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Do investors request advance tax rulings to alleviate tax risk (and do tax authorities provide them)? A joint taxpayers' and tax authorities' view on investment behavior

ABSTRACT: Tax uncertainty often negatively affects investment. Advance tax rulings (ATRs) are commonly used to provide tax certainty. We analyze ATRs from the taxpayers' and tax authorities' perspectives. Investors request ATRs if the fee does not exceed a certain threshold. We integrate this finding into the tax authorities' decision whether to offer ATRs. We find that ATRs are usually only offered if tax authorities are capable of significantly reducing their tax audit costs or increasing the detection probability. Otherwise, ATRs may be beneficial only if the tax authorities restrict them to classes of investments or use investment-specific fees. These results provide new explanations for why ATRs are currently not as intensively requested by taxpayers as expected against the background of high tax uncertainty. Moreover, the findings help to improve the design of ATRs.

JEL Classification: H21, H25, M41, M42, M48

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I. INTRODUCTION

Prior to making an investment decision, investors must forecast the prospective tax burden associated with the investment, as it can be a significant cost factor.[1] Often, investors face tax uncertainty in their tax planning activities. Because tax uncertainty may negatively affect investments, it may be beneficial for the taxpayer to request an advance tax ruling (ATR) to reduce this uncertainty. An ATR is a fiscal instrument that offers legal certainty on a specific tax issue associated with a future business activity, e.g., an investment. Thus, it helps estimate the fiscal consequences of a decision before it is taken. According to the Organization for Economic Co-operation and Development's (OECD) Comparative Information Series (OECD 2013, 282), which provides an overview of the tax administrations in OECD and selected non-OECD countries, ATRs are a popular and widely available instrument. Of the 34 OECD countries, 32 allow taxpayers to request an ATR. Colombia, India, and Russia are the only countries among the 18 non-OECD countries under review without this option. In 31 OECD countries and twelve non-OECD countries, the rulings are binding for the tax administrations. Non-binding rulings are offered in Japan, Brazil, Bulgaria, and Malta.

Investors will request an ATR if the fee for the ruling does not exceed a certain threshold. If tax authorities are cost-oriented and revenue maximizers, they will only offer a ruling if they can increase their overall revenues. We investigate the conditions under which tax authorities will offer ATRs if they correctly anticipate the investor's calculus.

Investment projects typically are not only uncertain in their future cashflows but are also characterized by high degrees of tax uncertainty. Prospective investment projects usually only

[1] For the impact of taxes on investment decisions see Scholes, Wolfson, Erickson, Maydew, and Shevlin (2008).

provide relatively weak tax facts. They often involve great tax uncertainty due to the difficulty in applying ambiguous tax laws and anticipating the consequences of a future tax audit (Mills, Robinson, and Sansing 2010; Lisowsky, Robinson, and Schmidt 2013).

Empirical studies provide evidence that a high level of tax uncertainty is associated with a high level of firm business activities. Here, unrecognized tax benefits (UTBs) that have to be reported according to Financial Accounting Standard Board (FASB Interpretation No. 48, Accounting for Uncertainty in Income Taxes) FIN 48 are often considered an appropriate indicator for uncertain tax positions. Using UTBs as a proxy for tax uncertainty, the study of Lisowsky et al. (2013) finds, among other results, that there is a significantly positive association between unrecognized tax benefits, e.g., R&D intensity and merger and acquisition activity.[2]

Other studies investigate the impact of tax uncertainty on welfare, compliance and investment behavior. For example, Alm (1988) and Bizer and Judd (1989) find that tax uncertainty has an ambiguous impact on economic welfare. Alm (1988) demonstrates that tax rate uncertainty particularly seems to decrease welfare. Furthermore, Alm, Jackson, and McKee (1992), Beck and Jung (1989) and Erard (1993), for example, find mixed results for the impact of tax uncertainty on tax compliance. E.g., Beck and Jung (1989) analytically demonstrate that greater tax liability uncertainty may either increase or decrease reported income. Furthermore, Edmiston (2004) provides empirical evidence for the negative impact tax uncertainty has on investments.

Among the studies that focus on the impact of tax uncertainty on investment decisions in a real option setting, Agliardi (2001) and Niemann (2011) identify ambiguous effects of tax uncertainty

[2] FIN 48 reserves are required when a firm is uncertain as to whether its tax positions may lead to an additional tax payment as a consequence of a future tax audit, settlement, or lawsuit because tax authorities do not agree to the tax benefits originally claimed. Unrecognized tax benefits (UTBs) must be reported in the financial statement notes and reflect a conditional liability due to tax benefits that are related to open tax positions according to FIN 48. See, e.g., Mills et al. (2010) and Lisowsky et al. (2013).

on investment decisions. Whereas both find that tax policy uncertainty delays investment, Niemann (2011) also shows that if tax uncertainty is small compared to cashflow uncertainty, and if both stochastic processes are positively correlated, increased tax uncertainty may also accelerate investment.

All three streams of literature obviously indicate that tax uncertainty affects investment behavior. Unfortunately, it is virtually impossible for taxpayers to estimate the tax burden of a future investment accurately. Even a detailed examination of the underlying legal norm cannot prevent a tax issue from being interpreted in different ways.

> *"Tax law ambiguity implies that even if you could claim to have committed to memory the entire Internal Revenue Code, you would be able to resolve only a small degree of ambiguity in how a tax return should be prepared. As technically detailed as the Tax Code may seem to be, it still contains rules that are far too general to indicate clearly how particular transactions are to be taxed."* (Scholes, Wolfson, Erickson, Maydew, and Shevlin 2008)

Therefore, given that investors typically strive to maximize their after-tax net cashflows, the uncertainty with respect to the assessment of the tax consequences of a prospective investment project may affect their investment decisions. In particular, taxpayers may refrain from investments if the tax treatment is likely to make the investment project unprofitable. As a consequence, if taxpayers carry out fewer investment projects compared to a certain tax environment, the tax authorities may suffer from an overall tax revenue decrease. This might be true for local investors. However, a highly uncertain tax environment may also deteriorate the quality of countries as an investment location for multinational investors.

Many tax authorities charge a fee when offering ATR-certainty to taxpayers. According to the OECD's Comparative Information Series, 13 (of 34) OECD and four (of 18) non-OECD countries charge a fee for providing ATRs (OECD 2013, 282).

Against this background we use a cashflow and revenue maximizing calculus to analyze whether and under what circumstances tax authorities that anticipate the investors' decision calculus benefit from offering ATRs. We determine the maximal fee that taxpayers are willing to pay for legal certainty and find so far unknown effects. Based on this maximal fee, we identify the crucial factors that drive the decision by tax authorities whether to offer ATRs. We find that tax authorities only benefit from ATRs if they are able to reduce tax audit costs or increase detection probabilities as a consequence of ATRs, whenever only a proportion of taxpayers are allowed to request such rulings, or when the ATR fee is a function of the after-tax net cashflow from the underlying investment.

Our results provide new explanations for why ATRs are not as intensively requested by taxpayers as expected against a background of high tax uncertainty and for how to improve the design of these rulings for the benefit of tax authorities.

The remainder of the paper is organized as follows. In the next section, we review the prior literature. In section III, we introduce our model and analyze the taxpayer's investment decision. In section IV, we integrate the tax authorities' perspective. Based on the results of the previous section, we determine the optimal fee that the tax authority should charge for ATRs for various settings and identify beneficial ATR designs. Finally, we summarize and draw conclusions in section V.

II. PRIOR LITERATURE

While there are several jurisprudential contributions regarding the legal conception and practical issues of ATRs, few contributions examine the economic reasoning behind such rulings. One such contribution is Givati (2009). By analyzing taxpayers' strategic considerations regarding whether to request an ATR, the author explains the infrequent use of such rulings in the US. The author shows that the strategic disadvantages of requesting ATRs (e.g., increased inspection, detection and expertise of tax examiners) outweigh the benefits (e.g., avoidance of penalties).

De Simone, Sansing, and Seidman (2013) study the attractiveness of "enhanced relationship tax compliance programs", in which taxpayers may disclose significant uncertain tax positions to the tax authority prior to filing a tax return. Simultaneously, the tax authority provides a timely resolution of these positions and does not challenge the position within the review of a filed tax return. Using a game theoretic framework, the authors identify settings in which these programs are mutually beneficial to taxpayers and tax authorities due to lower combined government audit and taxpayer compliance costs.

We contribute to this stream of literature by analyzing the advantageousness of ATRs from both the taxpayer's and tax authority's perspectives. Whereas "enhanced relationship tax compliance programs" address the resolution of uncertain tax positions, ATRs are an instrument that provides legal certainty to the taxpayer before the underlying business decisions are made. Therefore, in contrast to De Simone et al. (2013), we analyze the costs and benefits of the uncertainty shield generated by ATRs in a taxpayer's investment decision-making process. Based on a taxpayer's maximal fee, we identify the crucial factors that drive the decision of tax authorities to offer ATRs. In doing so we are able to identify those scenarios in which offering

ATRs is beneficial for tax authorities that anticipate a taxpayer's behavior. In particular and in contrast to De Simone et al. (2013), we derive fee design options that may lead to a greater supply and demand of ATRs.

In contrast to our study on ATRs, Beck and Lisowsky (2014) find that firms with moderate-sized FIN 48 reserves and moderate tax uncertainty exposure are more likely to participate in the "Compliance Assurance Process" audit program offered on a voluntary basis by the Internal Revenue Service. While they focus on compliance behavior, we are interested in the effect of an upfront tax uncertainty shield on investments. We also contribute to the literature that investigates the effects of additional information on tax compliance. Sansing (1993) investigates tax authorities' information acquisition that helps to improve audit decisions in a tax compliance game. Among other findings, he shows that such information acquisition often is likely to have no effect on the expected level of the tax authorities' revenues. Moreover, using a game-theoretic approach, Beck, Davis, and Jung (2000) investigate the effects of a penalty exemption for taxpayers who voluntarily disclose questionable positions to the government. They find that information disclosure may positively or negatively impact collection costs and tax revenues and that the penalty exemption often is not an effective tool to increase revenues. The results of both studies are in line with our finding that the tax authorities often are likely not to be better off when offering a tax uncertainty shield to taxpayers. Nevertheless, Sansing *(*1993) and Beck et al. (2000) do not provide insight into the taxpayers' possibility to eliminate tax uncertainty prior to the investment. Rather, they investigate the possibility of tax authorities' acquiring information to improve audit decisions and a voluntarily disclosure of uncertain positions, as well a compliance decision. Additionally, Mills et al. (2010) choose a game-theoretic approach to investigate the effects of FIN 48 on the strategic interaction between publicly traded corporate taxpayers and the government. They find that taxpayers, who are mandatorily required to disclose liabilities for uncertain tax benefits in their financial statements, are not necessarily harmed by FIN 48. Furthermore, they show that such liabilities can be overstated or understated relative to the expected cash payments. As is common in the tax compliance and tax aggressiveness literature, Mills et al. (2010) consider a post-investment mandatory disclosure of uncertain tax benefits, whereas we investigate an instrument that enables taxpayers to eliminate tax uncertainty before an investment decision is made. Nevertheless, in support of their findings, we also identify the ambiguous effects of information provided by the taxpayer in the ATR process. Reducing tax uncertainty and simultaneously increasing information do not necessarily seem to be beneficial for the parties involved.

Therefore, our paper also extends the existing literature on the demand for (tax) information or advice. Similar to our investigation of ATRs, Shavell (1988) studies contemplated acts and finds (in a non-tax context) that individuals engage in a contemplated act if the benefits outweigh the expected sanctions. They seek legal advice if the expected value of advice, which is determined by the probability that the individual's decision of committing the act may change, multiplied by the benefit of committing the act, exceeds the cost. Beck and Jung (1989) show that the demand for tax advice in order to reduce tax uncertainty depends on the audit probability, the penalty rate and the tax rate. Furthermore, Beck, Davis, and Jung (1996) find that taxpayers who face the highest degree of uncertainty acquire information by tax advisers more frequently. Frischmann and Frees (1999) empirically demonstrate that taxpayers purchase tax advice to save time and protect against uncertainty. In line with these studies, we also find high willingness to pay for information (ATR) for high volatility of after-tax return.

All of these studies indicate that gathering information from experts about uncertain tax issues leads, similar to requesting ATRs, to reduced legal uncertainty. Against this background, our study is intended to highlight whether and under what conditions ATR demand and supply will meet and therefore whether ATRs help to improve the investment environment.

III. INVESTOR´S CALCULUS

As a first step, we abstract from the tax authority's calculus. We focus on a taxpayer who has to decide whether to carry out an investment project. The decision is complex. There is uncertainty about the tax issues related to the investment. The taxpayer, who is the investor, cannot anticipate the eventual tax consequences of the project. He or she has the opportunity to request an ATR to achieve certainty. However, the ruling is not free of charge. The fee may outweigh the benefit of the intended investment. To examine this situation more closely, we use a binomial model.

Concretely, the investment is characterized by an initial outlay I and the cashflow CF. Both occur in period t. The return on investment is subject to tax at rate τ. The investor faces a simple cashflow tax, which in our one-period setting is equivalent to a profit tax with an immediate write-off. Consequently, the tax base is equal to the pre-tax net cashflow. Against this background, the intended investment earns an after-tax net cashflow, denoted by C, as long as the tax consequences are interpreted by the tax authority in line with the taxpayer's expectation. By contrast, if the tax authority interprets the consequences of the project differently, the project's pre-audit after-tax net cashflow C, called pre-audit net cashflow in the following, will be reduced by Δ to the post-audit after-tax net cashflow $\widetilde{C^{\Delta}}$, called post-audit net cashflow. By assumption, we exclude interpretations by the tax authority that are more favorable for the taxpayer than the anticipated tax outcome. Thus, Δ describes the (negative) impact of the different fiscal treatment on the after-tax net cashflow. If, for example, the tax authority does not allow the (supposed) immediate deduction of (part of) the investment's acquisition cost as operating expenses, the investor's tax base and, in turn, his or her tax burden increases. The project's pre-audit net cashflow C is reduced by a potentially higher tax burden ($\widetilde{\Delta}$) such that we obtain $\widetilde{C^{\Delta}} = C - \tilde{\Delta}$, where $\widetilde{\Delta}$ is a binary random variable with $\tilde{\Delta} \in \{0; \Delta\}$.[3]

If the tax authority accepts the favorable interpretation of the tax consequences, $\widetilde{\Delta}$ collapses to zero. The parameter Δ can also be seen as the value of the tax disadvantage. Thus, we assume that the underlying investment is not risky on a pre-tax basis, but only as a consequence of tax discretion. We abstract from pre-tax cashflow uncertainty in the following to be able to isolate tax uncertainty effects. In the following, for reasons of simplicity, Δ denotes a tax disadvantage with $\Delta > 0$.

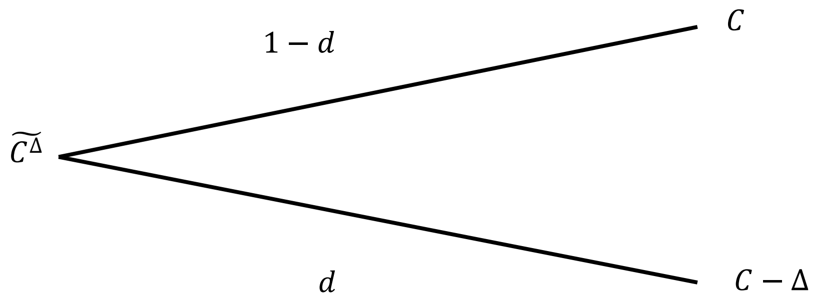
The probability that the tax authority interprets the situation to the disadvantage of the taxpayer is d, with $0 \leq d \leq 1$, whereas an interpretation in line with the taxpayer's guess occurs with probability $1 - d$; therefore,

$$\widetilde{\Delta} = \begin{cases} \Delta & \text{with probability } d \\ 0 & \text{with probability } 1 - d. \end{cases}$$

Figure *1* illustrates the random variable $\widetilde{C^{\Delta}}$:

[3] Similar to Mills et al. (2010), 1726, who also give an example for the discrete nature of tax disputes.

Figure 1: Random variable $\widetilde{\boldsymbol{C}^{\Delta}}$



The taxpayer is risk neutral (see, e.g., Beck et al. 2000, 247); that is, he or she strives for the maximal expected post-audit net cashflow of his or her investment $\mathrm{E}\left[\widetilde{C^{\Delta}}\right]$ and will therefore realize the project only if its expected post-audit net cashflow is positive. Therefore, without considering an ATR, the objective function ϕ of the taxpayer is given by

$$\phi = Max\left\{\mathrm{E}\left[\widetilde{C^{\Delta}}\right]; 0\right\} \tag{1}$$

with

$$\mathrm{E}\left[\widetilde{C^{\Delta}}\right] = (1-d)C + d(C - \mathit{\Delta}) = C - d\mathit{\Delta}.$$

Then, we obtain

$$\phi = Max\{C - d\mathit{\Delta}; 0\} = \begin{cases} C - d\mathit{\Delta} & \text{for } C > d\mathit{\Delta} \\ 0 & \text{otherwise.} \end{cases} \tag{2}$$

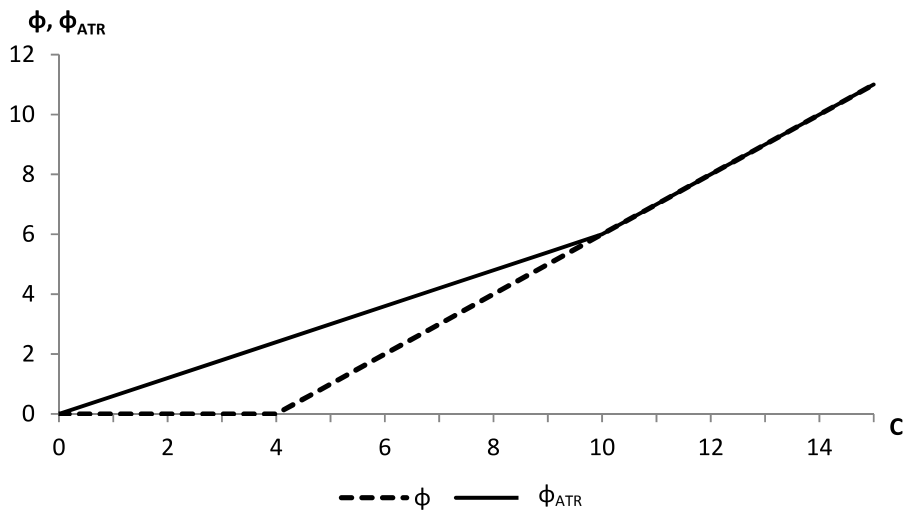
In line with the maximum calculus, the investor carries out the investment as long as $C > d\Delta$ (first case of eq. (2)). He or she will refrain from investment if the expected value of the post-audit net cashflow from the investment is not positive, that is, if $C \leq d\Delta$ (second case of eq. (2)). As tax damages are usually a function of gross values, such as operating expenses or accruals (e.g., depreciation allowances), we assume that the tax damage $\mathit{\Delta}$ is independent of C.[4]

[4] While C results from offsetting taxable earnings against tax deductible expenses and accruals, tax disputes typically focus on operating expenses or accruals (e.g., depreciation allowances). Such that, e.g., for $C = 0$ a huge tax damage may arise. Obviously, $\mathit{\Delta}$ is usually not a function of C.

To reduce uncertainty, the taxpayer may request an ATR before the decision on the investment is made. The tax ruling can either confirm the anticipated tax burden or induce a higher tax burden. If the ruling turns out to be disadvantageous for the investor, he or she will be able to refrain from the planned investment. The investor will not carry out the investment if it generates a negative post-tax audit net cashflow. In the decision-making process, the investor anticipates both a favorable and an unfavorable outcome of the ATR. Thus, he or she accounts for an unattractive tax treatment and the possibility that the investment will not be carried out. Assuming the investor requests an ATR,[5] the objective function ϕ of the taxpayer (eq. (2)) turns to ϕ_{ATR} with

$$\phi_{ATR} = (1-d)C + d * Max\{(C - \Delta); 0\} \tag{3}$$
$$= \begin{cases} C - d\Delta & \text{for } C > \Delta \\ (1-d)C & \text{otherwise.} \end{cases}$$

Figure 2: Objective functions with (ϕ_{ATR}) and without an ATR (ϕ) depending on the pre-audit net cashflow C



[5] Implicitly we assume that the probability of a negative outcome of the advance tax ruling is the same as the probability of a negative interpretation of the tax code in a setting without advance tax rulings.

Figure *2* depicts the objective functions with and without an ATR depending on the pre-audit net cashflow C for $d := 0.4$ and $\Delta := 10$.

The graphs illustrate that the option to apply for an ATR becomes attractive when the post-audit net cashflow $\widetilde{C^{\Delta}}$ becomes negative ($C \leq \Delta$, here: $C \leq 10$) because of the tax authorities' divergent interpretation of the fiscal consequences.

Thus far, we have abstracted from an ATR fee. However, if the taxpayer has to pay a fee $\bar{F}$ for the ATR, he or she has to include this fee in their calculus. Equating the objective functions with and without an ATR allows us to determine the maximal fee F^{max} the taxpayer is willing to pay. We obtain

$$\phi_{ATR} - F^{max} = \phi. \tag{4}$$

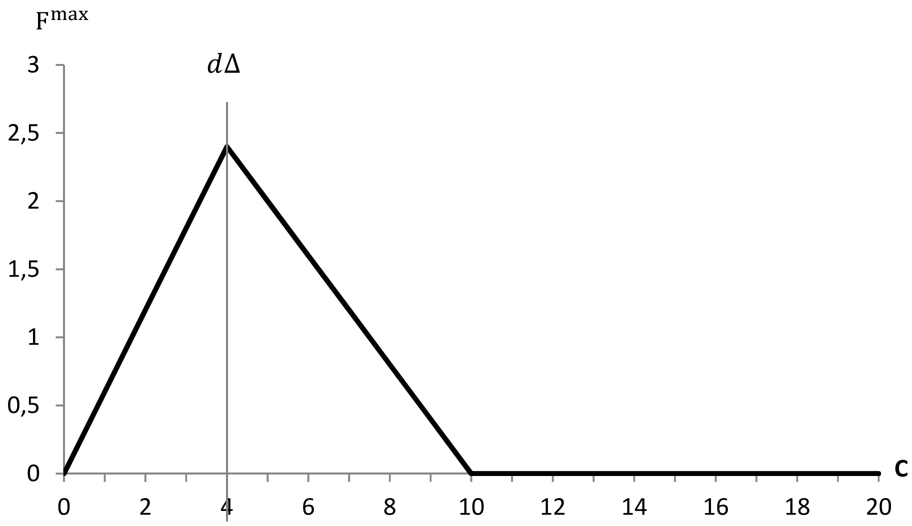
Solving the equation for the maximal fee F^{max} leads to

$$F^{max} = C - dC + d * Max\{(C - \Delta); 0\} - Max\{(C - d\Delta); 0\} \tag{5}$$

$$= \begin{cases} C(1-d) & \text{for } d\Delta \geq C \\ d(\Delta - C) & \text{for } \Delta \geq C > d\Delta \\ 0 & \text{otherwise.} \end{cases}$$

Figure *3* depicts the fee F^{max} as a function of the pre-audit net cashflow C for $\Delta := 10$ and $d := 0.4$.

Figure 3: Maximal fee $\boldsymbol{F^{max}}$ for an ATR as a function of the pre-audit net cashflow $\boldsymbol{C}$



To interpret the results and to examine whether the investor is willing to pay for an ATR, we distinguish between two scenarios. In the first scenario, the pre-audit net cashflow C exceeds the value of the impact of a different fiscal treatment Δ (third case in eq. (5)), while in the second scenario, C equals or is less than Δ (first and second case in eq. (5)).

If $C > \Delta$, the authority's divergent interpretation of the tax consequences leads to a reduction in the expected post-audit net cashflow $\mathrm{E}\left[\widetilde{C^{\Delta}}\right]$, but in both states, the investment is still worth being carried out upfront. Irrespective of the interpretation, this investment will be carried out because in both states, it provides a positive post-audit net cashflow. Therefore, the ATR is not decision-relevant and hence does not offer a benefit.

An example of a non-decision-relevant ATR would be the decision to invest in a factory without knowing whether the taxpayer will be allowed to use linear or declining-balance depreciation. Given that the investment is favorable irrespective of the depreciation pattern to be applied, even if one of these depreciation options is more worthwhile for the taxpayer than the other, the taxpayer will not be willing to pay for legal certainty on the depreciation pattern. Here, an ATR would not offer decision-relevant certainty.

By contrast, the option to apply for an ATR becomes decision relevant if $\widetilde{C^{\Delta}}$ becomes negative ($C \leq \Delta$) as a consequence of the tax authorities' divergent interpretation of the fiscal consequences. Then, the ATR serves as an effective shield against a possible tax damage. When we determine the maximal payable fee, we again distinguish between two cases. In the first case, the pre-audit net cashflow C ranges between Δ and $d\Delta$, that is, $d\Delta < C \leq \Delta$, while in the second case, C equals or is less than $d\Delta$, i.e., $C \leq d\Delta$. Here, $d\Delta$ can be interpreted as a threshold that indicates whether the investor would realize the investment in the "laissez faire" case (i.e., without an ATR).

We first consider the case $C \leq d\Delta$ (first case of eq. (5)), where the taxpayer will abandon the investment project without an ATR. He or she therefore will be willing to pay a fee up to the opportunity costs $F^{max} = C(1-d)$. Considering the second case with $d\Delta < C \leq \Delta$ (second case of eq. (5)), the maximal fee corresponds to the disadvantage that the taxpayer suffers due to the negative post-audit net cashflow caused by the divergent interpretation of the tax consequences weighted against the probability of the negative interpretation. The maximal fee is $F^{max} = d(\Delta - C)$. Thus, the fee accounts for the expected loss that the taxpayer would experience from the investment if the tax authority were to interpret the tax issue disadvantageously.

The maximum of the function F^{max}, that is, the highest fee a taxpayer is willing to pay for a given investment, is depicted by the peak of the triangle in Figure *3*. This maximum, $Max[F^{max}]$, is determined by $C = d\Delta$ and amounts to

$$Max[F^{max}] = (1-d)d\Delta.$$

If we compare this maximum with the variance of the post-audit net cashflow, from the investment given by

$$Var(\widetilde{C^{\Delta}}) = (1-d)\big(C-(C-d\Delta)\big)^2 + d\big((C-\Delta)-(C-d\Delta)\big)^2 = (1-d)d\Delta^2$$

it is obvious that both expressions are very similar. Both the variance and the maximum of the maximal fee are functions of d. Both have their maximum exactly at $d = 0.5$. A high (tax-) uncertainty, that is, the variance, induces a high willingness to pay for an ATR and therefore—for a given fee—also a high demand for rulings. In this context, the degree of ambiguity in a tax issue is reflected in the variance.[6] The variance is at its maximum for $d = 0.5$; that is, the investor has no clue how the tax issue is being interpreted by the tax authorities. If the uncertain interpretation is more likely to be interpreted favorably or unfavorably, that is, $d \neq 0.5$, the variance (ambiguity) decreases, as does the willingness to pay.

Focusing on the taxpayers' perspective, we have seen that investors who apply for legal certainty regarding the tax consequences of an investment project are willing to pay a positive maximal fee for the ruling only in the case of small pre-audit net cashflows. The intuitive economic interpretation of this result is that, for high pre-audit net cashflows (compared to Δ), the taxpayer is not willing to pay for legal certainty regarding the tax consequences, as he or she will carry out the investment anyway.

IV. TAX AUTHORITIES´ CALCULUS

We extend our model with respect to the tax authority's perspective. We aim to determine the optimal fee that tax authorities should demand for ATRs, taking into account the investor's

6 This tax ambiguity can be operationalized by FIN 48 reserves. Cf., e.g., Lisowsky et al. (2013).

calculus. We assume that the tax authority wants to maximize total revenue, which is the sum of expected taxes and the expected revenues from the fee net of costs (see, e.g., Graetz, Reinganum, and Wilde 1986; Reinganum and Wilde 1986; Beck and Jung 1989; Sansing 1993; Rhoades 1999). First, we determine the ex-ante optimal fee for the standard model, which abstracts from complications, such as tax audit cost effects and selective ATR patterns that will be examined in the subsequent sections.

Optimal Fee in the Standard Model

In this subsection, we assume that the pre-audit net cashflows C from decision-relevant investments, that is, investments with $C < \mathit{\Delta}$, in a country are distributed uniformly in the interval $[0, \Delta]$. Therefore, the probability density function for C is given by

$$g(C) = \begin{cases} \frac{1}{\Delta} & \text{for } 0 < C < \Delta \\ 0 & \text{otherwise.} \end{cases}$$

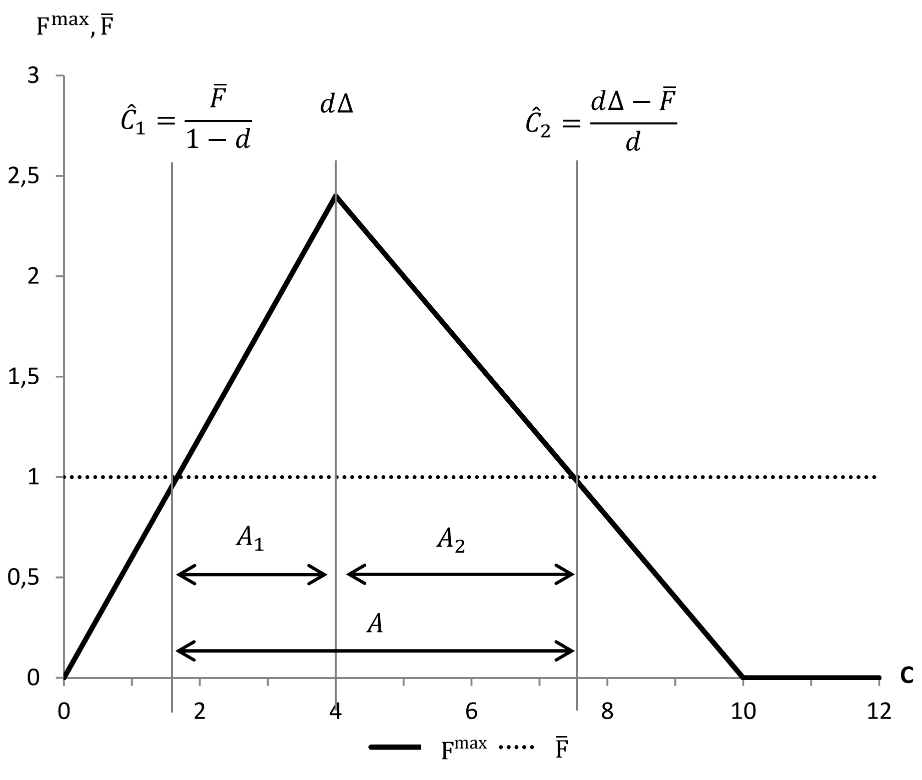
We do not need to consider cases with ATR decision irrelevance, as outlined in the previous section. This is in line with Mills et al. (2010).

We assume that the sequence of events is as follows. First, the tax authority determines the fee $\bar{F}$. Based on this fee, the taxpayers decide whether to request an ATR. Finally, the taxpayers make their investment decision and taxes have to be paid. Against this background, we can determine the equilibrium fee by backward induction, taking into account the previously derived taxpayers' decision.

The taxpayers will request an ATR if their benefit from gaining legal certainty exceeds the actual fee for an ATR. From eq. (5) (see also Figure *4*), we obtain two threshold values, $\hat{C}_1$ and $\hat{C}_2$, that are determined by the fee $\bar{F}$. The taxpayer requests the ATR if C is in the interval described by $\hat{C}_1$ and $\hat{C}_2$. The following tradeoff arises. The lower the fee $\bar{F}$, the more taxpayers demand ATRs. The revenue effect of a lower fee is ambiguous. On the one hand, revenues may increase as taxpayers carry out investment projects, which without the ruling, would not have been profitable in expected value terms. On the other hand, a lower fee may also reduce the fee revenues and, furthermore, decrease tax revenues due to projects that will not be carried out due to an unfavorable ruling.

In Figure *4*, we compare the maximal fee F^{max} and the tax authority's fee $\bar{F}$ depending on the pre-audit net cashflow C for $\Delta := 10,\ d := 0.4$ and $\bar{F} := 1$.

Figure 4: Comparison of the maximal fee $\boldsymbol{F^{max}}$ and the tax authority's fee $\boldsymbol{\bar{F}}$ for an ATR depending on the pre-audit net cashflow $\boldsymbol{C}$



To formally describe the tradeoff more precisely, we distinguish between three different effects (see Figure *4*).

First, area A described by the interval $\left[\frac{\bar{F}}{1-d};\frac{d\Delta-\bar{F}}{d}\right)$ captures investment projects for which ATRs are requested given a fee of $\bar{F}$. Outside the area A, taxpayers are not willing to request ATRs because $\bar{F} > F^{max}$. Considering the probability density function $g(C)$ in the interval, the tax authority receives expected fee-revenues $\mathrm{E}[\tilde{R}_A^F]$ of

$$\mathrm{E}[\tilde{R}_A^F] = \frac{1}{\Delta} * \bar{F} * \left(\frac{d\Delta - \bar{F}}{d} - \frac{\bar{F}}{1-d}\right). \tag{6}$$

Second, area A_1 described by the interval $\left[\frac{\bar{F}}{1-d}; d\Delta\right)$ includes those investment projects that would not have been realized without a request of an ATR. In the absence of the ATR, the taxpayer would not have carried out the investment project because, as long as the tax consequences are uncertain, the expected post-audit net cashflow is negative. The investment is only made in the case of a positive outcome of the ruling, that is, with probability of $(1-d)$. Therefore, compared to the case in which a request for an ATR is not possible, the tax authority generates higher expected tax revenues $\mathrm{E}\left[\tilde{R}_{A_1}^T\right]$ with the probability of $(1-d)$ for all investment projects in area A_1. As the net cashflow C is an after-tax value, we transform it to obtain the pre-tax net cashflow by dividing by $(1-\tau)$. Then, the tax rate τ is applied to this tax base. The expected additional tax revenues $\mathrm{E}\left[\tilde{R}_{A_1}^T\right]$ due to the ATR in region A_1 are

$$\mathrm{E}\left[\tilde{R}_{A_1}^T\right] = \frac{1}{\Delta} * \left(d\Delta - \frac{\bar{F}}{1-d}\right) * (1-d) * \frac{1}{2}\left(\frac{\bar{F}}{1-d} + \mathrm{d}\Delta\right) * \frac{\tau}{1-\tau}. \tag{7}$$

Third, in area A_2 described by the interval $\left[d\Delta; \frac{d\Delta-\bar{F}}{d}\right)$, taxpayers realize their investment projects even if no ATR is requested. However, when requesting an ATR, taxpayers only realize the investment project in the case of a positive outcome of the tax consequences. Thus, compared to the situation in which no ATR is requested, the tax authority loses tax revenues (including Δ) with the probability d. Hence, the expected lost tax revenues $\mathrm{E}\left[\tilde{R}_{A_2}^T\right]$ are

$$\mathrm{E}\left[\tilde{R}_{A_2}^T\right] = -\frac{1}{\Delta} * \left(\frac{d\Delta - \bar{F}}{d} - d\Delta\right) * d * \left(\frac{1}{2}\left(\frac{d\Delta - \bar{F}}{d} + \mathrm{d}\Delta\right) * \frac{\tau}{1-\tau} + \Delta\right). \tag{8}$$

Summing up all three effects leads to the overall effect $\mathrm{E}[\tilde{R}]$ with

$$\mathrm{E}[\tilde{R}] = \mathrm{E}[\tilde{R}_A^F] + \mathrm{E}\left[\tilde{R}_{A_1}^T\right] + \mathrm{E}\left[\tilde{R}_{A_2}^T\right] = \frac{(\tau-2)(\bar{F} + (d-1)d\Delta)^2}{2\Delta(d-1)d(\tau-1)}, \tag{9}$$

and differentiating $\mathrm{E}[\tilde{R}]$ with respect to the fee $\bar{F}$, we get the first order condition for the optimal fee:

$$\frac{\partial \mathrm{E}[\tilde{R}]}{\partial \bar{F}} = \frac{(\tau-2)(\bar{F} + (d-1)d\Delta)}{(d-1)d\Delta(\tau-1)} = 0. \tag{10}$$

Solving for $\bar{F}$, we receive the optimal fee $\bar{F}^*$:

$$\bar{F}^* = (1-d)d\Delta. \tag{11}$$

The optimal fee corresponds to the maximal willingness to pay.[7] Thus, it becomes obvious that tax authorities de facto choose a fee that is higher than taxpayers' willingness to pay for an ATR. Only a taxpayer who earns exactly a pre-audit net cashflow of $C = d\Delta$ would be indifferent to choosing an ATR and not doing so.

Theorem 1: *Assume that the pre-audit net cashflows are distributed uniformly in the interval* $[0, \Delta]$. *Then, the optimal fee for an advance tax ruling is given by*

[7] Cf. Figure *3*.

$$\bar{F}^{*} = (1-d)d\Delta.$$

When tax authorities offer advance tax rulings at this optimal fee, only taxpayers whose investment projects earn exactly a pre-audit net cashflow of $C = d\Delta$ *are willing to request an advance tax ruling. Thus, the number of taxpayers that are likely to request an advance tax ruling is marginal. Note that these taxpayers will only be indifferent towards the ruling and would not be able to increase their return in the expected post-audit net cashflow terms via an advance tax ruling.*

Two effects are crucial to why tax authorities are not able to take advantage of offering ATRs in the standard model, i.e., the so-called *real investment-revenue effect* and the so-called *advance tax ruling-revenue effect (ATR-revenue effect)*. To study these effects in detail, we first determine the lengths of the areas A, A_1 and A_2.

$$Length\ A = \left(\frac{d\Delta - \bar{F}}{d} - \frac{\bar{F}}{1-d}\right) = \frac{d\Delta(1-d) - \bar{F}}{d(1-d)}. \tag{12}$$

$$Length\ A_1 = \left(d\Delta - \frac{\bar{F}}{1-d}\right) = \frac{d\Delta(1-d) - \bar{F}}{1-d}. \tag{13}$$

$$Length\ A_2 = \left(\frac{d\Delta - \bar{F}}{d} - d\Delta\right) = \frac{d\Delta(1-d) - \bar{F}}{d}. \tag{14}$$

The complexity of these effects (*real investment-revenue effect, ATR-revenue effect)* requires further elaboration. This analysis will provide further insights into the economic mechanism and support the underlying intuition.

Real Investment-Revenue Effect

The real investment-revenue effect refers to the tax associated with the pre-audit net cashflows $\frac{\tau}{1-\tau} * C$. If the tax authority offers ATRs, it earns additional revenues in area A_1 from those investment projects that are realized with the probability $(1-d)$. However, in area $A_{2,}$ the tax authority loses revenues with the probability d from those investment projects that the taxpayer would have realized based on the expected post-audit net cashflows $\mathrm{E}\big[\widetilde{C^{\Delta}}\big]$, but not in the case of a negative outcome of such a ruling. The probability p_{A_1} for the pre-audit net cashflows being additionally invested in area A_1 is

$$p_{A_1} = (1-d) * \frac{1}{\mathit{\Delta}} * \frac{d\Delta(1-d) - \bar{F}}{1-d} = \frac{d\Delta(1-d) - \bar{F}}{\mathit{\Delta}}, \tag{15}$$

and the probability p_{A_2} for the pre-audit net cashflows that are not realized anymore in area A_2 is

$$p_{A_2} = d * \frac{1}{\mathit{\Delta}} * \frac{d\Delta(1-d) - \bar{F}}{d} = \frac{d\Delta(1-d) - \bar{F}}{\mathit{\Delta}}. \tag{16}$$

When considering the probabilities in both areas, it becomes clear that the tax authority loses as many investment projects in area A_2 as it gains in area A_1. Nevertheless, these effects do not balance each other because the after-tax net cashflows from the additional investment projects in area A_1 are smaller than the lost after-tax net cashflows in area A_2, as are the expected tax revenues. The following theorem summarizes the result.

Theorem 1a: *Assume that the pre-audit net cashflows are distributed uniformly in the interval* $[0, \mathit{\Delta}]$. *Then, tax revenues associated with the pre-audit cashflow* C *decrease when tax authorities offer advance tax rulings because expected revenues from additionally realized investment projects are smaller than those from projects that are cancelled due to the ruling.*

Obviously, for small values of C, ATRs stimulate extra investment projects whenever the ruling is favorable for the investor. In contrast, investors will not conduct investments for high after-tax net cashflows if the ATR's outcome is unfavorable.[8]

[8] The ex-ante probability of losing cashflows due to fewer investments equals the one of additional cashflows due to more investment. This result crucially depends on the assumption that C is uniformly distributed.

Advance Tax Ruling-Revenue Effect

In addition to the tax revenues that the tax authority receives from the realized investment projects, they earn expected revenues from the fee $\mathrm{E}[\tilde{R}_A^F]$ for ATRs. By offering ATRs, they also lose, in addition to the revenue loss addressed in eq. (16), tax revenues amounting to Δ in area A_2 because taxpayers cancel investments with disadvantageous tax consequences.

Whenever taxpayers request an ATR, the tax authority receives expected revenues from fees $\mathrm{E}[\tilde{R}_A^F]$ in area A with

$$\mathrm{E}[\tilde{R}_A^F] = \frac{1}{\Delta} * \bar{F} * \frac{d\Delta(1-d) - \bar{F}}{d(1-d)}. \tag{17}$$

Simultaneously, in the case of ATRs, the tax authority loses tax revenues of Δ for each investment that is no longer carried out in area A_2 with the probability d. The expected value of losing these tax revenues is

$$\mathrm{E}\left[\tilde{R}_{A_2}^{\Delta}\right] = d\Delta * \frac{d\Delta(1-d) - \bar{F}}{d\Delta} = d\Delta(1-d) - \bar{F}. \tag{18}$$

Note that the highest possible fee is $\bar{F}^* = (1-d)d\Delta$, as derived in eq. (11). At higher fees, no taxpayer will request ATRs. Therefore, we can focus on fees $\bar{F}$ with $\bar{F} \leq (1-d)d\Delta$. We obtain

$$\begin{aligned} \mathrm{E}[\tilde{R}_A^F] &= \frac{1}{\Delta} * \bar{F} * \frac{d\Delta(1-d) - \bar{F}}{d(1-d)} \leq d(1-d) * \frac{d\Delta(1-d) - \bar{F}}{d(1-d)} \\ &= d\Delta(1-d) - \bar{F} = \mathrm{E}(\tilde{R}_{A_2}^{\Delta}). \end{aligned} \tag{19}$$

Therefore, it becomes obvious that the expected revenues from the fee $\mathrm{E}[\tilde{R}_A^F]$ are generally smaller than expected reduction of tax revenues that are associated with Δ, that is, $\mathrm{E}\left[\tilde{R}_{A_2}^{\Delta}\right]$. The following theorem summarizes this result.

Theorem 1b: *When offering advance tax rulings to all interested taxpayers, tax authorities are in expected value terms not able to generate more revenues from charging a fee than they lose due to the advance tax ruling-induced lost tax revenues Δ.*

The total effect from offering ATRs can be decomposed into two separate effects: the ones described in Theorem 1a and those in Theorem 1b. Because both effects are negative, it follows that by offering ATRs, the tax authorities cannot be better off than by not offering the ruling.

Theorem 1c*: Assume that the pre-audit net cashflows are distributed uniformly in the interval* $[0, \Delta]$. *Then, there is no fee* $\bar{F}$ *such that tax authorities strictly benefit from offering advance tax rulings.*

The above theorem recaptures Theorem 1. The optimal value in Theorem 1 is such that no taxpayer requests ATRs. This is equivalent to not offering ATRs at all.

Nevertheless, we can observe ATRs in reality. Against the background of this observation, Theorem 1c is unsatisfactory. Therefore, in the following, we integrate further details that may help to understand the puzzle. These settings might help to explain why ATRs are requested in practice, although based on our analysis, they do not offer any benefit to the involved parties.

Optimal Fee for Model Extensions

Tax Audit Cost

Up to now, we have abstracted from tax audit costs that the tax authorities face when evaluating a tax case. In the following, we integrate audit costs and assume that these costs are reduced if investors use an ATR (similar to Beck et al. 2000, 248-249). This reduction of tax audit costs can be motivated as follows. To request ATRs, taxpayers need to precisely explain the tax issue and provide detailed descriptions of the situation and possible legal problems that are subject to the ruling. In contrast to the situation of an ordinary tax audit, in a ruling-free setting, the tax authorities receive more information about the tax issues. Therefore, they are able to assess and evaluate the tax case more quickly, which may lead to reduced tax audit costs.

We assume that the tax authority audits all tax issues and evaluates them correctly in cases without ATRs. Abstracting from tax evasion, the tax authority is able to reduce its tax audit costs whenever the investor receives an ATR. Therefore, in area A, the tax authority is able to save tax audit costs. We denote the size of the reduction in audit costs by P.

Because we want to conduct a relative comparison of the setting with and without ATRs, we can simply modify eq. (6). To determine the expected audit cost savings, we have to distinguish between the areas A_1 and A_2. In area A_2, audit cost reduction (P) resulting from requesting an ATR works as an additional fee because the investment has to be audited with or without the ruling. However, the additional investment projects that taxpayers carry out due to a positive outcome of the ATR in area A_1 evoke additional audit costs K. The costs K would not have occurred without the ruling and are of course also diminished by P due to the ATR. Table *1* illustrates the effects of the ruling on the audit costs.

*Table 1: Effect of an ATR on audit costs, considering additional audit costs **K** and audit cost reduction **P***

	$C < d\Delta$ no investment without ruling	$C \geq d\Delta$
no ruling	0	$-K$
ruling	$-(K-P)$	$-(K-P)$
difference	$-(K-P)$	$+P$

Thus, the expected fee revenues can be modified to

$$\mathrm{E}^{audit}[\tilde{R}_A^F] = \frac{1}{\Delta} * \left(\bar{F} - (K - P)\right) * \left(d\Delta - \frac{\bar{F}}{1-d}\right) + \frac{1}{\Delta} * (\bar{F} + P) * \left(\frac{d\Delta - \bar{F}}{d} - d\Delta\right). \tag{20}$$

The presence of audit costs does not affect the expected additional tax revenues $\mathrm{E}\left[\tilde{R}_{A_1}^T\right]$ and the lost tax revenues $\mathrm{E}\left[\tilde{R}_{A_2}^T\right]$ (see eqs. (7) and (8)). Again, we are able to determine the optimal fee ($\bar{F}_{audit}^*$) from the respective first-order condition:

$$\bar{F}_{audit}^* = (1 - d)d\Delta + (dK \; - P)(1 - \frac{1}{2 - \tau}). \tag{21}$$

It is obvious that this fee is smaller than the one found in Theorem 1 given $P > d\ K$; that is, the saved audit costs P are greater than the additional audit costs multiplied with the probability d. In this case, the tax authority offers a fee that at least some investors will accept. Thus, we describe a setting in which it is rational for both investors and the tax authority to participate in ATRs. The following theorem summarizes the result.

Theorem 2: *Assume that tax authorities' audit costs are reduced by $P > d\ K$ if investors ask for advance tax rulings. Then, the optimal fee is given by*

$$\bar{F}_{audit}^* = (1 - d)d\Delta + (d\ \ K - P)(1 - \frac{1}{2 - \tau})$$

with $\bar{F}_{audit}^* < \bar{F}^*$.

To summarize, a reduction of tax audit costs increases the attractiveness of ATRs. Therefore, the tax authorities reduce the fee such that more investors request ATRs. We also want to emphasize that the reduction of the audit costs only affects the tax authorities' view and not the investors'. Therefore, it is not a zero-sum game.

Increased Inspection Risk

In the case of an ATR, intensive documentation of all possibly ambiguous tax issues is required. Hence, more intensive inspection, higher expertise of the tax inspector dealing with these tax issues and detection with possibly unfavorable interpretations will take place by assumption (cf. e.g., Givati 2009). By contrast, in the no-ruling case, the (less-qualified and less informed) tax inspector might not be aware of such ambiguous tax issues and simply overlook them.

Consequently, in case of an ATR, the tax authorities will always be aware of a tax problem (as in the previous subsections), which they possibly would not have detected otherwise.

To integrate this issue into our model, the probability that the tax review in the no-ruling case is conducted by a non-specialist, who is not aware of the inherent tax ambiguousness, is a. By contrast, we assume that with probability $(1-a)$, a specialist will review the tax assessment in the no-ruling scenario. The expected post-audit net value without an ATR is

$$\mathrm{E}\left[\widetilde{C_a^{\Delta}}\right] = a\,C + (1-a)\big((1-d)C + d(C - \mathit{\Delta})\big). \tag{22}$$

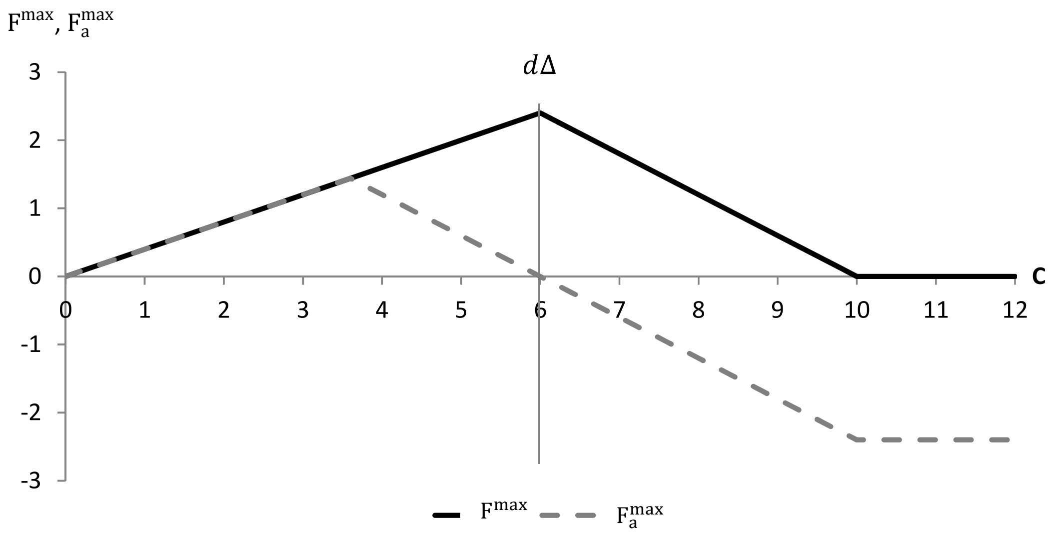
With probability $a,$ the tax authorities are not aware of the ambiguous tax issue, and the post-audit net cashflow is C. Otherwise, with probability $(1-a)$, the expected post-audit net cashflow from eq. (1) will emerge. The expected post-audit net cashflow in the case of an ATR is identical to the one described in previous subsections, as tax ambiguousness will always be disclosed.

Again after equating the objective functions and solving for the maximal fee F_a^{max} we obtain

$$F_a^{max} = \begin{cases} C(1-d) & \text{for } d\mathit{\Delta}(1-a) \geq C \\ d(\Delta(1-a) - C) & \text{for } \mathit{\Delta} \geq C > d\mathit{\Delta}(1-a) \\ -ad\mathit{\Delta} & \text{otherwise.} \end{cases} \tag{23}$$

Obviously, the maximal fee has changed in comparison to our standard model. Figure *5* compares the maximal fee in the standard model with the model with inspection risk for $d \coloneqq 0.6, a \coloneqq 0.4$ and $\Delta \coloneqq 10$.

Figure 5: Comparison of the maximal fee in the standard model $\boldsymbol{F^{max}}$ *and in the model with inspection risk* $\boldsymbol{F_a^{max}}$



One can see that for small net cashflows the maximal fee function remains unchanged after having integrated the inspection risk into the no-ruling scenario. The reason is that, without an ATR, these investments would not have been carried out. Therefore, these investments are not exposed to the benefits from more negligent tax inspections; that is, they are not able to benefit from the probability a. Only for higher net cashflows is the maximal fee affected by the inspection risk. The "laissez faire"-alternative is, compared to investments with an advance ruling, more attractive due to the possibility of not being audited in detail; therefore, the maximal fee for high net cashflows is lower and even takes negative values.

For the extended model with inspection risk for sufficiently large a, i.e., $a > 1 - d$, ATRs are only requested for $C \in [0;\ d\,\Delta)$, i.e., in the area in which in the “laissez-faire” scenario no investment would have been carried out. Then, there is no negative revenue effect in contrast to the setting described in eq. (8). No investment projects are lost when offering ATRs. Therefore, the tax authority’s expected revenues are given by

$$\mathrm{E}^{a}[\tilde{R}_{A}^{F}] = \frac{1}{\Delta} * \bar{F} * \left(\frac{d\Delta - ad\Delta - \bar{F}}{d} - \frac{\bar{F}}{1-d}\right). \tag{24}$$

$$\mathrm{E}^{a}\left[\tilde{R}_{A_1}^{T}\right] = \frac{1}{\Delta} * \left(\frac{d\Delta - ad\Delta - \bar{F}}{d} - \frac{\bar{F}}{1-d}\right) * \left((1-d) * \frac{1}{2}\left(\frac{\bar{F}}{1-d} + \frac{d\Delta - ad\Delta - \bar{F}}{d}\right)\frac{\tau}{1-\tau}\right). \tag{25}$$

We obtain the tax authorities’ optimum fee:

$$\bar{F}_{a}^{*} = (1-d)d\Delta(1-a)\frac{d-\tau}{2d-\tau}. \tag{26}$$

This fee is always lower than the maximal fee $F_{a}^{max} = (1-d)d\Delta(1-a)$ a taxpayer is willing to pay in this setting. To ensure positive fees, we have to postulate $\tau \leq d$. For higher tax rates ($\tau > d$), it is efficient for the tax authorities to set an optimal fee of zero. This is also due to the real investment effect, which outbalances the fee revenues for high tax rates.

Basically, the result that ATRs are offered also holds for the case in which the “new” maximal fee function has positive values for $C > d\Delta$ and thus for $a < (1-d)$. Because no additional insights will be gained, we will not elaborate this in detail.

Theorem 3: *Assume that there is a probability that indicates the possibility of not being audited in detail (or by experts), which exists only if no advance tax ruling is requested. In this case, the optimal fee for advance tax rulings is given by*

$$\bar{F}_a^* = (1-d)d\Delta(1-a)\frac{d-\tau}{2d-\tau}$$

where $\bar{F}_a^* < \bar{F}^*$ *for* $a > (1-d)$. *Hence, the fee* $\bar{F}_a^*$ *is not cost-prohibitive such that the advance tax ruling will be requested by taxpayers and even can become zero.*

To summarize, the tax authorities' capability of increasing the detection probability as a consequence of an ATR increases the attractiveness of such rulings. Therefore, the tax authorities reduce, under certain circumstances, the fee such that more investors request ATRs.

Fee Design

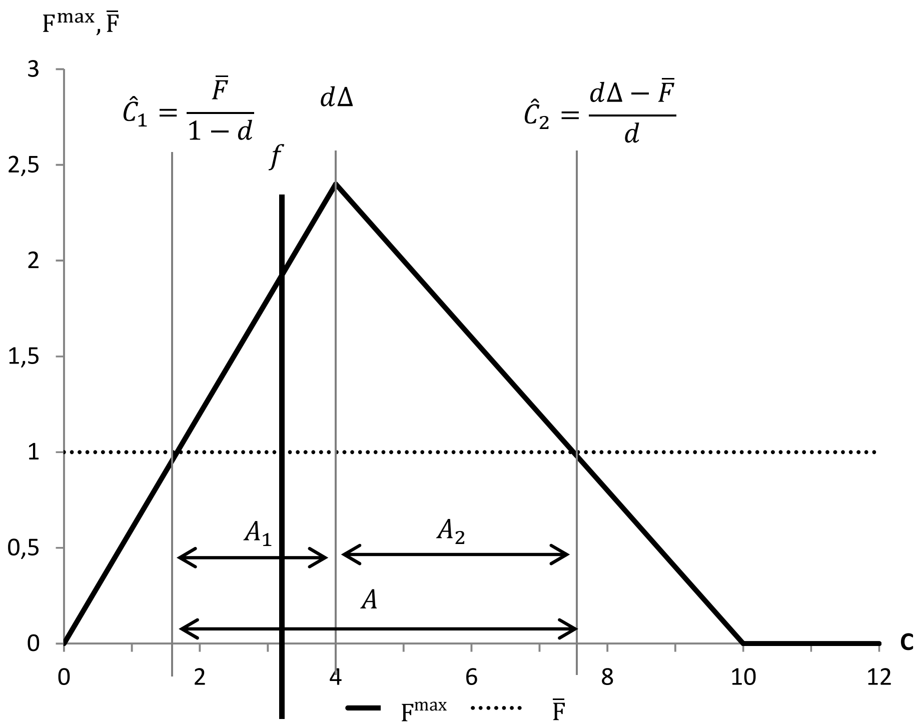
We have shown that under the given set of assumptions, ATRs are not often likely to be an effective tool to reduce tax uncertainty-induced distortions. Thus, it is interesting to determine whether there are fee designs that are able to increase the rulings' attractiveness such that both tax authorities and taxpayers take advantage. Therefore, we consider two different approaches to improving the fee design. First, we examine whether ATRs can be improved if the tax authority restricts the ruling to specific investment projects. Second, we investigate fee patterns with the fee being a function of the characteristics of the investment project.

Investment Project-Specific Restriction

Tax authorities may improve ATRs if they restrict them to selected investments, in particular to investments with small pre-audit net cashflows.

To show this, we assume a threshold f such that only investors who have investment projects with $C < f$ are allowed to ask for ATRs. Figure *6* exemplifies this setting graphically.

Figure 6: Comparison of the maximal fee $\boldsymbol{F^{max}}$ *and the tax authority's fee* $\boldsymbol{\bar{F}}$ *for an ATR depending on the pre-audit net cashflow* $\boldsymbol{C}$ *considering the threshold* $\boldsymbol{f}$



Again, we assume uniformly distributed investment projects. We consider the case $\frac{\bar{F}}{1-d} < f \leq d\Delta$.[9] As illustrated in Figure 6, investors in area A_2 are not allowed request ATRs. Thus, only investors in the lower part of area A_1 can demand ATRs. Given the threshold *f*, the tax authority receives expected revenues from the fee $\mathrm{E}^f[\tilde{R}_A^F]$ of[10]

$$\mathrm{E}^f[\tilde{R}_A^F] = \frac{1}{\Delta} * \bar{F} * \left(f - \frac{\bar{F}}{1-d}\right). \tag{27}$$

The additional tax revenues due to extra investment caused by the increased certainty provided by the ATR (for low C) in area A_1 can be written as

[9] We only consider the case of an existing border f that is smaller than $d\Delta$. This is reasonable because tax authorities are only able to generate additional tax revenues in this area A_1.

[10] See also eq. (6).

$$\mathrm{E}^f\left[\tilde{R}_{A_1}^T\right] = \frac{1}{\Delta} * \left(f - \frac{\bar{F}}{1-d}\right) * \left((1-d) * \frac{1}{2}\left(\frac{\bar{F}}{1-d} + f\right)\frac{\tau}{1-\tau}\right). \quad (28)$$

The tax authority does not lose tax revenues by ATRs in area A_2, as taxpayers are not authorized to request rulings for their investment projects in this area. Thus, $\mathrm{E}^f\left[\tilde{R}_{A_2}^T\right] = 0$.

The optimal fee $\bar{F}_f^*$ in case of $\frac{\bar{F}}{1-d} < f \leq d\Delta$ is

$$\bar{F}_f^* = \frac{(1-d)f(1-\tau)}{2-\tau}. \quad (29)$$

Because the optimal fee in eq. (29) satisfies the previous assumption ($\frac{\bar{F}}{1-d} < f \leq d\Delta$), $\bar{F}_f^*$ represents the optimal fee for all $f \leq d\Delta$.

Theorem 4: *Assume that the tax authorities only offer advance tax rulings for investors who face investment projects with $C < f$. Then, the optimal fee in the case of $\frac{\bar{F}}{1-d} < f \leq d\Delta$ equals*

$$\bar{F}_f^* = \frac{(1-d)f(1-\tau)}{2-\tau}$$

where $\bar{F}_f^* < \bar{F}^*$.

The optimal fee in Theorem 4 is strictly smaller than the one in Theorem 1. Therefore, the tax authorities offer a fee that is accepted by a specific group of investors. This is possible because the tax authorities exogenously exclude investors whose investment projects earn too high pre-audit net cashflows C. For these investors, the tax authorities would lose more tax revenues than they would gain by receiving the fee.

Investment-Specific Fees

Up to now, tax authorities have only been able to offer ATRs at a constant fee. In this section, we consider fees that depend on the investments project's characteristics. We consider in detail fees that are a function of the pre-audit net cashflow C with $\bar{F}(C)$ instead of constant fees $\bar{F}$. Thus, tax authorities have more design options, and therefore, it is easier to generate positive expected revenues.

We want to determine the optimal function $\bar{F}^*(C)$. Again, we distinguish between two areas. For low values of the pre-audit net cashflow C, that is, $C \leq d\Delta$, ATRs stimulate investment while they discourage investment for higher values of C, that is, $d\Delta \leq C \leq \Delta$. The effect on investments is independent of the magnitude of the fee as long as the fee is smaller than the maximal fee F^{max} that investors are willing to pay for ATRs.[11] If the fee $\bar{F}$ set by the tax authority is greater than the maximal fee, investors F^{max} will not request ATRs. Hence, the tax authority will receive neither revenues from the fee nor additional tax revenues from more realized investment projects. As long as investors request ATRs, the tax authority's revenues increase with the fee. Therefore, for low values of the pre-audit net cashflow C ($C \leq d\Delta$), it is optimal to set the fee equal to the investors' maximal fee (see eq. (5)).

$$\bar{F}^*(C) = (1-d)C$$

for

$$C \leq d\Delta.$$

Next, we consider large values of C ($d\Delta < C \leq \Delta$). The investor's maximal fee is $d(\Delta - \mathrm{C})$. If the tax ruling is unfavorable, the investor will not carry out the investment, and therefore, the tax authority loses Δ. The probability of an unfavorable ruling is d. Therefore, the tax authority loses expected revenues of at least $d\Delta$. Because the revenues from the maximal fee that investors are willing to pay are smaller than the lost tax revenues, that is,

$$d(\Delta - C) \leq d\Delta,$$

[11] This maximal fee that investors are willing to pay for advance tax rulings is illustrated in Figure 3.

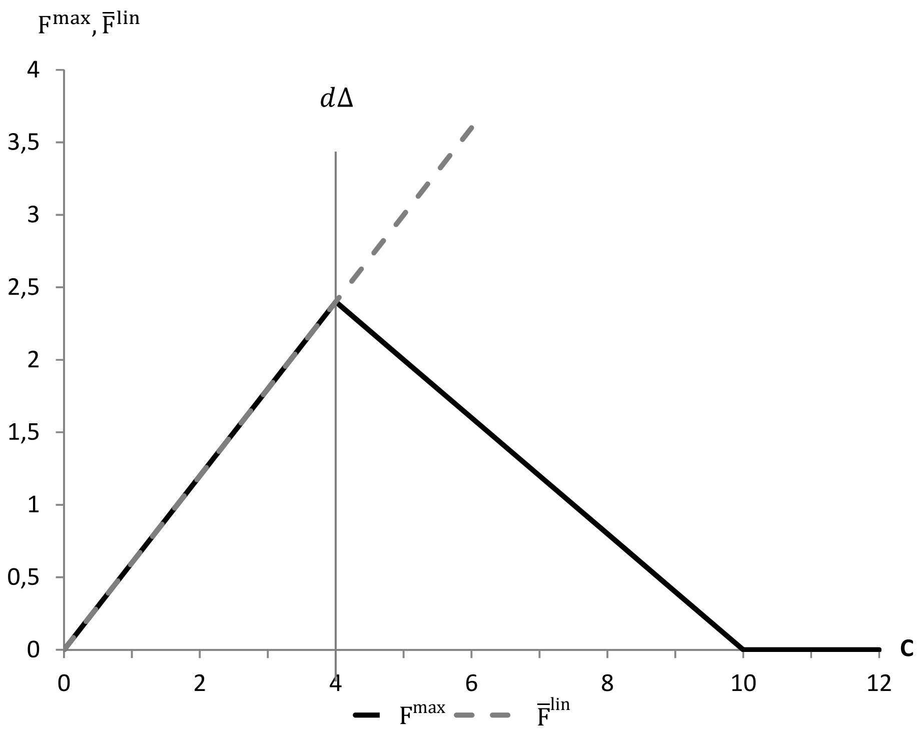
it is optimal to offer a fee that the investor will not accept. Hence, the optimal fee is not unique in the area $d\Delta < C \leq \Delta$. The only requirement for optimality is $\bar{F}^{*}(C) > d(\Delta - \mathrm{C})$.

We have demonstrated that there are many optimal functions. Note that among them there is a linear function, which also fulfills the optimality conditions. This linear fee $\bar{F}^{lin}(C)$ is illustrated in Figure *7* and is given by

$$\bar{F}^{lin}(C) = (1 - d)C. \tag{30}$$

The optimality of $\bar{F}^{lin}(C)$ can be easily seen in Figure *7* as that $\bar{F}^{lin}(C) = \bar{F}^{*}(C)$ for $C \leq d\Delta$ and $\bar{F}^{lin}(C) > d(\Delta - C)$ for $d\Delta < C \leq \Delta$.

Figure 7: Comparison of the maximal fee $\boldsymbol{F^{max}}$ *and and the linear fee* $\boldsymbol{\bar{F}^{lin}}$ *for an ATR depending on the pre-audit net cashflow* $\boldsymbol{C}$



If the fee is set by the tax authority as illustrated in Figure *6*, that is, it is identical to the left part of the taxpayer's F^{max} function, only the tax authority benefits from the ATR while the taxpayer neither suffers nor may take advantage of it. Alternatively, to generate a benefit for the taxpayer the tax authority may offer a fee that, in the underlying region, is lower than the above depicted $F(C)$.[12]

The following theorem summarizes the result.

Theorem 5*: Assume that the fee can be dependent on the pre-audit net cashflow C. Then, the optimal fee $F^*(C)$ satisfies*

$$\bar{F}^*(C) = (1 - d)C$$

for $C \leq d\Delta$ where $\bar{F}^*(C) = \bar{F}^*$ in this interval. For $d\Delta < C \leq \Delta$ the optimal fee must satisfy the inequality

$$\bar{F}^*(C) > d(\Delta - C).$$

Especially, there exists a linear fee that is optimal.

Whereas most results in this paper crucially depend on the assumption that C is uniformly distributed, this is not the case with Theorem 5. The shape of the optimal fee only depends on the maximal fee that investors are willing to pay for ATRs. This maximal fee F^{max} is determined for fixed values of C. Therefore, the distribution of C does not affect the determination of the optimal fee.

[12] For example, for selected investments, a fee according to $F(C) = \gamma\,(d\Delta - C)$ with $0 < \gamma < 1$ for $0 < C < d\Delta$ and $\gamma = 1$ for $C \leq d\Delta$ could be offered.

V. CONCLUSION

ATRs are commonly used by tax authorities to provide taxpayers with legal certainty regarding the tax burden that will emerge from intended investment projects within an uncertain tax environment. We extend the existing literature on ATRs by integrating the investor's and the tax authority's perspectives simultaneously. Specifically, we analyze the attractiveness of offering ATRs to taxpayers to tax authorities. Based on the maximal fee that risk neutral taxpayers are willing to pay for tax certainty, we determine the optimal fee that the tax authorities should set for an ATR. We demonstrate in the standard model that, assuming maximization of tax revenues, the tax authorities should de facto choose a fee that is higher than the willingness of (most of the) taxpayers to pay for an ATR, such that ATR supply will not find an ATR demand.

We identify settings and fee designs that are likely to ensure positive revenues and a benefit for the taxpayer. For example, ATRs become favorable when tax authorities are capable of significantly reducing their tax audit costs or increasing the detection probability. We find ATRs may be beneficial if the tax authorities charge investment-specific fees or restrict ATRs to specific classes of investments. We abstract from negative efficiency effects that might result from asymmetric tax treatment of different investments and from further problems arising from a violation of the principle of equality. This should be subject to future research.

These findings provide new explanations for why ATRs are currently not as intensively requested by investors as expected against the background of high tax uncertainty. Moreover, the findings help to improve the design of ATRs for the benefit of both investors and tax authorities.

Our results are limited to settings with a tax-risky investment project and risk neutral investors. If we take into account that there is a risk averse investor who has to decide between two investment projects with different legal uncertainty, of course he or she might be willing to pay for certainty in the case of high net cashflows from the investment. Our research may stand as a starting point for future research in this field, particularly on the impact of different risk attitudes.

We believe our model also has testable empirical implications, such as the implication that ATRs are more frequently requested for investment projects that are characterized by small expected cashflows. Further research should also test the hypothesis that ATR will be offered and requested if the tax authorities are able to effectively exploit the extra information provided by taxpayers during the ATR process to either reduce costs or increase revenues directly. As long as the data availability on ATR requests is very limited, experiments could contribute evidence to test some of the implications of our model and provide insight regarding whether the deduced fee patterns are likely to improve the investment environment.

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