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**Mandatory Auditor Rotation:
A Means of Reducing the Expectation Gap?**

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Mandatory Auditor Rotation: A Means of Reducing the Expectation Gap?

Abstract

The paper analyzes whether mandatory auditor rotation is a means to reduce an expectation gap caused by moral hazard problems. The analysis is divided into two parts with reference to the two different types of auditor rotation systems: (1) rotation of audit firms, and (2) rotation of audit partners.

In the case of mandatory rotation of audit firms, it can be shown by a multi-period agency model that the first best solution, i.e. the closing of the expectation gap, cannot be achieved. Additionally, any beneficial effect on audit quality induced by monitoring instruments is reduced.

In the second case of audit partner rotation, a first best solution may be achieved. A hold-up problem leading to personal under-investment in audit quality may nevertheless reduce the principal's first best utility below the level of a no-rotation system.

The conclusion is that none of the two auditor rotation systems should be made mandatory.

Key words: auditor rotation, expectation gap, multi-period agency model

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1. Introduction

As a reaction to the spectacular cases of balance sheet manipulation and auditor failure – ENRON and the resulting downfall of Arthur Andersen being the most prominent example - which have been observed since 2001, mandatory auditor rotation has become a much-discussed regulatory instrument in several countries to increase auditor independence and therefore reduce the so-called expectation gap.

In this respect, a much-cited example is the United States of America's Sarbanes-Oxley Act of 2002, which has made auditor rotation mandatory for all SEC registrants. More specifically, the Sarbanes-Oxley Act requires both audit partners as well as review partners of any SEC registrant to be rotated within the audit firm after a period of five years (audit partner rotation).

Nevertheless, many other countries have either preceded or followed this example. For example, Germany since 1998 has implemented via the KonTraG (Gesetz zur Kontrolle und Transparenz im Unternehmensbereich) a similar rule on mandatory audit partner rotation for the auditors of officially listed companies (amtlicher Handel) after a period of seven years (§ 319 Par. 3 No. 6 of the German Commercial Code).

Rules on mandatory audit partner rotation with respect to listed companies can also be found in Canada (with regard to local banks), the United Kingdom, Ireland, Singapore (with the exception of local banks who have to rotate audit firms after five years). Other countries, e.g. Greece or Italy, even require the rotation of audit firms after a given period of time (audit firm rotation) with respect to listed companies. An audit firm rotation rule has also been discussed in the United States of America prior to the Sarbanes-Oxley Act but has not (yet) been made effective.

On the other hand, countries like Australia and New Zealand as well as several supra-national institutions, e.g. the Commission of the European Communities or the IFAC (International Federation of Accountants) have decided to recommend auditor rotation only on a non-compulsory basis.

These divergent ways of handling the regulation on auditor rotation leads to the research question whether a recurrent change of auditors indeed enhances audit quality and reduces the expectation gap. The latter can be interpreted as a result of moral hazard problems between the auditor (agent) and the firm's investors (principal) (Biener, 1995; Sweeney, 1997): As investors are not able to observe the auditor's effort in producing a statement on the firm's financial position, the auditor might be tempted to reduce personally costly efforts, resulting in a decrease of expected audit quality. In this context, the expectation gap is equivalent to the agency costs the investors have to carry.

Reviewing the existing literature on auditor rotation, arguments both in favor as well as against mandatory auditor rotation systems can be found. Winters (1978) and Kemp/Reckers/Arrington (1983) argue, for example, that mandatory auditor rotation

increases auditor independence and therefore audit quality by reducing the incentive for collusive action between auditor and audited firm. Bales/Ingram/Reckers (1982) and Tan (1995) also support mandatory auditor rotation by referring to an increase in auditor productivity induced by short audit cycles. They argue that a long-term auditor-client relationship reduces the auditor's ability to integrate skepticism into his audit. Having worked for too long a time with the client's given accounting system, he is less likely to detect fraud and irregularities.

On the other hand, empirical research indicates a significantly higher degree of undetected fraud and errors in the first two auditing periods as the auditor seems to need some time to familiarize himself with the client's accounting system (see e.g. IDW, 1997 referring to a study conducted by the AICPA in 1992). The empirical research is supported by the theoretical discussion put forward by Hoyle (1978) and Petty/Cuganesan (1996). They fear that mandatory auditor rotation leads to higher production costs of the auditor's output under a given quality. They argue that errors and irregularities that would be detected during a longtime auditor client relationship might go unchecked. Additionally, short audit engagements might make it difficult for the auditor to deeply understand large and complex corporation structures.

Arrunada/Paz-Arres (1997) and Summer (1998) disapprove of mandatory auditor rotation as short audit cycles may restrict the auditor's capability to build up reputation and therefore reduce the incentive to maintain a high level of audit quality. Arrunada/Paz-Arres additionally point out that especially the rotation of audit firms reduces competition in the narrow oligopolistic market for auditing services (Big Four).

Herzig/Watrin (1995) and Vanstraelen (2000) discuss mandatory auditor rotation with regards to renewable long-term audit mandates. Herzig/Watrin focus on the problems of a long-term auditor-client-relationship which reduces the client's shareholders potential to use auditor switching as an incentive device. They argue that in this context any type of mandatory auditor rotation reduces this potential even further. Vanstraelen, on the other hand, gives empirical evidence that restrictions in auditor switching lead to a decrease in auditor quality which may call for mandatory auditor rotation as a counter-device.

Shifting the focus to the international audit profession, mandatory auditor rotation is traditionally rejected (see e.g. Pearson, 1980; Anonymous, 1993). As the discussion on mandatory auditor rotation in theory as well as in practice leads to rather ambiguous results, we want to introduce the question of moral hazard in the case of mandatory auditor rotation in order to gain additional insights. More specifically, we intend to show that mandatory auditor rotation might be a counter-productive measure in the light of existing moral hazard problems between investor and auditor, hindering a bridging of the expectation gap. This result - considered either in isolation or in conjunction with the traditional arguments on auditor rotation - indicates that no type of auditor rotation system should be made mandatory. The audit profession's point of view of implementing auditor rotation individually is therefore not to be taken as an expression

of competitive pressure among audit firms, but as an efficient solution with respect to a company's investors.

We start our analysis by first discussing the effects of mandatory audit firm rotation on moral hazard. We show that moral hazard issues tend to be solved by multi-period contingent contracts if audit quality is observable by all parties involved, i.e. if the auditor's report is an experience good. In that case, the introduction of mandatory audit firm rotation is likely to obstruct the reduction of agency costs, thus opening up a new expectation gap. If audit quality is not observable by a firm's investors, i.e. if the auditor's report is a credence good, two cases are possible: Either a fixed contract is agreed upon, in which case mandatory audit firm rotation has no effect on the amount of agency costs, or a contingent contract is implemented based on behavioral or result monitoring instruments. In this case, mandatory audit firm rotation once again obstructs the reduction of agency costs, as it does in the case of experience goods.

We then expand our analysis to mandatory audit partner rotation as implemented in most existing auditor rotation systems. We show that audit partner rotation may lead to a first best solution if an appropriate payment scheme is implemented by the audit firm. Nevertheless, the problem of audit quality is not yet resolved, as audit partner rotation may lead to personal underinvestment in audit quality. Consequently, the first best level of audit quality under mandatory audit partner rotation might be below the first best level or even the second best level without mandatory rotation.

In the following section 2 we will propose our model, showing also in how far the elements of our model correspond to the present German corporate governance system. Section 3 discusses the case of mandatory audit firm rotation. Section 4 deals with issues of mandatory audit partner rotation. Section 5 concludes our discussion.

2. The model

To analyze the effects of mandatory auditor rotation on moral hazard in the relationship between a firm's auditor and its investors, i.e. shareholders and investors, we establish an agency model in which the firm's supervisory board is assumed to be the auditor's principal.

Before continuing the description of our model, we want to make some short remarks on the role of the firm's supervisory board in the German corporate governance system and the choice of letting it represent the auditor's principal in our model, as this is a slight variation on the traditional agency models on auditing (Antle, 1982; Baiman/Evans/Noel, 1987; Ballwieser, 1987; Ewert, 1990).

In Germany, as in most Central European countries, the board of directors is divided into the supervisory board and the executive board. Together with the shareholders' meeting they establish the three organs of a stock corporation. It is the duty of the executive board to carry out the firm's day-to-day operation. This is monitored by the

supervisory board whose members are elected according to the laws of codetermination partly by the shareholders' meeting and partly by the corporation's employees.

On the part of the shareholders, the supervisory board usually seats directors of friendly companies and former members of the executive committee, but also high bank representatives due to the strong influence of the German banking system on the credit market. On the part of the employees, the supervisory board seats union members and some of the firm's employees themselves. Consequently, the German supervisory board represents shareholders, creditors and employees as three important groups of stakeholders. The auditor is appointed by the shareholders' meeting based on a proposition made by the supervisory board, which is usually followed.

The second reason for focusing our attention on the supervisory board is the fact that the quality of its monitoring of the executive board depends crucially on the relationship to the auditor and on the existence of moral hazard in this relationship. We will show in section 3 that mandatory auditor rotation is a counterproductive measure with respect to this intention.

In the following, we assume that the supervisory board delegates the checking of the firm's financial statements to the auditor as an economic agent. The auditor produces a long-form audit report based upon personally costly and non-trivial effort. After delivering the audit report, the auditor receives a payment $s(\bullet)$. As the auditor's chosen level of effort in producing the audit report may not be observed by the supervisory board, a moral hazard problem may arise.

Referring to the present German corporate governance system, the order to check the firm's financial statements is formally given to the auditor by the firm's supervisory board. Consequently, our model takes a rather idealistic perspective with reference to the present system by attributing all contractual power on the part of the principal to the supervisory board, which is nevertheless still in line with the broad understanding of contracts in neo-institutional theory.

The audit report as the auditor's output can be interpreted as an information structure η on the financial statements presented by the executive board. It is thus a nonmonetary asset, to which some monetary value D can be attributed. D is the gross value of the information structure η before the deduction of the auditor's remuneration $s(\bullet)$. D may be either positive or negative depending on other information structures the supervisory board has access to. If, for example, the supervisory board has to decide whether to use information structure η or another information structure η' without being able to use them in combination, then $D > 0$ if η is a better information structure than η' and $D \leq 0$ otherwise. If the value D is negative, then the supervisory board should not use the auditor's report η in the decision making process, e.g. when deciding whether to accept or to reject the financial statements presented.

Note that a ranking of information structures may not always be possible on a general basis, but with reference to a given decision problem and a given utility function U :

$\eta_1 > \eta_2$ if $E[U, \eta_1] > E[U, \eta_2]$ and $\eta_1 \leq \eta_2$ otherwise. For this rule to apply, we have to assume in addition that the supervisory board's preference order can be represented by a given Bernoulli utility function. This implies not necessarily a single-person approach, but only the absence of conflicts of interest among the supervisory board's members which may, for example, have been neutralized by some additional organizational or contractual measures.

We assume D to be dependent on the auditor's chosen level of effort e in the auditing process and on an exogenous random variable θ , representing the risk that even in a diligently conducted auditing process some errors, frauds, or mistakes might remain undetected: $D = D(e, \theta)$ with $D_e > 0$. If the supervisory board is not able to identify the chosen level of effort e ex post, this asymmetric information causes a moral hazard problem: The auditor is tempted to choose a minimum level of effort e_{\min} and to attribute low values of D to unfavorable states of θ .

The loss in expected utility $E[U(D-s(\bullet))]$ caused as the supervisory board is not able to commit the auditor to the desired level of effort e^* is measured by agency costs. These agency costs are interpreted as expectation gap, indicating to which extend the supervisory board's expectations are not met. A rational principal minimizes agency costs by integrating contractual elements into $s(\bullet)$ that motivate the agent to choose a level of effort $e > e_{\min}$.

Such a contractual element might consist for example in a multi-period contingent design with memory if the agent is risk-averse. In that case, there is ex ante an understanding between the principal and agent on a long-term relationship in which the remuneration of each period t is not only dependent on the realization of the agreed-upon contingencies in this period, but also on the realizations in the past periods $t-1$, $t-2$, etc. Such a contingency can be, for example, the observed value D or a monitoring variable with respect to the auditor's effort.

It is important for our model that in the relationship between supervisory board and auditor such a multi-period design does not necessarily imply the auditor's multi-period appointment. A multi-period contract effectively decreasing agency costs is already implemented if the supervisory board commits itself to proposing a prolongation of the auditing contract at the shareholders' meeting based upon the realization of the agreed-upon contingencies. Nevertheless, such a type of multi-period contract should have a somewhat weaker effect on the reduction of agency costs compared to a multi-period appointment as the agent does not know for sure if he is going to be employed in future periods. We therefore assume that such a multi-period contract between supervisory board and auditor is implemented if it leads to a reduction of agency costs.

The contractual design $s(\bullet)$ the supervisory board may offer to the auditor finally depends on the observability of D . In the traditional agency model, the value of the agent's output to the principal is usually observable so that some type of contingent contract $s(D)$ will be implemented as an incentive device motivating the auditor to choose a level of effort $e > e_{\min}$. Nevertheless, it may also be possible that the value D is

not observable by the supervisory board, e.g. if it cannot conclude in how far an action indicated by the auditor's report has beneficial or detrimental effects on the expected utility. In this latter case, we will describe the auditor's report as a credence good, and otherwise as an experience good.

This classification is based on the works of Nelson (1970) and Darby/Karni (1973). They classify goods and services according to the (potential) buyer's ability to determine relevant product qualities. Based on this classification, phenomena in industrial organization, e.g. the existence of monopolies (Nelson, 1970), or in welfare economics, e.g. the welfare loss caused by overselling in medical and other services (Darby/Karni, 1973), are examined.

In this paper, the classification of experience goods and credence goods is used to analyze the auditing sector. It can be shown that mandatory auditor rotation has different effects on moral hazard problems depending on whether the auditor's output is an experience good or a credence good and depending on the set of contracts available. This will be analyzed in the following section.

3. Mandatory rotation of audit firms

Mandatory rotation of audit firms demands not only a change in audit partners but also the appointment of another audit firm after a given number of periods. It is therefore the strictest type of auditor rotation system and is explicitly implemented only in few countries. Nevertheless, with respect to small audit firms a mandatory audit partner rotation also results in a rotation of audit firms, if they do not have enough resources to implement rotation internally.

The case of experience goods

If the auditor's report is an experience good, the supervisory board is able to verify its monetary value D at some time during the contractual relationship with the auditor. We assume that in the case of mandatory auditor rotation the audit firm has to be changed after one period whereas in the absence of mandatory rotation a two-period contract would be agreed upon: the supervisory board promises to propose a renewal of the contract to the shareholders' meeting after the first period.

We assume that the supervisory board's utility function U depends on D and on some remuneration $s(D)$ paid to the auditor. s consists not only of the audit fees to be paid in the present period, but also of additional elements, e.g. the possibility to negotiate an increase in audit fees during the contract renewal or to sell additional consulting services. In the case of a two-period contract, the payment scheme for the first period is $s_1(D_1)$ and $s_2(D_1, D_2)$ for the second period. The exogenous risks θ_1 and θ_2 in each period t are assumed to be stochastically independent.

The auditor's utility function $V = N(D) - H(e)$ depends on s as well as on e , and the auditor will only agree to work for the supervisory board if his expected utility $E[V]$

equals at least some reservation utility V_{\min} . We finally assume that the auditor is risk-averse so that any contingent contract $s(\bullet)$ does not represent the optimal risk-sharing rule.

In the case of mandatory rotation of auditor firms, solving the supervisory board's maximizing problem $E[U(D)-s(D)]$ subject to $E[V] \geq V_{\min}$ and to $e = \arg \max E[V]$ leads, e.g. via the first-order-condition-approach to the familiar condition for the optimal contractual design s :

$$(1) \quad \frac{U' [D - s(D)]}{N' (s(D))} = \lambda + \mu \frac{f' (D | e)}{f(D | e)}$$

The μ -term in condition (1) indicates the existence of agency costs, as in the first best situation with $e = e^*$ and agency costs of zero the μ -term vanishes.

In the case of no mandatory rotation, the supervisory board implements a two-period contract. Lambert (1983) has shown that in such a model the condition for the optimal contractual design s in the second period changes to

$$(2) \quad \frac{U_2' [D_2 - s_2(D_1, D_2)]}{N_2' (s_2(D_1, D_2))} = \lambda + \mu_1 \frac{f_1' (D_1 | e_1)}{f_1(D_1 | e_1)} + \mu_2 \frac{f_2' (D_2 | e_2)}{f_1(D_1 | e_1) f_2(D_2 | e_2)}$$

The second μ -term indicates that the agency costs decrease in comparison to the one-period model by implementing the two-period contract. The economic intuition behind this is the diversification of exogenous risk θ made possible by $s_2(D_1, D_2)$: it is improbable that with high efforts in both periods a negative state of θ will lead to an unfavorable result D . The resulting income smoothing with respect to the auditor is indicated by the expectancy values of the conditions for the optimal contractual designs: $E[U_t'/V_t'] = \lambda$ in each period t (Lambert, 1983).

Comparing (1) and (2) we find that mandatory rotation of audit firms obstructs a decrease in agency costs that can be achieved by a two-period contract. Extending our model to more than two periods, this result becomes even more distinct: Rubinstein (1979) and Radner (1981) have shown that the more periods are included ex ante into a multi-period contract with memory, the stronger the reduction of agency costs with a risk-averse agent. If the number of periods is infinite, then agency costs are zero and the first best solution is achieved: the auditor chooses the desired level of effort e^* as the exogenous risk θ can now be fully diversified and does not have any negative incentive effects anymore.

Even though the mathematical construct of infinity at first sight does not seem to have any relevance with respect to auditing practice, it can be interpreted as the contracting parties' understanding that after each period of cooperation another period will follow. This interpretation matches the state of the auditing sector in Germany under the present corporate governance system without mandatory auditor rotation.

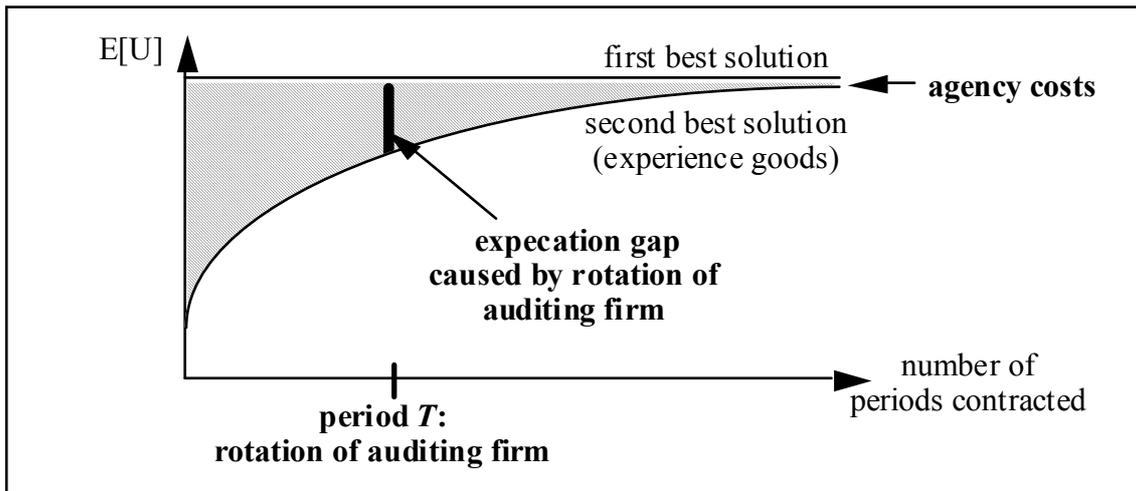
Figure 1 indicates this result graphically. The first best solution serves as a benchmark for the second best solution. The difference between both functions represents the

agency costs or the expectation gap which tends to be closed with an increasing number of periods contracted.

If this is obstructed by mandatory rotation of audit firms in period T part of the agency costs remain. A gap opens up that represents the supervisory board's expectations of lower audit quality.

Figure 1

Mandatory rotation of audit firms in the case of experience goods



Mandatory auditor rotation in the case of experience goods can be interpreted as an artificial restriction on the class of available contracts that is likely to lead to a Pareto-deterioration as the auditor in all cases receives just his reservation utility V_{\min} whereas the supervisory board's expected utility is likely to be reduced as part of the agency costs remain.

Only if the period T of mandatory rotation is so late that by T no significant level of agency costs remains does the mandatory auditor rotation prove not to be harmful, but - with respect to the moral hazard problem - neither will it be helpful. The decrease of agency costs also depends on the auditor's risk-aversion: the more the auditor tends to be risk-neutral, the stronger agency costs are decreased so that an early rotation period T should create a smaller expectation gap than with a strongly risk-averse auditor.

The case of credence goods

If the auditor's report is a credence good, the supervisory board is not able to verify the monetary value D of the auditor's output at any time during the contractual relationship with the auditor. Consequently, any contractual design $s(D)$ can no longer be implemented.

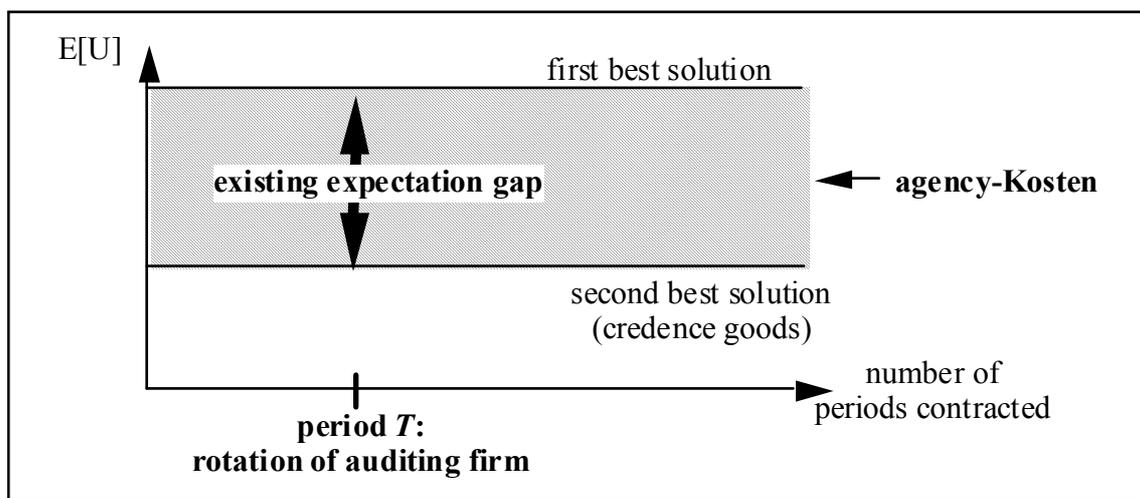
In the simplest case, the supervisory board now offers a fixed contract s_{fix} to the auditor. Such a type of contract has no incentive power so that under the existing information asymmetry the auditor will choose the minimum level of effort e_{\min} . To maximize

expected utility $E[U]$ in this situation, s_{fix} has to be set so small that even under $e = e_{\text{min}}$ the auditor just receives his reservation utility V_{min} : $s = s_{\text{fix,min}}$. Price competition among audit firms can be interpreted as an empirical indication for such a situation.

With a fixed contract $s_{\text{fix,min}}$, the agency costs to be incurred by the supervisory board are maximal and do not depend on the numbers of periods contracted. Figure 1 therefore changes to Figure 2: the second best solution does not approach the first best solution. The existing expectation gap is not influenced by the mandatory auditor rotation in period T ; the auditor rotation system therefore is unnecessary.

Figure 2

Mandatory rotation of audit firms in the case of credence goods



The constant level of expected utility in the second best situation independent of the number of periods contracted is nevertheless unsatisfactory. There should exist some contractual elements that allow the implementation of a contingent contract regardless of the credence character of the auditor's output.

Such contractual elements are provided by additional monitoring instruments. They can be used by the supervisory board to gain additional information on the auditor's efforts (behavioral monitoring) or on the value of the auditor's output (result monitoring). In the case of experience goods, such monitoring instruments tend to be infeasible if they are costly: result monitoring gives no additional information as the output value can be observed free of cost. Behavioral monitoring tends not to contribute significantly to the reduction of agency costs even with a very risk-averse agent if a multi-period contract is implemented: the costless observation of D supersedes the use of other, costly monitoring instruments.

In the case of credence goods, however, the use of such monitoring instruments gains importance. If, for example, a behavioral monitoring system $\{m_b\}$ is used, a contingent contract of the type $s(m_b)$ is implemented with $m_b = (e, \psi_b)$, ψ_b being some exogenous monitoring risk independent of θ . Already the condition for the optimal contract in the

one-period model shows the potential of such a contract for reducing agency costs (Weißenberger, 1997):

$$(3) \quad \frac{E_{\theta} \left[U' \left[D - s(m_b) \right] \right]}{N' \left(s(m_b) \right)} = \lambda + \mu \frac{f(m_b | e)}{f(m_b | e)}$$

Similar to Lambert's (1983) model it can be shown that in a two-period model agency costs decrease compared to the one-period model and that $E[E_{\theta}(U'_t)/N'_t] = \lambda$.

Condition (3) shows a second aspect: even though behavioral monitoring may be used by the supervisory board as an incentive device with respect to the auditor, it gives no additional information with respect to the level of D under a given level of θ , hence the expectancy value $E_{\theta}[U'_t]$. It indicates that the level of expected utility the supervisory board reaches with an optimal contract $s(m_b)$ is reduced by the possibility of rejecting the auditor's report even though $D > 0$ (alpha mistake) or accepting the auditor's report even though $D < 0$ (beta mistake).

An alternative to behavioral monitoring is result monitoring $\{m_r\}$: it gives information on the level of D and thus reduces the probability of an alpha/beta mistake. Additionally, $\{m_r\}$ can be used as an incentive device with respect to the auditor's efforts as $D = D(e, \theta)$. If we assume that the monitoring risk ψ_r is independent of the exogenous risk θ , the condition for the optimal contractual design $s(m_r)$ in a one-period model is (Weißenberger, 1997)

$$(4) \quad \frac{U' \left[D - s(m_r) \right]}{N' \left(s(m_r) \right)} = \lambda + \mu \frac{f(m_r | D) f(D | e)}{f(m_r | D) f(D | e)}$$

Similar to Lambert's (1983) model it can also be shown with result monitoring that in a two-period model, agency costs decrease compared to the one-period model, and that $E[U'_t/N'_t] = \lambda$.

The μ -term in condition (4) indicates that result monitoring can be interpreted as a garbling in the sense of Blackwell's theorem of the behavioral monitoring system $\{D\}$ used in the case of experience goods. So the increase in expected utility by avoiding at least partly the alpha/beta mistake is to some degree set off by a decrease in incentive effects: agency costs can be reduced by implementing $\{m_r\}$ into the contract, but the reduction tends to be slower than with a good behavioral monitoring system $\{m_b\}$. Nevertheless, in an infinite model, agency costs are zero with both types of monitoring so that in such a case result monitoring is more valuable than behavioral monitoring independent of the monitoring risks ψ_r and ψ_b .

Summarizing the results, by using monitoring information as a contingency in the contract between supervisory board and auditor, a decrease in agency costs can be achieved similar to that attained in the case of experience goods.

Behavioral monitoring can, for example, be implemented by peer reviews. In a peer review, the auditing process is analyzed, which should give a clear indication on e but

does not help to identify the state of the exogenous auditing risk θ . As a peer review is conducted by a third party, there might arise some additional moral hazard with respect to the third party weakening the information provided by the peer review.

Result monitoring gives joint information on e and θ . It could be carried out by audit committees, i.e. a specialized group of members of the supervisory board. Another type of result monitoring is measuring customer satisfaction, e.g. by a service gap model (Parasuraman/Zeithaml/Berry, 1988).

Summarizing our arguments presented in section 3, in the case of credence goods as well as in the case of experience goods, auditor rotation systems that directly or indirectly cause a rotation of audit firms should not be made mandatory.

4. Mandatory audit partner rotation

In this section we discuss the effects of audit partner rotation on the expectation gap constituted by moral hazard problems with respect to the auditor's efforts. Mandatory audit partner rotation demands a change in audit partners after a given number of periods. It is therefore a less strict type of auditor rotation system, but can be implemented only if the audit firms have enough resources to rotate auditing assignments internally.

Our analysis in section 3 has shown that the main problem with mandatory rotation of audit firms is its restricting the class of available contingent contracts to rather short-term contracts, including periods only up to the rotation period. Consequently, the beneficial effects of long-term contracts with memory, including in extremis an infinite number of periods, on the reduction of agency costs can only become partly effective.

With mandatory audit partner rotation, the pitfalls of such a short-term perspective can be avoided, as the audit firm is able to act as a contractual intermediary between its clients on the one hand and the individual audit partners organized in the audit firm on the other hand.

With respect to the contract established between the audit firm and its clients, there are under mandatory audit partner rotation systems no direct restrictions: a long-term contract may be established, decreasing agency costs with respect to the audit firm's moral hazard towards zero. In the simplest case of audit quality being an experience good, a multi-period contract of the type $s_k(D_k)$ is implemented between the supervisory board of a firm k and the audit firm, independent of which individual audit partner actually conducts the audit in each period t , but contingent on the level of D_k realized in present and past periods.

A second type of contract has to be established between the audit firm and the individual audit partners, who now take the role of subcontractors with respect to the auditing assignments taken on by the audit firm. To introduce a long-term perspective

into an audit partner's strategic choice of effort, the payment scheme has to be separated from the number of periods the audit partner is assigned to some auditing project k .

The audit firm can, for example, offer a multi-period contract $s'(D)$ depending on the level of audit quality observed in any auditing projects conducted in the past and present periods by the audit partner in question. In that case, the audit partner is indifferent to changes in his assignments caused by a mandatory rotation system, as the level of audit quality D based on this strategic choice of effort e in each period t is independent of the clients k he is auditing: he is only interested in realizing an optimal level of D in each period t .

Consequently, the first best solution is approached as described in Figure 1 and - under the given assumption - in an infinite model even realized: agency costs are zero and the expectation gap is thus closed.

Nevertheless, it is important to bear in mind that it is not mandatory audit partner rotation that is the reason for a reduction of agency costs, but rather the fact that it allows a specific type of long-term contracts so that *in spite of* mandatory audit partner rotation agency costs decrease. We therefore have to discuss whether there are any possible adverse effects not healed by separating the payment scheme from the number of periods the audit partner is assigned to a given auditing project k . Such an adverse effect might be caused if the audit partners have the potential for creating a hold-up situation.

Let us assume that conducting any audit project k requires a specific investment i made by the audit partner at the beginning of the project. Such an investment could, for example, be the accumulation of individual knowledge with respect to the client or the client's industry. The investment i is desirable from the supervisory board's k point of view as it is assumed that it will exercise a positive effect on audit quality in all periods t independent of the chosen level of effort e : $D_k'(i) > 0$.

From the audit partner's point of view, i leads to higher income at least in the those periods in which D_k is a contingency in his payment scheme. Additionally, i is beneficial as it decreases the liability risks caused by undetected errors, frauds, or irregularities in the firm's k financial statements. The investment i thus leads to the building up of reputation and may even help the audit partner to sell additional consulting projects with a positive return.

We now assume that the specific investment i is verifiable by all contractual parties involved, but not enforceable on the audit partner. He can be committed neither legally nor contractually to making such a specific investment of a given amount i .

To identify the level of i an audit partner undertakes in a no-rotation system versus an audit partner rotation system, we will once again establish a two-period model (Hart, 1995). We assume that in the no-rotation system, a two-period contract is established with the audit partner, whereas in the audit partner rotation system a one-period contract has to be implemented as the audit partners are assumed to rotate after one period.

The audit partner may undertake a specific investment in period $t = 1$ with the amount i and $i' > 0$ and $i'' > 0$ with respect to an audit project k . The audit partner's additional income resulting from i is $R_1(i) > 0$ in $t = 1$ and $R_2(i) > 0$ in $t = 2$ if the specific investment is made, with $R_1'(i) > 0$ and $R_1''(i) < 0$. If i is not undertaken at all, the additional income in both periods is $r < R_1(i)$. The rate of interest is assumed to be zero.

We set $2r < R_1(i) + R_2(i)$, so that the audit partner in a no-rotation system will undertake a specific investment i if $2r < R_1(i) + R_2(i) - i$. (5) then shows the first order condition for the optimal amount i :

$$(5) \quad \frac{d R_1(i)}{d i} + \frac{d R_2(i)}{d i} = i'$$

Comparing this result to the audit partner rotation system, the auditor will undertake a specific investment only if $r < R_1(i) + i$, as now only the results achieved in the first period are relevant to him. Any results $R_2(i)$ are relevant to the new audit partner taking up the assignment k after the rotation. The first order condition for the optimal amount i now changes to

$$(6) \quad \frac{d R_1(i)}{d i} = i'_{rotation}$$

Based on the assumptions on the slope of $R_1(i)$ and i , comparing conditions (5) and (6) leads to conclusion (7), indicating the problem of underinvestment:

$$(7) \quad i_{rotation} < i$$

The idea of the underinvestment problem has already been conveyed indirectly by the traditional arguments against auditor rotation. First, an increase in auditing costs caused by mandatory auditor rotation implies that a given specific investment becomes too costly in a short-term versus long-term assignment. Second, a decrease in auditor productivity attributed to mandatory auditor rotation implies the decreasing incentive to undertake a specific investment i in a short-term versus long-term assignment.

The underinvestment in i is not desirable as it decreases the supervisory board's k level of expected utility independent of the level of effort the audit partner chooses. To include the underinvestment problem, Figures 1 and 2 in section 3 have to be modified: under a given underinvestment problem, the levels of the first best solution as well as the second best solution decrease. The first best level under mandatory audit partner rotation might then be found below the first best level without auditor rotation: the price for closing the expectation gap paid in the form of underinvestment might well be too high.

Consequently, the stronger the influence of i on the level of audit quality in the second period, the more important it becomes to solve this underinvestment problem by adequate contractual means. This argument is relevant not only to audit partners but to all senior members of the auditing team whose specific investments may have a significant influence on the level of audit quality. An empirical indication for its

validity would be the fact that most audit firms are inclined to change the assignments of senior staff and audit partners significantly less often than the assignments of junior staff.

If there is no way to transfer the specific investment i to the new audit partner, e.g. because communication is too costly, then the underinvestment problem cannot be solved under mandatory audit partner rotation. But this is a rather strict point of view. One can, for example, assume that at least part of the investment i can be transferred, e.g. because the new audit partner might benefit from well-structured and informative audit records established by the first audit partner as part of his specific investment.

In the simplest case, both audit partners and/or the audit firm conclude an agreement that the first audit partners receive an amount equivalent to $R_2(i)$ from the new audit partner in addition to his other income $s'(D)$. This solves the underinvestment problem as now the property right on the results of the investment i are well attributed from an incentive point of view.

Applying this solution to auditing practice might nevertheless be difficult: only if $R_2(i)$ can be clearly identified will the appropriate transfers be made with certainty. Otherwise, the transfers might be either too low or too high. In the first case, the underinvestment problem with respect to the first auditor will be solved only partially. If, on the other hand, transfers are too high because too great a part of D_2 is attributed to the first auditor's specific investment, this will increase the new auditor's tendency to underinvest. As we can assume that in most cases the identification of $R_2(i)$ will be rather difficult, the underinvestment problem will probably not be solved.

5. Conclusions

Summarizing our analysis we have found the following results with mandatory auditor rotation systems:

- If the auditor's output is an experience good, the expectation gap can be closed by implementing multi-period contingent contracts with memory leading to a first best solution. Restricting the set of available contracts to rather short-term agreements by implementing mandatory rotation of audit firms opens up a new expectation gap.
- If the auditor's output is a credence good, an expectation gap exists if the auditor is offered a fixed contract. In that case, mandatory rotation of audit firms has no effect at all on the expectation gap.
- If in the case of credence goods a contingent contract can be offered based on monitoring instruments, the experience goods' first best result may be achieved. Mandatory rotation of audit firms then once again opens up a new expectation gap.
- If mandatory audit partner rotation is implemented, a first best solution may be achieved with respect to the auditor's effort. On the other hand, underinvestment in

audit quality caused by auditor rotation may lead to a first best level of expected utility below the first best level in a no-rotation system.

With respect to mandatory audit partner rotation, which is the most common type of auditor rotation system, an additional aspect is relevant concerning small size audit firms. As we have pointed out above, in their case audit partner rotation in fact leads to rotation of audit firms if their internal resources do not allow partner rotation. Consequently, a moral hazard problem remains with the small size firms whereas in big audit firms these problems can be solved as pointed out in section 4.

The underinvestment problem described above may, nevertheless, occur not only under audit partner rotation but also under rotation of audit firms. Small size audit firms are thereby made worse off by mandatory audit partner rotation. Clients of small size firms face moral hazard *and* underinvestment problems whereas only the underinvestment problem is relevant to big size audit firms. Consequently, the position of the small size firms is weakened considerably in comparison to big size audit firms. From the point of view of a public competitive policy aiming to reduce the concentration of economic power in the auditing sector, this is a particularly interesting result, strongly opposing mandatory audit partner rotation systems.

A last point to discuss is whether the results indicate that preferably no auditor at all should take place. We would not agree with that. On the one hand, agency costs and/or costs of underinvestment decrease with the number of periods contracted with an auditor, but on the other hand, there should be some truth behind the argument of increasing auditor dependence with the number of periods contracted as well. Both cost curves indicate some optimal period of rotation T^* .

But if we consider the assumptions on which this optimal period of rotation is based, we find that they are largely in the nature of the auditor himself and of his specific tasks. T^* should therefore vary significantly among different auditors as well as the audited industries. Consequently, the mandatory rotation period T_{rotation} should be equivalent to T^* only by accident. If $T^* > T_{\text{rotation}}$, the auditor rotation system causes the undesired consequences described above. If, on the other hand, $T^* \leq T_{\text{rotation}}$, the auditor rotation system is irrelevant. One can assume that based for example on audit liability rules or auditing standards implemented by the auditing profession themselves, the incentive for rotating at T^* should be high enough so that a legal enforcement of T_{rotation} is not necessary.

The final conclusion is that neither rotation of audit partners nor rotation of audit firms should be made mandatory at all.

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