Strategy set of the tax consultant containing the strategies "consulting accurately" and "consulting inaccurately"
$\mathcal{S}_{TA} = \{b_a, b_{na}\}$	Strategy set of the tax authority containing the strategies "audit" and "no audit"
$\mathcal{S}_{TP} = \{c_a, c_{na}\}$	Strategy set of the taxpayer containing the strategies "audit" and "no audit"
F	Consulting fee
C	Additional cost of the tax consultant for accurate consulting
A_{TA}	Tax authority's audit cost
A_{TP}	Taxpayer's audit cost
I	Taxpayer's income
T	Minimal tax payment that is in line with the law
D	Positive or negative deviation from the minimal tax payment
H	Monetary fine for tax evasion
α	Probability that the tax consultant provides accurate services
β	Probability that the tax authority audits the tax return
γ	Probability that the taxpayer audits the tax return
p	*Exogenous* probability that tax deviation D is positive (resulting in a tax payment that is too high)

TABLE 2.1: *Symbols.*

that they have been found guilty of tax evasion. If this happens, the game ends and the taxpayer does not need to decide on whether or not to audit.

Although the structure of the game is sequential, the actors can be thought of as choosing strategies simultaneously (because they can't observe the others' choices besides the exception explained above). Table 2.1 provides an overview of the symbols applied throughout the paper. Figure 2.1 depicts the structure of the game and the respective payoffs.

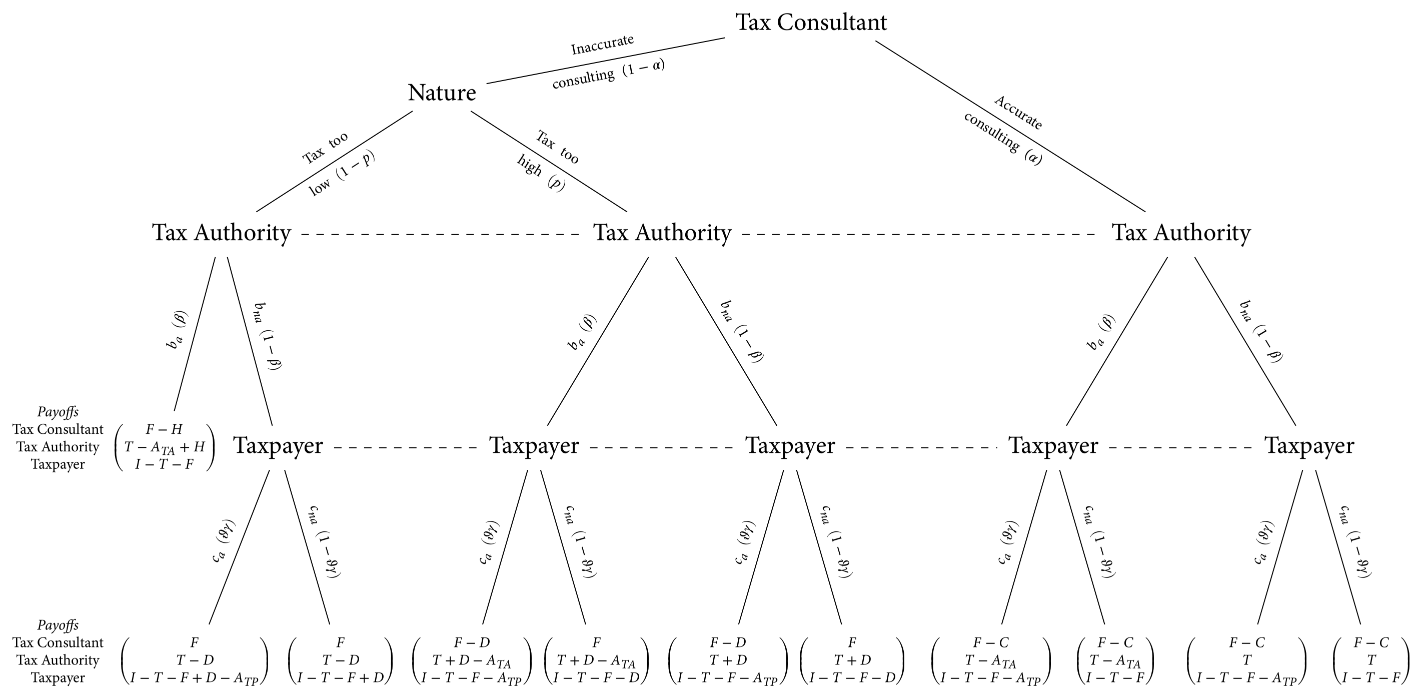

FIGURE 2.1: *Timing of events: First the tax consultant decides on whether or not to provide accurate consulting services. Then, in the case of an inaccurate preparation, nature determines whether the tax payment is too high or too low. Next, the tax authority decides whether or not to audit the tax return. Finally, the taxpayer decides whether or not to audit. The dashed lines indicate information sets, namely, the players are not informed about their exact position in the game tree.*

2.2. Equilibrium

Parameter constellations exist that cause a certain strategy to be beneficial to the respective player, independent of the other players' choices. Given that all players are rational, a tax consultant will never work accurately if $u_{TC}(a_a, s_{TA}, s_{TP}) \leq u_{TC}(a_{ia}, s_{TA}, s_{TP}) \forall s_{TA} \in \mathcal{S}_{TA}, s_{TP} \in \mathcal{S}_{TP}$. The tax authority will never audit if $u_{TA}(s_{TC}, b_a, s_{TP}) \leq u_{TA}(s_{TC}, b_{na}, s_{TP}) \forall s_{TC} \in \mathcal{S}_{TC}, s_{TP} \in \mathcal{S}_{TP}$ and taxpayers will never audit if $u_{TP}(s_{TC}, s_{TA}, c_a) \leq u_{TC}(s_{TC}, s_{TA}, c_{na})$ $\forall s_{TC} \in \mathcal{S}_{TC}, s_{TA} \in \mathcal{S}_{TA}$. We exclude these cases from the following analysis.[12] Instead we will assume that the above stated inequalities are *not* fulfilled. As a result, the players are faced with a discoordination game, which takes place between tax consultant on the one hand and both tax authority and taxpayer on the other. If the tax consultant always provides accurate services it is never beneficial for the tax authority and the taxpayer to audit. If, however, the tax authority and the taxpayer never audit it becomes advantageous for the tax consultant to work inaccurately—which, in turn, induces tax authority and taxpayer to start auditing. If the tax authority and the taxpayer always audit, it is, of course, better for the tax consultant to provide accurate services, and so on. Furthermore, the taxpayer's and the tax authority's audit activities are partially substitutes in that they both induce the tax consultant to work more often accurately. However, taxpayer and tax authority have different reasons to audit. The taxpayer wants to avoid tax overpayment. Hence, they won't report tax underpayment to the fiscal authority. Conversely, the tax authority seeks to avoid tax underpayment but won't report tax overpayment to the taxpayer. As a result, the taxpayer (tax authority) may want to audit sometimes even if the tax authority (taxpayer) audits *always*.

Below, we search for a Nash equilibrium in mixed strategies.[13] Applying mixed strategies, players choose their respective strategies with a certain probability. The probabilities that the tax consultant works accurately, the tax authority audits the tax return and the taxpayer audits their tax payment are denoted by α, β, and γ, respectively. A Nash Equilibrium is a strategy profile $(\alpha^\star, \beta^\star, \gamma^\star)$ that renders all three players indifferent between their two possible strategies. To provide intuitive insights, we adopt a step-by-step approach.

[12] It is ultimately an empirical question, whether or not these inequalities are fulfilled. See Appendix B.1 for a further analysis.

[13] Refer to Appendix B.2 for an analysis of the presuppositions necessary for mixed strategies that are part of a Nash equilibrium.

First, we consider the mixed strategy of tax consultant and tax authority that render the taxpayer indifferent between auditing or not auditing their tax return.

The taxpayer's expected outcome from auditing or not auditing is, respectively,

$$
\begin{aligned}
u_{TP}\left(\alpha,\beta,c_a\right) &= I - T - F + D(1-p)(1-\alpha)(1-\beta) \\
&\quad - A_{TP}(1-(1-p)(1-\alpha)\beta), \qquad (1)\\
u_{TP}\left(\alpha,\beta,c_{na}\right) &= I - T - F + (1-\alpha)\left[(1-p)\left(1-\beta\right)D - pD\right]. \qquad (2)
\end{aligned}
$$

The taxpayer always receives income I and has to pay tax T and consulting fee F. When choosing action c_a (= auditing), the taxpayer always bears the audit cost. If the audit reveals overpayment, the taxpayer earns the deviation D. If the tax authority detects tax evasion, however, the taxpayer automatically receives the audit results without incurring the audit costs A_{TP}. Thus, the taxpayer earns D with a probability conditioned on the fact that the tax authority did not reveal underpayment. This conditional probability is given by

$$
\frac{(1-\alpha)p}{1-(1-\alpha)(1-p)\beta} = \frac{(1-\alpha)p}{(1-\alpha)p + \alpha + (1-\alpha)(1-p)(1-\beta)}. \qquad (3)
$$

The numerator states the (unconditional) probability that an overpayment occurs, i. e., that the tax consultant worked inaccurately and that the error results in a tax payment which is too high. The denominator is determined by the (unconditional) probabilities that the tax authority did *not* detect tax underpayment which can be simply written as the converse probability that it *detects* tax evasion (left-hand side) or, alternatively, as the sum of probabilities of all events that lead to an outcome where the tax authority does not detect tax evasion (right-hand side). The taxpayer is indifferent[14] if their costs equate their expected benefit, thus

$$
A_{TP} = \frac{(1-\alpha)p}{1-(1-\alpha)(1-p)\beta} \cdot D. \qquad (4)
$$

[14] Note that this indifference condition can also (though, less intuitive) be derived by setting equal equations (1) and (2).

This indifference condition gives a first insight into how the tax consultant's and the tax authority's behavior affects the taxpayers expected payoff. Surprisingly, if the tax authority audits more *often* (i. e., β increases), the taxpayer's expected benefit from auditing *increases* since the conditional probability of earning D rises: From the viewpoint of the taxpayer, an undetected underpayment $(1-\alpha)(1-p)(1-\beta)$ gets less likely. Instead, they assign a "larger proportion" of probability to outcomes which involve a tax overpayment. A more accurate tax consultant (increasing α), on the other hand, reduces the expected overpayment both directly (numerator increases) and indirectly (denominator decreases since the event where an underpayment is detected by the tax authority gets less likely).

In argumentum e contrario, we can derive some first comparative static results[15] with respect to α.

Proposition 2.1 *In a game between the taxpayer and the tax consultant (i. e., keeping β exogenous) the tax consultant will* increase *his probability of accurate consulting iff the deviation D* increases, *iff β* increases, *and iff the probability of overpayment p* increases.

Most of the statements made in Proposition 2.1 can easily be verified directly from equation (4). The derivative of α (as given by (4)) with respect to p is necessarily positive because of $D/A_{TP} > 1$.[16] Note that the reason for the positive interaction between α and β is the fact that (exogenously) decreasing β reduces the taxpayer's expected benefit from auditing. The tax consultant reacts by decreasing α, thus again increasing the taxpayer's expected audit result.

In the next step, we analyze the relationships that induce the tax consultant to be indifferent between providing inaccurate or accurate consulting services. The tax consultant's expected payoffs are given by

$$u_{TC}\left(a_a, \beta, \gamma\right) = F - C, \tag{5}$$
$$u_{TC}\left(a_{ia}, \beta, \gamma\right) = F - p\vartheta\gamma\left(-D\right) + \left(1-p\right)\beta\left(-H\right). \tag{6}$$

When consulting accurately, the consultant always bears additional costs C. When providing inaccurate consulting services, he faces negative payoffs in

[15] Note that this is not an equilibrium yet. I. e., when analyzing β we implicitly assume that the tax consultant's probability of accurate consulting α is given exogenously, and vice versa.
[16] See also Appendix B.1.

the case of tax overpayment if the taxpayer audits or, in the case of tax underpayment, if the tax authority audits. Hence, the tax consultant is indifferent if

$$C = p\vartheta\gamma D + (1 - p)\beta H. \tag{7}$$

That is, the cost of providing accurate services must exactly outweigh the expected negative monetary consequences that result from providing inaccurate consulting services. For example, if the tax authority decides to audit more often, saving the (expected) penalty H becomes more valuable for the tax consultant. Furthermore, the expected deviation D increases in value if the taxpayer audits more often. This allows us to state the following

Proposition 2.2

a) *In a game between the tax consultant and the tax authority (i. e., keeping γ exogenous) the tax authority will* increase *its audit activity iff the deviation D and the penalty H* decrease, *iff the tax consultant's cost of accurate consulting C* increases, *and iff γ decreases.*

b) *In a game between the tax consultant and the taxpayer (i.e., keeping β exogenous) the taxpayer will* increase *their audit probability iff the deviation D and the penalty H* decrease, *iff the tax consultant's cost of accurate consulting C* increases, *and iff β decreases.*

Regarding the influence of the probability of overpayment, p, no clear results can be derived. The reason is that, on the one hand, increasing *p increases* the expected deviation incurred on the tax consultant. On the other hand, increasing *p decreases* the expected penalty. The overall effect depends upon the equilibrium values of β and γ.

Finally, consider the tax authority. Auditing or not auditing the taxpayer's tax return yields, respectively:

$$u_{TA}(\alpha, b_a, \gamma) = T - A_{TA} + (1 - \alpha)(pD + (1 - p)H), \tag{8}$$

$$u_{TA}(\alpha, b_{na}, \gamma) = T + (1 - \alpha)(pD - (1 - p)D). \tag{9}$$

If the tax authority decides to audit, it has to pay the audit costs A_{TA}. If the tax consultant provides inaccurate services, the tax authority receives D in the case of tax overpayment and H in the case of tax underpayment. If the tax authority does not audit and the tax consultant provides inaccurate services, it either receives or loses D, depending on the type of deviation. Overall, the tax authority's cost from auditing is A_{TA} whereas its expected benefit is given by the deviation and the penalty if the tax consultant is inaccurate and underreports. The indifference condition yields

$$A_{TA} = (1-\alpha)(1-p)(D+H). \tag{10}$$

The tax authority's auditing activity increases in value if either the deviation amount or the penalty increase, as well as if the probability for an underpayment increases. There is no (direct) strategic interaction between the tax authority and the taxpayer since any potential errors are paid by the tax consultant. This gives

Proposition 2.3 *The tax consultant* increases *his probability of accurate consulting iff the deviation D and the penalty H* increase, *iff the tax authority's cost of auditing* decreases, *and iff the probability for overreporting* decreases.

Note that, while propositions 2.1 and 2.2 are only valid when regarding the respective two-player games, proposition 2.3 also holds in equilibrium. The equilibrium is found by simultaneously solving the players' indifference conditions (4), (7), and (10).

Proposition 2.4 *A Nash-Equilibrium in mixed strategies is given by the players applying the following strategies:*

a) the tax consultant works accurately with probability

$$\alpha^\star = 1 - \frac{A_{TA}}{(1-p)(D+H)};$$

b) the tax authority audits with probability[17]

$$\beta^\star = \frac{(1-p)A_{TP}(D+H) - pA_{TA}D}{(1-p)A_{TP}A_{TA}} = \frac{D+H}{A_{TA}} - \frac{pD}{(1-p)A_{TP}};$$

[17] The equation might suggest that the tax authority could be induced to audit always by increasing H up to infinitum. However, under normal legal settings the fine will be subject to a maximal amount by the principle of proportionality.

c) the taxpayer audits with probability

$$\gamma^\star = \frac{H\left(pA_{TA}D - A_{TP}\left(1-p\right)\left(D+H\right)\right)}{pA_{TP}A_{TA}\vartheta D} + \frac{C}{pD}$$
$$= \frac{C - \left(\frac{D+H}{A_{TA}} - \frac{pD}{(1-p)A_{TP}}\right)\left(1-p\right)H}{p\vartheta D}.$$

Derivatives with respect to the tax authority's audit costs, the deviation amount, the fine, and the probability of underreporting provide us with the following results:

$$\frac{\partial \alpha^\star}{\partial A_{TA}} = -\frac{1}{\left(1-p\right)\left(D+H\right)} < 0, \tag{11}$$

$$\frac{\partial \alpha^\star}{\partial D} = \frac{\partial \alpha}{\partial H} = \frac{A_{TA}}{\left(1-p\right)^2\left(D+H\right)^2} > 0, \tag{12}$$

$$\frac{\partial \alpha^\star}{\partial p} = -\frac{A_{TA}}{\left(1-p\right)^2\left(D+H\right)^2} < 0. \tag{13}$$

The probability that the tax consultant will provide accurate services increases in direct relation to the following: an increase in deviation; an increase in the possible fine; an increase in the probability that the deviation will be negative; and a decrease of the tax authority's audit costs. This is because the tax consultant anticipates that the tax authority will increase its efforts to sanction inaccurate consulting services.

Consider the tax authority's audit probability given by part b) of Proposition 2.4. The first term measures what can be gained by a fiscal audit valued in terms of the audit costs. In other words: The higher the deviation amount and the potential fine (and therefore financial gain to the tax authority), and the lower the audit costs, the more likely it is that the tax authority will audit the tax return. Note that these incentives for β are not directly attributable to the tax authority. On the contrary, they enter into the calculus of the tax authority because they are the *tax consultant's* incentives. The second term shows the explicit compensation effect of the taxpayer's audit: The lower the costs and the higher the deviation when the tax payment is too high, the lower the tax authority's audit probability: This is because tax authority anticipates that the taxpayer will audit the tax return themselves. Comparative statics display the overall effects:

$$\frac{\partial \beta^\star}{\partial A_{TA}} = -\frac{D+H}{A_{TA}^2} < 0, \tag{14}$$

$$\frac{\partial \beta^\star}{\partial A_{TP}} = \frac{pD}{(1-p)\,A_{TP}^2} > 0, \tag{15}$$

$$\frac{\partial \beta^\star}{\partial p} = -\frac{D}{(1-p)^2\,A_{TP}} < 0, \tag{16}$$

$$\frac{\partial \beta^\star}{\partial H} = \frac{1}{A_{TA}} > 0, \tag{17}$$

$$\frac{\partial \beta^\star}{\partial D} = \frac{(1-p)\,A_{TP} - pA_{TA}}{(1-p)\,A_{TP}A_{TA}} < 0 \Longleftrightarrow p > \frac{A_{TP}}{A_{TP}+A_{TA}}. \tag{18}$$

Not surprisingly, the tax authority audits more often if its own audit costs decrease, and if the taxpayer's audit costs increase and if the probability of a negative deviation increases. It may come as some surprise, though, to see that the tax authority's audit probability increases if the potential fine *increases*. One might think that the threat of a fine to some extent would offset the need to audit with a high probability. Indeed, higher fines induce the tax consultant to work more accurately (see (12)) which then induces the tax authority to audit *more often* (which in turn is odd), as can be seen from proposition 2.1. This phenomenon arises from the fact that, in equilibrium, the taxpayer needs to be indifferent between auditing and not auditing: the increase in α needs to be balanced by a corresponding increase in β (see equation (4)). The derivative of $\beta^\star$ with respect to the deviation D is not distinct. If the probability for a tax overpayment is higher than the taxpayer's share in overall audit costs, the taxpayer audits less often after an increase in the absolute value of the deviation D.

Finally, comparative statics of the taxpayer's audit probability given by part c) of Proposition 2.4 are

$$\frac{\partial \gamma^\star}{\partial A_{TP}} = -\frac{H}{A_{TP}^2} < 0, \tag{19}$$

$$\frac{\partial \gamma^\star}{\partial A_{TA}} = \frac{H(1-p)(D+H)}{\vartheta p A_{TA}^2 D} > 0, \tag{20}$$

$$\frac{\partial \gamma^\star}{\partial C} = \frac{1}{\vartheta p D} > 0, \tag{21}$$

$$\frac{\partial \gamma^\star}{\partial H} = \frac{A_{TA} D p - A_{TP}(1-p)(D+2H)}{\vartheta p A_{TA} A_{TP} D} < 0 \iff \tag{22}$$

$$p < \frac{A_{TP}\,(D+2H)}{A_{TA} D + A_{TP}\,(D+2H)},$$

$$\frac{\partial \gamma^\star}{\partial p} = \frac{H(D+H) - A_{TA} C}{\vartheta p^2 A_{TA} D} > 0 \iff C < \frac{H(D+H)}{A_{TA}}. \tag{23}$$

The lower the taxpayer's own audit cost and the higher the tax authority's audit cost, the higher the taxpayer's audit probability. The reason is that the taxpayer reacts to the tax authority which in turn reacts to the taxpayer and to the tax consultant. Therefore, the effect of the fine is ambiguous: If the likelihood of tax underpayment exceeds a certain threshold, the taxpayer's audit probability rises as the fine decreases. In such circumstances, the taxpayer anticipates that the tax consultant has an incentive to work accurately. However, the taxpayer has to consider that the tax authority not only reacts to this effect but also that it takes into account the taxpayer's incentives on how to respond to the reaction of the tax consultant.

Table 2.2 provides a summary of the comparative statics results. Taken together, these results provide answers to our first research question. Essentially, the lower the probability that the tax authority and / or the taxpayer audit the consulting services carried out by the tax consultant, the higher the probability that the tax consultant will refrain from providing accurate consulting services, even though there may be high fines at stake. These results emphasize the need to pay attention to strategic interactions beyond cost benefit at an individual level: Effects arising from strategic interaction could render decision theoretic motivated incentives meaningless. Against this background, we will now focus

	$\alpha^\star$	$\beta^\star$	$\gamma^\star$
C			$+$
A_{TA}	$-$	$-$	$+$
A_{TP}		$+$	$-$
D	$+$	?	
H	$+$	$+$	?
p	$-$	$-$	?

Table 2.2: *Comparative statics.*

on answering our second research question, namely, which changes in the model setting could motivate tax consultants to increase their provision of accurate services.

3. Some Suggestions to Improve the Accuracy of Tax Consulting

In this section, we elaborate on two different alternatives to change the equilibrium obtained above. Due to the game-theoretical context, it is common to both alternatives that they do not focus on the direct incentives of the tax consultant: Instead, they focus on the incentives of the other parties involved, namely: taxpayer and tax authority. First, the probability of a tax underpayment could change due to exogenous market pressures induced by the taxpayers. Second, the incentives that influence the tax authority could change.

3.1. Market Solutions—the Effect of the Invisible Hand of Nature

As long as the legal status of the tax return is ambiguous, taxpayers may press tax consultants to reduce the tax payment as much as possible—even beyond the legal minimum, which, after all, is not known to the taxpayers without an audit being performed. Since tax consultants are subject to intense competition, consequently, they have to choose between either losing the client or assisting in tax evasion, thus bearing the risk of a fine. We model exogenous pressure by varying the probability $(1 - p)$ that a tax underpayment results. The difference between the outcomes of the basic model and its modified version is captured by

$$p' \equiv p - \Delta.$$

At the same time, it needs to be taken into account that tax evasion is punished by more severe fines than tax inaccuracy, that is, $H' > H$. The tax consultant's probability of providing accurate services is then given as

$$\alpha' = 1 - \frac{A_{TA}}{(1-(p-\Delta))(D+H')}. \tag{24}$$

The change in p shows that the tax consultant increases his probability of consulting accurately to outweigh the pressure of the taxpayer. The reason for the observed changes is that the tax consultant reacts to the tax authority. The tax authority takes into account that the probability of tax underpayment has now increased; this induces the tax authority in turn to increase its audit activities. Where the tax authority perceives and reacts to taxpayers putting pressure on tax consultants, this might avert the need to provide market regulation of tax consultants because the additional activities of the tax authority would reduce the incentives that would induce the tax consultant to provide inaccurate services. As a side-effect, the higher fine H' additionally increases consulting quality.

Under these assumptions, the audit probability of the tax authority is given by:

$$\begin{aligned} \beta' &= \frac{(1-(p-\Delta))A_{TP}(D+H') - (p-\Delta)A_{TA}D}{(1-(p-\Delta))A_{TP}A_{TA}} \\ &= \frac{(D+H')}{A_{TA}} - \frac{(p-\Delta)D}{(1-(p-\Delta))A_{TP}}, \end{aligned} \tag{25}$$

$$\frac{\partial \beta'}{\partial \Delta} = \frac{D}{A_{TP}(1-p+\Delta)^2} > 0. \tag{26}$$

Note, first, that Δ only enters into the second part of equation (25), namely, in the taxpayer's incentives. The tax authority raises its audit probability, because, naturally, the taxpayer will reduce their own audit activities as they influenced the deviations towards a direction in which auditing does not pay off for them and in which they do not need to audit because the tax authority does so. In other words, the taxpayer's active pushing of the tax consultant towards tax evasion not only pays off in terms of evasive tax savings, it also pays off in terms of redirecting audit effort to the tax authority.

Finally, the taxpayer's audit probability is given by

$$\gamma' = \frac{C}{(p-\Delta)\,\vartheta D} - \frac{\left(\frac{D+H'}{A_{TA}} - \frac{(p-\Delta)D}{(1-(p-\Delta))A_{TP}}\right)(1-(p-\Delta))\,H'}{(p-\Delta)\,\vartheta D}, \tag{27}$$

$$\frac{\partial\gamma'}{\partial\Delta} < 0 \Longleftrightarrow C > \frac{H'(D+H')}{A_{TA}}.$$

Increasing the probability of tax underpayment results in a decrease in the probability that the taxpayer will carry out their own audit. The reason is that the taxpayer anticipates that the tax consultant will anticipate an increase in the probability of having to pay a fine for tax evasion. As a result, the tax consultant will increase his focus on providing accurate consulting services and the tax authority will focus on auditing more often.

In the section above, we assumed that taxpayers exert pressure on tax consultants to raise the probability of tax *underpayment.* The reciprocal (likewise ethically questionable) behavior relating to the tax consultant consists in him (the tax consultant) seeking to increase the probability of tax *overpayment,* thus reducing the likelihood of having to pay the fine H. A modified model with $p' = p + \Delta$ predicts that tax consultants decrease their consulting effort, the tax authority audits less often and taxpayers audit more often.

3.2. Changing the Incentives that Motivate Taxpayers and the Tax Authority

An alternative to taking into account the—from the viewpoint of the model, exogenous—effect of the probability of tax overpayment consists of introducing real changes within the incentive structures. One possible solution that mitigates the tax consultant's incentives to provide inaccurate services could be to obligate the tax authority to correct *all* detected tax deviations—namely, also those deviations that otherwise would be beneficial to the tax authority. In addition, a fine $\widetilde{H}$ could be imposed upon the tax consultant if he works inaccurately, with this resulting in tax overpayment. The result of this change is that payoffs change in all combinations in which the tax consultant provides "inaccurate consulting" services that result in a tax overpayment. The new payoffs are given as

$$\begin{aligned}
\tilde{u}_{TC}(a_{ia}, b_a, c_a|\text{tax too high}) &= \tilde{u}_{TC}(a_{ia}, b_a, c_{na}|\text{tax too high}) = F - \widetilde{H} \\
\tilde{u}_{TA}(a_{ia}, b_a, c_a|\text{tax too high}) &= \tilde{u}_{TA}(a_{ia}, b_a, c_{na}|\text{tax too high}) \\
&= T - A_{TA} + \widetilde{H} \\
\tilde{u}_{TP}(a_{ia}, b_a, c_a|\text{tax too high}) &= -T - F - A_{TP} \\
\tilde{u}_{TP}(a_{ia}, b_a, c_{na}|\text{tax too high}) &= -T - F.
\end{aligned}$$

The new equilibrium probability for accurate consulting is given as

$$\tilde{\alpha} = 1 - \frac{A_{TA}}{(1-p)(D+H) - pD + p\widetilde{H}}. \tag{28}$$

The term $-pD$ that enters the denominator of equation (28) with a negative sign accounts for the tax overpayment that is now lost as a source of revenue for the tax authority. Not earning pD after an audit creates incentives for the tax authority to audit less often which in turn incentivizes the tax consultant to work accurately less often. However, this effect is outweighed by the term $p\widetilde{H}$ which enters the denominator with a positive sign, capturing the fact that the tax authority earns the revenue from a fine when it detects tax overpayment.

Obviously, $\tilde{\alpha} > \alpha^\star \iff p\widetilde{H} > pD$. As long as the fine to be paid when a tax overpayment is detected outweighs the positive tax deviation, tax consultants will work more often accurately. It should be noted that, now, increasing the tax deviation does not necessarily mean that the accuracy of tax consulting increases, as was the case in our basic model. Instead, $\frac{\partial \tilde{\alpha}}{\partial D} > 0 \iff p < \frac{1}{2}$. If the probability of tax overpayment is rather high, the tax authority must refrain from collecting the difference D (in contrast to the basic model) rather often. To ensure that the tax authority remains indifferent to whether it will audit or not audit, the tax consultant will then work more often inaccurately. However, if the probability of tax overpayment is low, the tax consultant will work more accurately.

The new audit probability of the tax authority is given by

$$\tilde{\beta} = \frac{A_{TP}}{A_{TA}} \frac{(1-p)(D+H) + (p\widetilde{H} - pD)}{(1-p)A_{TP} - pD} - \frac{pD}{(1-p)A_{TP} - pD}. \tag{29}$$

It can be shown that $\tilde{\beta} > \beta^{\star} \iff (1-p)A_{TP} > pD$.[18]

4. Summary

In the preceding sections, we examined the interplay between taxpayers, tax consultants and the tax authority. As a particularly noteworthy result of our basic model, we obtain that the audit probability of tax authority and taxpayers complement each other with respect to the effects of inaccurate consulting. When the incentive structure induces the taxpayer to reduce their controlling activities, the tax authority will enhance its audit probability, and vice versa. With respect to our first research question, these interplays reveal that it has to be taken into account how the incentives of the tax authority and the taxpayer account for the incentives that induce the tax consultant to provide accurate services. Addressing our second research question, we introduced two basic modifications in comparison to our basic model.

First, we find that an exogenous increase in tax evasion pressure on the tax consultant could induce him to work accurately more often. When the taxpayer forces the tax consultant into ethically questionable situations to reduce their tax burden beyond the legal minimum and the tax consultant as a result provides more accurate services, the tax authority enhances its audit probability. From a regulatory perspective, these rather surprising consequences make clear that one needs to carefully consider which pressures are exerted on tax consultants and which consequences they may entail before reforming the institutional setting surrounding tax legislation.

Second, if the tax authority was required to audit and punish also on behalf of the taxpayer, the (higher) fines received by the tax authority in situations of tax overpayment could introduce the necessary pressure on tax consultants to work more accurately.

Our model contains several interesting testable empirical implications. First, the basic model already suggests that audit activities of the tax authority ought to lower audit activities on behalf of taxpayers and vice versa. Second, the model suggests that exogenous market pressure on tax consultants to distort tax returns to the advantage of taxpayers will result in tax consultants increasing their efforts to work accurately. Finally, the model suggests that a comparison

[18] We do not elaborate on the modified taxpayer's probability $\tilde{\gamma}$ due to a lack of analytical tractability.

between tax consultants' accuracy in countries in which tax authorities maximize tax revenues and countries in which tax authorities detect and punish over- and under-payments will likewise reveal differences.

Several limitations have to be taken into account when interpreting our results. First, the simplification of a perfect tax consulting technology is empirically and theoretically questionable. Tax complexity seems to be too high to allow for a perfect technology. This is of importance, because it justifies the existence of tax consultants' insurances which could in turn influence the incentives of tax authority and taxpayer to scrutinize a tax consultant's work. Whoever abolishes tax insurances would have to find a different way to account for the incalculable uncertainty that would arise among consultants concerning their legal liabilities. In the light of such considerations, our model has to be restricted with respect to the area in which it is applicable. The modelled inaccuracies refer only to those types of tax complexity which can be tackled by further effort, but not to the remaining irreducible level of tax complexity which causes tax uncertainty. Second, there are size effects to be taken into account: Eichfelder (2011) has demonstrated that taxpayers of a considerable size possess a competitive edge over smaller taxpayers in coping with tax codes. Next, our model does not cover the fact that taxpayers are heterogeneous with respect to their income and, thus, that the tax authority could strategically vary its audit probability conditional on reported income. Then, the model does not include dynamic interactions. These could include, among other things, the building of reputation, quasi-rent effects faced by tax consultants, and processes of information asymmetry reduction experienced in the relationships between the three parties, when time elapses. These simplifications are justifiable in the light of the considerable complexity they would add to the analysis without changing the basic insights.

Finally, we want to highlight that there are epistemological limitations of game theory in general, which include the overly exact definitions of given situations in order to derive exact results as they have been highlighted, among others, by Shackle (1992). They are at odds with the reality that taxpayers, tax consultants and the tax authority face and instead simply epitomize some of the interactions that might occur.

Appendix

A. Choice of Contracting a Tax Consultant

Our model can be easily extended to a setting in which the taxpayer will only make use of a tax consultant's services if the advantages of doing so sufficiently compensate the consulting fee F. In such a setting, our results apply only to those taxpayers who employ tax consultants. The question is, then, whether or not taxpayers contract tax consultants. There are probably three main changes that occur when tax consultants are employed: (1) Without the use of a tax consultant, there is a different audit probability[19] $\hat{\beta} \neq \beta$, and, (2) the extent of deviations $\widehat{D}$ from the optimal legal tax payment (and consequently also the fine $\widehat{H}$) ought to be higher if no tax consultant is contracted. (3) Finally, the taxpayer has to invest time to prepare the tax return on their own which incurs preparation effort E. Note that the tax authority can observe whether or not the taxpayer contracted a tax consultant and can hence condition its strategy choice on this information. As a consequence, once the taxpayer decides to actually choose a tax consultant, all three players will play the game as described above. Rational taxpayers will employ a tax consultant if

$$\begin{aligned} u_{TP}\left(\alpha, \beta, c_a\right) = u_{TP}\left(\alpha, \beta, c_{na}\right) > I - T - \widehat{H}(1-p)\hat{\beta} \\ + (1-\hat{\beta})\widehat{D}(1-p) - p\widehat{D} - E \Longleftrightarrow \\ -F + (1-\alpha)\left[(1-p)(1-\beta)D - pD\right] > -\widehat{H}(1-p)\hat{\beta} \\ + (1-\hat{\beta})\widehat{D}(1-p) - p\widehat{D} - E. \end{aligned}$$

Starting with $\beta = \hat{\beta}$, tax consultants will be employed as long as the consulting fee F is lower than the liability H, the preparation effort E and the reduction in tax payment deviation as a result of the work performed by the tax consultant, each weighted with the respective probabilities.

It seems noteworthy that in the case of risk aversion, more tax consultants are contracted as (1) the consulting fee has the effect of an insurance against

[19] See, e. g., Beck et al. (1996). In the context of our model $\hat{\beta}$ would be a) zero, if the taxpayer always works inaccurately and the audit cost exceeds the expected negative tax deviation; b) one, if the taxpayer always works inaccurately and the audit cost is lower than the expected negative tax deviation; c) between zero and one if the taxpayer can choose to work accurately, resulting in a mixed-strategy equilibrium.

the liability $\widehat{H}$ and (2) $\widehat{D} > D$ and (3) $\widehat{H} > H$. All three aspects account for an increased variance in outcomes in cases of self-prepared tax returns. Furthermore, fewer consultants are contracted where values of D and $\widehat{D}$ are lower. This captures the fact that so long as tax codes are not complex, taxpayers can prepare their tax returns on their own. If tax complexity increases, however, taxpayers will rely to an increasing degree on professional assistance, since the number of errors committed by the taxpayer increases. Empirical evidence for this is provided by Long and Caudill (1987) and Christian et al. (1993). It must, however, be noted that a consistent extension of the model requires the validity of the assumption that the taxpayer can detect any inaccuracy in an audit carried out by a contracted tax consultant even though the tax consultant is precisely contracted because he is an expert in his area. This assumption, however, becomes quite reasonable when first taking into account that auditing a given piece of work always requires less time and effort than preparing this piece of work in the first place, and secondly taking into account that the taxpayer may have simply hired another tax consultant at a lower price to check the tax return.

Measuring the level of the taxpayer's lack of tax knowledge by the difference $\widehat{D} - D$ shows that taxpayers are more likely to contract a tax consultant the greater the difference in knowledge between them and the tax consultant. Similarly, increasing the taxpayer's self-preparation cost E increases the likelihood of the taxpayer employing a tax consultant. This captures the economies of scale resulting from labor specialization.

Finally, note that the choice of contracting a tax consultant could be endogenized if the tax consultant had control over the fee F. Then, rational tax consultants would set the fee such as to set the taxpayer (almost) indifferent between self-preparation and using a tax consultant. We do not elaborate on such an equilibrium fee, however, in order to focus on our research questions.

B. Assumptions on Parameter Relations

B.1. Presuppositions for Strategic Interaction

The strategic interactions which are assumed throughout this paper do not always apply. On the contrary, there are certain parameter constellations that induce rational players to choose certain strategies *independently from other* *player's decisions.* In our setting such constellations are obtained under the following assumptions.

From the viewpoint of the tax consultant, consulting accurately is dominated by consulting inaccurately when all possible payoffs arising from consulting inaccurately are at least as high as the payoffs from consulting accurately, while one payoff is higher. Such a constellation is given when the tax consultant's loss arising from the detection of inaccurate consulting service is equal to or lower than the cost for accurate consulting service, C:

$$u_{TC}(a_a, s_{TA}, s_{TP}) \leq u_{TC}(a_{ia}, s_{TA}, s_{TP}) \forall s_{TA} \in \mathcal{S}_{TA}, s_{TP} \in \mathcal{S}_{TP} \iff C \geq (1-p)H + p\vartheta D. \tag{30}$$

If (30) holds, independent of the other players' actions, a tax consultant will never provide accurate consulting services.

With respect to the tax authority, such a constellation is given when auditing is dominated. This result can be obtained when the worst outcome from not auditing is equal to or better than the best outcome from auditing:

$$u_{TA}(s_{TC}, b_a, s_{TP}) \leq u_{TA}(u_{TC}, b_{na}, s_{TP}) \forall s_{TC} \in \mathcal{S}_{TC}, s_{TP} \in \mathcal{S}_{TP} \iff A_{TA} \geq (1-p)(D+H). \tag{31}$$

Under such assumptions, again, the tax authority will never audit—irrespective of the strategies chosen by the other players. This relation presupposes, of course, that income maximization is the tax authority's only goal, while other potential objectives—e. g. deterrence—are not taken into account.

Finally, a last constellation delivers the premises under which the taxpayer will never audit, namely, when auditing is a dominated strategy:

$$u_{TP}(s_{TC}, s_{TA}, c_a) \leq u_{TP}(s_{TC}, s_{TA}, c_{na}) \forall s_{TC} \in \mathcal{S}_{TC}, s_{TA} \in \mathcal{S}_{TA} \iff A_{TP} \geq D. \tag{32}$$

Note, that the conditions are decreasingly restrictive: Inequality (30) will most probably never hold, as it is unrealistic to assume that the cost for accurate consulting exceeds possible fines—even if the taxpayer (almost) never audits and hence $\vartheta \to 0$. It is also very unlikely that (31) is fulfilled; this would imply that the sum of tax deviation and fine in case of tax underpayment is lower than the tax authority's audit cost. However, in some cases (32) might hold: The taxpayer's audit costs might be higher than the amount of tax deviation.

B.2. Presuppositions for Mixed Strategies

It goes without saying that the probabilities obtained in mixed strategies always need to be well defined. When the incentives result in probabilities which do not fulfill the requirements of a probability, this simply requires that pure strategies apply instead and that a Nash Equilibrium in mixed strategies does not exist.

In this section, we examine which parameter relations are required to obtain valid probabilities for $\alpha, \beta, \gamma \in (0,1)$. From the tax consultant's probability α we obtain limits for A_{TA}, D and H:

$$0 < 1 - \frac{A_{TA}}{(1-p)(D+H)} < 1 \iff$$
$$A_{TA} < (1-p)(D+H).$$

As α is derived from the tax authority's indifference condition, the relation can be interpreted as follows: Auditing must be beneficial for the tax authority; otherwise it would always be disadvantageous for the tax consultant to work accurately.

Limits for the relation between A_{TA}, A_{TP}, D and H can be obtained from the tax authority's audit probability β:

$$0 < \frac{D+H}{A_{TA}} - \frac{pD}{(1-p)A_{TP}} < 1.$$

Finally, the taxpayer's audit probability γ delivers:

$$0 < \frac{C}{p\vartheta D} - \underbrace{\left[\frac{(D+H)}{A_{TA}} - \frac{pD}{(1-p)A_{TP}}\right]}_{\beta} \frac{(1-p)H}{p\vartheta D} < 1.$$

In a first step, with respect to $\beta \to 0$, the term reduces to

$$0 < C < p\vartheta D.$$

The tax consultant's loss arising from an audit by the taxpayer after having worked inaccurately is to be less than the consultant's net costs for accurate consulting. Otherwise the taxpayer will always audit as long as the tax authority does not audit. Setting, then, $\beta \to 1$, we obtain

$$(1-p)H < C < p\vartheta D + (1-p)H.$$

The cost for accurate consulting must be higher than the loss from detected tax underpayment but lower than the result of the joint reaction of taxpayer and tax authority to the tax consultant's behavior. Otherwise the taxpayer will never audit as long as the tax authority audits.

B.3. Reputation Costs

In all events where the tax consultant is found to have worked inaccurately resulting in a tax overpayment we assume that he incurs a reputational loss R. However, if the taxpayer after an audit finds that the tax consultant worked accurately, this is associated with a reputational gain of R. If the taxpayer audits and finds a mistake which went undetected by the tax authority there is a reputational net effect of zero because the positive effect triggered by the tax underpayment is compensated by the negative effect of the tax consultant working inaccurately.

It turns out that introducing reputation costs does not change the tax consultant's probability of working accurately; the tax authority's audit probability remains unchanged as well. However, the taxpayer's equilibrium probability of auditing the tax return is then given by

$$\check{\gamma} = \frac{A_{TA}(A_{TP}C + pD(H+R)) - A_{TP}(1-p)(D+H)(H+R)}{A_{TA}A_{TP}\vartheta(R + p(D+R))}$$

The effect of introducing reputation costs is not distinct since the tax consultant benefits from a disclosure of his work in some cases while he suffers in other cases. We exclude reputation effects from the further analysis in order not to complicate the model. Another reason for this exclusion is that it is hard to quantify reputation effects.

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