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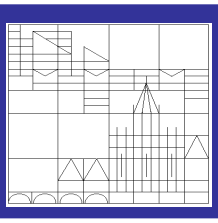

The Interdependence Between Audit Market Structure and the Quality of Financial Reporting: The Case of Non-Audit Services

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The Interdependence between Audit Market Structure and the Quality of Financial Reporting: The Case of Non-Audit Services

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Abstract

Recently, the Commission of the European Communities has put up for discussion various reform proposals to enhance the reliability of audits and to re-establish trust in the financial market. In particular, the EU Commission aims at strengthening auditor independence and at decreasing the high level of audit market concentration. Using the example of a ban on the joint provision of audit and non-audit services, we show that strengthening auditor independence and reducing market concentration may represent competing goals. Neglecting such interdependencies in the debate on regulation thus could lead to premature regulatory decisions.

Our arguments are based on a model that integrates a strategic auditor-manager game into a circular market matching model. We show that prohibiting general consulting services can result in a decrease in the equilibrium number of audit firms (i.e., in an increase in market concentration). Moreover, a ban on the joint supply of general consulting services might even have negative effects on the quality of audited financial statements, since the managers' average probability to misreport increases. We predict the opposite effects to occur from a prohibition of audit-related consulting services managers demand in order to tempt auditors to compromise their independence. The effects of "single-provider" auditing and consulting thus crucially depend on the kind of services the auditor is allowed to offer. In particular, the point in time when consulting services are contracted upon is pivotal.

Keywords

Auditing, Non-Audit Services, Audit Market Concentration, Auditor Independence, Quality of Audited Financial Statements

JEL-Classification

D43, L11, M42

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1. Motivation

Immediately following the recent financial crisis, there was an outpouring of public criticism aimed at banks, central banks, bank regulators, standard setters, rating agencies, and hedge funds. As, however, many of the financially distressed institutions had only just received unqualified opinions from their auditors, the Commission of the European Communities lately directed its focus to the auditing process. With the publication of the Green Paper "Audit Policy: Lessons from the Crisis" in October 2010,[1] the EU Commission puts up for discussion a variety of measures intended to strengthen the function of auditing, so that in the future auditing could make an increased contribution to the stabilization of the financial system.[2] Only in November 2011, the EU Commission has issued a proposal regarding regulatory reforms to improve the quality of public-interest entities' audits[3] and a proposal for a directive to enhance the single market for statutory audits.[4]

In the current debate, the EU Commission places a high priority on the strengthening of *auditor independence*. In order to increase the willingness of statutory auditors to communicate any errors they uncover to the users of financial statements, the EU Commission, among other measures, proposes the implementation of a restriction on the fees an audit firm can earn from the provision of related financial audit services to an audited entity to 10 % of the fees paid by that entity for the statutory audit, a cap on the total fees from audit and related financial audit services received from one specific public-interest entity to 15 % for two consecutive years, a more frequent use of joint audits, and the adoption of a mandatory audit firm rotation for public-interest entities after a maximum period of six years (as an exception of eight years) in addition to the rotation of the key audit partner(s) after seven years. Furthermore, the EU Commission suggests a restriction of the joint provision of non-audit services.[5] More precisely, the EU Commission proposes that the statutory auditor should be prevented from providing non-audit services that are assessed as incompatible with the independent public-

1 See Commission of the European Communities 2010.

2 However, thus far there has been no concrete evidence to suggest that a failure in the audit process was actually responsible for the financial crisis. One subject of critical discussion in this regard was the complaint of the Attorney General of New York against Ernst & Young in the case of Lehman Brothers and the actions of the Public Prosecutor's Office in Berlin against PricewaterhouseCoopers, related to SachsenLB.

3 See Commission of the European Communities 2011b.

4 See Commission of the European Communities 2011a.

5 Article 22 Par. 2 of the Statutory Audit Directive 2006/43/EU prescribes that auditors in cases in which an objective, reasonable, and informed third party would draw the conclusion that their independence was at risk should not provide audit services. Article 22, which also addresses the provision of non-audit services, however, has been implemented differently in the various Member States. In France, for example, there is a ban on the provision of non-audit services by auditors; other Member states are far less restrictive.

interest function of auditing to their audit clients in any case.[6] For non-audit services that are not fundamentally incompatible with the audit function, in contrast, the EU Commission suggests that the audit committee should be empowered to assess whether or not the auditor should provide these services to the audited entity.[7] Audit-related financial audit services could, however, still be provided.[8] In general, the idea behind the abolition of "single-provider" auditing and consulting is to reduce the business interests of the auditor in the audited company: The independence of the auditor should be enhanced when consulting profits contingent on decisions regarding the audit certification are not at stake ("threat of self-interest"). Furthermore, the independence of auditors is considered to be at risk when they must assess the results of their own services ("threat of self-review"). Thus, the EU Commission even argues that large audit firms should not be allowed to supply any non-audit services to public-interest entities and shall not belong to a network which provides non-audit services within the Union.[9]

The second major criticism raised by the EU Commission is related to the *high concentration of the audit market*. Numerous empirical studies have indeed confirmed that the level of supplier concentration in the audit market is quite high, most notably in the segment of listed companies' audits.[10] In most of the internal audit markets of EU Member States, the so-called "Big 4"[11] have secured a proportion of more than 90% of listed companies' audits.[12] Taking

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6 See Commission of the European Communities 2011b, Article 10.3.a. These services contain expert services unrelated to the audit, tax consultancy, general management and other advisory services, bookkeeping and preparing accounting records and financial statements, designing and implementing internal control or risk management, procedures related to the preparation and/or control of financing information included in the financial statements and advice on risk, valuation services, providing fairness opinions or contribution-in-kind reports, actuarial and legal services, designing and implementing financial information technology systems for public-interest entities, participating in the audit client's internal audit and the provision of services related to the internal audit function, and broker or dealer, investment adviser, or investment banking services.

7 See Commission of the European Communities 2011b, Article 10.3.b., which addresses the provision of human resources services, including recruiting senior management, and providing comfort letters for investors in the context of the issuance of an undertaking's securities.

8 These services encompass auditing or reviewing of interim financial statements, providing assurance on corporate governance statements or on corporate social responsibility matters, providing assurance on or attestation of regulatory reporting to regulators of financial institutions beyond the scope of the statutory audit, providing certification on compliance with tax requirements where such attestation is required by national law, and any other statutory duty related to audit work imposed by Union legislation to the statutory auditor or audit firm (see Commission of the European Communities 2011b, Article 10.2).

9 See Commission of the European Communities 2011b, Article 10.5. A large audit firm is one that generates more than one third of its annual audit revenues from large public-interest entities or belongs to a network with combined annual audit revenues above € 1.500.000.000 within the European Union.

10 Quick/Wolz 2003 and Bigus/Zimmermann 2008 provide concentration studies for the German audit market, and Stefani 2006 has investigated the Swiss market for audit services. The General Accounting Office 2008 has analyzed the US, and Ewert/London Economics 2006 and Le Vourc'h/Morand 2011 provide evidence regarding audit market concentration within the EU.

11 The following audit companies are considered the "Big 4": PwC, KPMG, Deloitte, and Ernst & Young.

12 See Ewert/London Economics 2006, p. 22 f, and Le Vourc'h/Morand 2011, p. 89ff.

into consideration the industry specialization of audit companies, in reality only very few suppliers are capable of auditing complex financial institutions. For example, auditing and consulting services for banks and insurance companies are dominated by only two of the Big 4 firms in Germany.[13] In addition, there is evidence of even a further increase in market concentration over time.[14] Above all, the EU Commission has expressed its fear that the existing supply structure contradicts the principles of a free common market and could represent a risk for the functioning of market mechanisms. Moreover, there is the concern that the collapse of one of the "systemic" suppliers could lead to an interruption in the capital market's supply of audited financial information, which in turn could have negative effects on the stability of the financial system. Other stakeholders have also recently expressed their concerns about the high level of audit market concentration.[15]

In its current reform proposals, the EU Commission is following a two-pronged policy in which "auditor independence" and "market concentration" are mainly regarded as two separate areas of action. The arguments laid out in the Green Paper and in the recently published proposals implicitly assume that these two problem areas can be considered separately; that is, measures strengthening auditor independence will have, at the most, negligible effects on market structure, and, *vice versa*, a change in the level of market concentration will not affect the quality of audited financial statements.

In the present paper, we focus on the potential effects of the proposed prohibition of the joint supply of audit and non-audit services by audit firms. Using a formal model, we show that "single-provider" auditing and consulting, which is intended to strengthen auditor independence, can also have adverse effects on the market structure. Thus, strengthening auditor independence and reducing market concentration may represent competing goals. This conflict, however, has not yet been sufficiently addressed either by the EU Commission or in the academic literature.[16] The neglect of such interdependencies in the debate on regulation, how-

[13] Le Vourc'h/Morand 2011 document similar findings from an analysis of market concentration by category of industry for the EU Member States.

[14] Studies spanning several years are presented by Köhler et al. 2010 and by Quick/Sattler 2011.

[15] The House of Lords (see House of Lords 2011a, House of Lords 2011b) and the British Office of Fair Trading (OFT) (see Office of Fair Trading 2011b) have articulated concerns about the high concentration of suppliers in the UK's national audit market and audit quality. The OFT notes that in 2010 the Big 4 aggregated a combined share of 99% (98.5%) of the audit fees paid by FTSE-100 (FTSE-250) companies. Thus, the OFT has referred the market for the supply of statutory audit services to large companies in the UK to the Competition Commission for further investigation (see Office of Fair Trading 2011a). In addition, the OFT has proposed measures that should counteract the unequal distribution of market shares.

[16] Comunale/Sexton 2005 investigate the effects of mandatory auditor rotation and a multi-year appointment of auditors on the resulting market share by means of a *Markov* model; Bleibtreu/Stefani 2011 present a formal analysis of the effects of a ban on "single-provider" auditing and consulting on the market structure.

ever, could lead to premature regulatory decisions if the potential mutual interference of the proposed measures is not properly anticipated.

Our arguments are based on a model that integrates a strategic game between a manager and an auditor into a market model in the tradition of the circular market matching models introduced by Schmalensee 1978 and Salop 1979. Using a strategic auditor-manager game, we investigate the managers' incentives to misreport a bad economic condition of the firm as well as the auditors' incentives to exert high audit effort in order to detect managers' misreporting, and to correctly report their findings to the public. We assume that the auditors' effort costs depend on their specialization regarding the clients' audit-relevant characteristics. We determine the auditors' ex ante expected costs he/she has to incur from auditing a specific client, and determine cost-covering audit fees by assuming *Bertrand* competition between audit firms. The zero-profit constraint then leads to the equilibrium number of audit firms active on the market for audit services.

Since the EU Commission differentiates between non-audit services that are incompatible with the audit function on the one hand and related financial audit services on the other, we also analyze two different scenarios:

First we investigate a scenario in which audit firms are permitted to supply general non-audit-related consulting services in addition to the audit. Since audit and consulting services are contracted upon simultaneously, and fees are sunk when decisions during the audit process are made, non-audit fees do not affect auditor independence in our single-period setting. The possibility to provide general, non-audit-related consulting services, however, increases audit firms' profit contributions and thus the equilibrium number of audit firms. The resulting increase in the degree of auditor industry specialization, however, tends to reduce the additional costs for exerting high audit effort, which, in turn, also decreases the managers' average probability to misreport a bad economic condition of the firm. Since the possibility to buy consulting services ex ante does not alter the managers' decision-relevant payoffs, the auditors' strategies are unaffected. Thus, the average quality of audited financial statements actually is higher in a situation where "single-provider" consulting is allowed (i.e., our model predicts a negative relationship between the level of market concentration and the quality of audited financial statements). An additional effect of the joint provision of audit and non-audit services is that average audit fees are lower as compared to a situation in which audit firms provide audit services only. In total, a prohibition of this kind of consulting services would actually *increase* concentration (i.e., reduce the number of audit firms), and at the same time

decrease the quality of financial reporting (i.e., increase the percentage of deceptive financial reports). These effects are in direct contrast to the aims the Commission has outlined in its recent reform proposals.

Second, we analyze a scenario in which managers demand audit-related non-audit services in order to tempt auditors to compromise their independence. More precisely, audit-related consulting services are demanded as a return service for receiving a clean audit opinion only after the auditor has detected a false report. We assume that auditors have superior bargaining power in setting non-audit fees. Our results indicate that since in fact exclusively auditors gain from the additional supply of non-audit services, managers react with an *individual decrease* in the probability to misreport, whereas the managers' payoffs and thus the auditors' strategy again remain unchanged. Thus, the auditors' expected costs, but also their audit fees and thus their profit contribution decrease due to the additional supply of non-audit services. This, in turn, leads to a decrease in the number of audit firms. An effective ban on the provision of audit-related consulting services thus would indeed increase the number of audit firms, i.e., would *decrease* the level of market concentration.

We can sum up our findings as follows: First, measures intended to strengthen auditor independence might have unintended secondary effects on the already high level of supplier concentration. Second, if the effects on the equilibrium number of audit firms resulting from a prohibition of non-audit services are taken into account, "single-provider" auditing might even have adverse effects on the quality of audited financial statements. Third, the effects outlined above crucially depend on the kind of non-audit services the auditor is allowed to offer. In particular, the point in time when consulting services are contracted for is pivotal.

The paper is organized into five sections. In Section 2, we briefly review the relevant literature. Section 3 presents our model and the analysis of a situation in which audit firms are not allowed to provide consulting services. In Section 4, we investigate the effects of the supply of general, non-audit-related consulting services in addition to the audit as well as the effects of the joint provision of audit-related consulting services. Section 5 summarizes our principal findings and derives conclusions regarding the EU Commission's proposal for audit market regulation.

2. Related Literature

Until now, only a few analytical papers have directly addressed the effects of the joint supply of audit and non-audit services. Wu 2006, for example, has presented a model in which accounting firms provide both audit and non-audit services. The question is how competitive behavior in the market for audit services and for non-audit services, respectively, affects oligopolistic competition in the respective other market. Although knowledge spillovers from auditing to consulting or vice versa (e.g., in the form of cost savings) are always beneficial to auditors, knowledge spillovers also provide an economic link between the two markets. Since oligopolistic competition in one of the markets will affect accounting firms' strategies in the other market ("competition crossovers"), knowledge spillovers thus can result in aggressive competition (e.g., price reductions). Based on a *Cournot* Duopoly Game in quantities, Wu 2006 analyzes the trade-off between these two economic forces in oligopolistic markets and audit fee price setting. Thus, Wu 2006 emphasizes the resulting market equilibrium rather the strategic interaction between auditors and clients.

Beck/Wu 2006 focus on the trade-off between audit fees and audit quality. They present a non-strategic, dynamic *Bayesian* model to analyze audit quality, which is measured as the precision of the auditor's posterior beliefs regarding client-specific characteristics. In their model, audit quality is affected by two components: Auditors learn from doing audits over time (learning effect), and auditors can perform non-audit services that influence their clients' managerial decisions (business advisory effect). Thus, providing non-audit services enables auditors to anticipate changes in their clients' business models. The results of Beck/Wu 2006 indicate that large professional fees can lead auditors to provide non-audit services that increase engagement risk and reduce audit quality. Since the empirical evidence regarding the existence of knowledge spillovers is mixed,[17] our model neglects both information effects and direct cost reductions resulting from a joint supply of both services, but focuses on the effects on market structure.

[17] Most of the studies using a single-equation model with audit fees (non-audit fees) as a dependent (independent) variable have found a positive relationship between non-audit fees and audit fees (see Simunic 1984, Simon 1985, DeBerg et al. 1991, Butterworth/Houghton 1995, Ezzamel et al. 1996, Craswell/Francis 1999, Bell et al. 2001), which could be a result of knowledge spillovers. Models taking the endogeneity between non-audit and audit fees into account, however, have shown that these findings might be the result of a biased estimation of the non-audit fee coefficient (see Whisenant et al. 2003; Antle et al. 2006 provide contrary results). Studies based on audit staff hours also did not find evidence consistent with the existence of audit production efficiencies arising from knowledge spillovers (see Davis et al. 1993, O'Keefe et al. 1994).

DeAngelo 1981 views audit quality as the market-assessed joint probability that auditors will both discover and report material misstatements in their clients' accounting systems. Based on her model, DeAngelo 1981 argues that the ratio between the economic advantage auditors derive from one client ("quasi-rent") and the sum of the economic advantages they earn from providing services to all of their clients is crucial for auditor independence. The provision of non-audit services can increase the profit contribution derived from one specific client, and thus raise the economic advantage auditors put at risk if they deviate from an unqualified audit opinion.

In line with this argument, Beck et al. 1988 presented a model to analyze the relationship between non-audit services and auditor independence. They showed that the provision of recurring non-audit services that decrease the auditor's start-up costs for auditing a client can decrease the quasi-rent derived from that particular client, and thus reduce the threat to auditor independence. Non-recurring non-audit services, however, are predicted to increase the client-specific quasi-rent only if knowledge spillovers reduce the ongoing costs for auditing the client.[18] Although Beck et al. 1988 offer a detailed explanation of the conditions that must be fulfilled for non-audit services to increase the client-specific quasi-rent, the authors do not address the ratio of quasi-rents that is crucial for the potential impairment of auditor independence, because neither the behavior of other clients nor the effect of allowing or prohibiting non-audit services on the auditors' market shares is explicitly modeled. In the present paper, in contrast, market shares and the equilibrium number of audit firms are endogenously determined within a market matching model. Our model therefore allows investigating the effect between the scope of services auditors are permitted to provide and market shares, as well as the effect of auditors' market shares on the quality of audited financial statements.

The idea of applying a market matching model to the audit market has also been presented by Chan 1999 and by Simons/Zein 2011. To model the auditors' decisions regarding the level of audit quality they want to supply (i.e., quality-related audit market segmentation), Simons/Zein 2011 adopt a linear market matching model based on Hotelling 1929. An interesting result of their paper is that improving the market position of mid-tier audit firms can lead to a decrease in overall audit quality. Chan 1999 uses a three-stage variant of the Hotelling 1929 spatial-competition model, taking into account auditors' start-up costs and thus relationship-specific economic interests. He focuses on auditors' decisions regarding their specialization with respect to client characteristics and on the economic implications of

[18] See Ewert 1990, p. 197ff., Dopuch 1988, and Graham 1988 for a critique.

low-balling. However, both Chan 1999 and Simons/Zein 2011 do not address the effects of non-audit services.

This paper is closely related to the model presented by Bleibtreu/Stefani 2011, who also use a circular market matching model. The focus of Bleibtreu/Stefani 2011, however, is on the effects of a prohibition of non-audit services on the equilibrium number of different types of audit firms. In particular, they differentiate between generalist audit firms that can provide consulting and audit services, and small audit firms specialized in auditing small corporations. Large audit firms are assumed to have higher fixed costs and higher costs for planning the audit process, whereas small audit firms have higher costs per unit of auditing clients for which they are not perfectly specialized. In addition, knowledge spillovers flowing from non-audit to audit services reduce the costs incurred in planning the audit process. The results indicate that prohibiting the provision of non-audit services to audit clients has direct effects on the structure of the audit market. In particular, Bleibtreu/Stefani 2011 show that the effect that a prohibition of the joint supply of audit and non-audit services has on the equilibrium market structure depends on the cost structures of small and large suppliers of audit services, and on the degree of competition for small audit clients. One drawback of their study, however, is that the strategic interaction between managers and auditors is not explicitly modeled. In the present paper, in contrast, we address managers' reporting decisions and auditors' effort choices, and thus directly investigate the effect of the scope of services on the quality of audited financial statements.

3. Model

3.1. General Structure of the Model

In the present paper, we jointly investigate (1) the matching between audit firms and clients, audit fee price setting, and audit firms' equilibrium market shares, as well as (2) the strategic interaction between auditors and clients during the auditor-client contractual relationship. Consequently, we integrate two separate games into our model:

We use a *sequential game* to model decision-making of the auditor and the company to be audited in the phase of preparing and auditing financial statements, i.e., after both parties have entered into an audit contract. In this game, managers decide about the quality of their company's financial statements, and auditors determine audit quality, i.e., the audit effort exerted for a specific client and the corresponding reporting strategy (which is contingent on the find-

ings accumulated during the audit). We apply backward induction to derive the managers' and auditors' optimal strategies regarding financial reporting and audit quality, respectively.

In addition, we apply the *circular location model* presented by Salop 1979 to analyze audit fee price-setting during the contracting process. More precisely, we embed the optimal decisions from the strategic game between the auditor and his/her clients, which determine expected audit costs and reputational effects, into a market matching model. This allows us deriving the audit fees actually contracted upon, the equilibrium matching between clients and audit firms, and the resulting market shares.

The joint analysis of the matching between clients and audit firms and thus of equilibrium market shares (ex ante) on the one hand and auditors' and clients' decision-making during the process of preparing and auditing financial statements (ex post) on the other enables us to address the effect of the number of audit firms on audit quality, and, vice versa, the effect of the players' incentives affecting the strategic interaction on audit firms' market shares. Thus, our model combines both the aspect of the quality of audited financial statements and concerns regarding the high concentration of the audit market. In particular, we investigate the effects resulting from a prohibition of the supply of non-audit services to audit clients.

To analyze the effect of the joint provision of both services, we consider three different scenarios for the additional supply of non-audit services to audit clients: *Case I*, in which audit firms do not provide consulting services at all, serves as a benchmark. In *Case II*, audit firms offer general, non-audit-related consulting services. Consulting services and audit services are simultaneously contracted upon. In *Case III*, audit firms can extend the audit by audit-related non-audit services. In contrast to *Case II*, non-audit services are contracted upon only after the auditor has detected that financial statements are misstated. We assume that clients mandatorily demand audits, whereas purchasing non-audit services in *Case III* is optional. For simplicity, we assume for C*ase II* that general consulting services are valuable for all clients, and thus actually all clients demand non-audit services.[19]

3.2. Strategic Auditor-Manager Interaction (*Case I*)

To analyze the strategic auditor-manager interaction during the process of preparing and verifying a company's financial statements, we start from the assumption that a manager and an auditor have already entered into an audit contract which determines the audit fee, fee_A.

[19] Our results would, however, not be changed if only some clients would buy non-audit services, provided that each audit firm has an identical market share in the market for consulting services.

Thus, the audit fee is fixed for the following game. In the next step, we use the market matching model described in the subsequent section to determine cost-covering audit fees emerging as equilibrium of a game between n competing audit firms.

As a reference point, we first describe *Case I*, in which audit firms are not allowed to supply non-audit services to audit clients. For *Case I*, Figure 1 illustrates the time line of the players' decisions, their respective information sets, and the payoffs resulting from the players' respective choices.

Figure 1

We assume that after both parties have agreed upon the audit contract, one of two different economic states of the company, good (G) or bad (B), can emerge. With the exogenous probability $0 < \theta_B < 1$, the economic condition of the client is bad, whereas the economic condition is good with the probability of the complementary event ($\theta_G = 1 - \theta_B$).

For simplicity, we presume that managers do not have an incentive to under-report the economic condition of their firm, for example in order to meet analysts' forecasts, to signal poor performance of their predecessors in case a change in the board of executive directors has occurred,[20] or to set aside earnings for future fiscal years when managers' bonuses are already at the maximum.[21] In our model, managers thus report G truthfully, i.e., $r(G) = G$. If, in contrast, the economic condition of the company is bad, managers have to decide whether they should report truthfully ($r(B) = B$) or give the distorted report that the firm is in a good state ($r(B) = G$): (1) If managers truthfully report $r(B) = B$, their utility decreases by d_t. The decrease in utility d_t can be interpreted as a consequence of capital markets reacting negatively on bad news or as a reduction of managements' performance-contingent payments. (2) Managers can exert some manipulation effort m ($m < d_t$) to overstate the economic condition of their firm (i.e., $r(B) = G$).[22] In doing so, however, managers must fear the risk that

[20] There is empirical evidence consistent with this hypothesis: Cotter et al. 1998 found that senior management changes are associated with greater write-downs taken to the income statement. Pourciau 1993 provides evidence that incoming executives manage accruals to decrease earnings in the year of the executive change and increase earnings the following year. Wilson/Wang 2010 found significant income-decreasing earnings management in the year where a change of the CEO and a change in board chairperson occur simultaneously. Murphy/Zimmerman 1993, however, found that discretion over turnover-related changes in R&D, advertising, capital expenditures, and accounting accruals exists only for poorly performing firms changing their CEO non-routinely.

[21] Healy 1985 and Holthausen et al. 1995 present empirical evidence in line with the "big bath" hypothesis.

[22] There is empirical evidence indicating that managers engage in earnings management to maximize their performance-contingent payments (see, for example, Healy 1985, Balsam 1998, Guidry et al. 1999, and

auditors will detect their misreporting and deny issuing a clean audit opinion on their financial statements. A qualified or even adverse audit report, in turn, results in a decrease of d_d in the managers' utility, which can result from a loss of reputation, a decrease in compensation based on accounting numbers, or adverse reactions of investors or creditors.[23] We assume $d_d > d_t$, i.e., that consequences for a manager who is caught misreporting are more severe than those occurring if the manager honestly admits the bad economic condition of the corporation voluntarily. We denote the probability that managers distort financial statements (i.e., $r(B) = G$) with Pr_d.

With regard to audit effort, we consider two alternatives: (1) Auditors can exert high effort (he), which enables them to perfectly observe their client's actual economic condition, or (2) choose low effort (le), which leaves misstatement in the client's financial reports undetected. Exerting high audit effort, however, induces higher audit costs than low audit effort, i.e., $c_{he} > c_{le}$. We describe these costs in more detail in the subsequent section.

We assume that auditors cannot observe their client's economic condition prior to conducting the audit. If, however, managers have reported the bad economic condition truthfully, auditors do not need to exert high audit effort, since $r(B) = B$ is always credible. Thus, auditors issue a clean opinion on the report $r(B) = B$ and earn the profit contribution $fee_A - c_{le}$ from auditing. If, on the other hand, managers have reported $r(B) = G$ or $r(G) = G$, auditors are only imperfectly informed about their clients' actual economic condition when choosing their audit effort: (1) If auditors exert low effort, they cannot distinguish whether G or B is actually valid, i.e., they cannot prove that $r(B) = G$ is misleading. Thus, auditors have to issue a clean audit report on $r(B) = G$ as well as on $r(G) = G$. If, however, later on it turns out that the economic condition was actually B and $r(B) = G$ was therefore deceptive, auditors face a loss of RL (e.g., reputational damages or legal action initiated by third parties), which has to be subtracted from the profit contribution, $fee_A - c_{le}$.[24] (2) If auditors perform high audit effort, they can perfectly reveal the actual economic situation of the firm. Thus, they know that

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Holthausen et al. 1995). In addition, there is evidence that managers avoid reporting earnings that fall short of analyst forecasts (see, for example, Burgstahler/Eames 2006).

[23] For empirical evidence, see, for example, Menon/Williams 2010.

[24] The most prominent example perhaps is the financial scandal of Enron, which caused erosion in the reputation of Arthur Andersen, clients changing their statutory auditor following Arthur Andersen's indictment, and finally the audit firms' demise soon after its conviction. Chaney/Philipich 2002, Krishnamurthy et al. 2006 and Asthana et al. 2010, among others, found that the market reacted negatively to Andersen clients when news about Andersen's indictment was released.

$r(G)=G$ is true, issue a clean audit opinion, but only earn the lower profit contribution, $fee_A - c_{he}$. Auditors exerting high effort can, however, also prove that the report $r(B)=G$ is misleading. Thus, auditors can decide whether they report their findings truthfully (qualified or adverse audit opinion) or whether they prefer to conceal their findings (clean audit opinion). If they decide not to issue a clean opinion, they can realize a reputational gain (RG) in addition to the profit contribution, $fee_A - c_{he}$; after consciously issuing a clean audit opinion which is inappropriate for $r(B)=G$, they risk reputational losses of RL which have to be subtracted from the profit contribution, $fee_A - c_{he}$. We define $RG + RL \equiv R$. Pr_{he} denotes the probability that auditors choose a high effort level after having observed $r(B)=G$ or $r(G)=G$, and Pr_r is the probability that the auditor does not issue a clean audit opinion after having revealed a misstated report of $r(B)=G$ (i.e., remains independent).

We make the standard assumptions of risk neutrality, perfect rationality, and common knowledge about these attributes as well as of all payoffs and probabilities. We apply backwards induction to determine the players' optimal strategies.

Given the payoffs described above, auditors who have exerted high audit effort would truthfully report their eventual finding that a manager's report of $r(B)=G$ misstates the economic condition of the firm, i.e., $Pr_r = 1$.[25] In the next step, we determine auditors' effort choices and managers' reporting strategies:

(1) If managers truthfully report $r(B)=B$, auditors always choose low audit effort in order to save the difference $c_{he} - c_{le} \equiv \Delta c$ in costs for auditing a specific client. (2) If managers report $r(G)=G$ or $r(B)=G$, in contrast, the auditor does not know the actual economic condition of the firm prior to conducting the audit. Although auditors make their audit effort choices chronologically after the managers have decided about their reports, the players' strategies can be analyzed as simultaneous decisions. If managers do not distort financial reports with certainty, there is obviously no Nash equilibrium in pure strategies. Auditors exert high audit effort if the probability for a distortion of financial statements, Pr_d, is relatively high, i.e., if $Pr_d \geq \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta c}{R-\Delta c}$. Thus, managers will report $r(B)=G$ with probability

[25] In *Case I* of our model, the problem of auditor independence (see DeAngelo 1981, Antle 1984, Magee/Tseng 1990, Dye 1991, and Lee/Gu 1998) is thus not in the focus.

$$(1) \qquad Pr_d^{*} = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta c}{R - \Delta c},$$

because auditors then are indifferent between conducting high and low effort after having observed a report of a good economic condition. We assume that reputational effects are relatively large as compared to the difference in audit costs, i.e., $\theta_B \cdot R > \Delta c$. Thus, managers randomize between their pure strategies $\left(Pr_d^{*} < 1\right)$.

Managers prefer $r(B) = G$ over $r(B) = B$ if the probability of high audit effort, Pr_{he}, is relatively low, i.e., if $Pr_{he} \leq \frac{d_t - m}{d_d}$. Thus, managers are indifferent between misreporting and truthfully reporting a bad economic condition if auditors exert high audit effort after having observed a report of a good economic condition with probability

$$(2) \qquad Pr_{he}^{*} = \frac{d_t - m}{d_d} < 1.$$

These probabilities specify the Nash equilibrium in mixed strategies. Our model resembles the Matching Pennies Games that have been frequently applied to study problems inherent to accounting and auditing.[26] Like in these Matching Pennies Games, the auditor's probability for exerting high audit effort only depends on the manager's payoffs, whereas the manager's probability for misreporting only depends on the auditor's payoffs.[27]

3.3. Market Matching Model (*Case I*)

To derive audit fees and the equilibrium number of audit firms, we apply the circular market matching model presented by Salop 1979 to our audit market. Again, we first consider *Case I* in which auditors do not provide non-audit services. We assume that all of the auditors' potential clients are uniformly distributed on a unit circle. The position of a client on the unit circle describes its audit-relevant characteristics such as its complexity (e.g., industry diversification, number of business areas, geographic dispersion of operations, corporate

[26] See Magee 1980 and Fellingham/Newman 1985. Smith et al. 2000 have extended the model sequentially by offering the auditor the choice of auditing the internal control system before a Matching Pennies Game is played. Anderson/Young 1988 use a similar game for planning internal audits, and Matsumura/Tucker 1995 as well as Tucker/Matsumura 1997 for second-partner-reviews. For extensions of the basic model, see Fellingham et al. 1989, Newman/Noel 1989, Patterson 1993, Bloomfield 1995, and Newman et al. 2001.

[27] Goeree/Holt 2001, Goeree et al. 2003, Bloomfield 1997, and Fischbacher/Stefani 2007 have investigated the (often counter-intuitive) behavioral predictions of Matching Pennies Games and provide experimental results regarding their predictive power.

structure, listing status, or accounting standard in use). We suppose that clients are distributed continuously on the unit circle, and normalize the mass of clients to 1. In addition, we assume that a certain discrete number n ($i = 1, 2, ..., n$) of audit firms is also uniformly distributed on the unit circle.[28] The position of an audit firm on the unit circle determines the correspondence between the audit firm's specialization and the client's characteristics, i.e., the auditor's industry specialization. The structure of this model is visualized in Figure 2.

Figure 2

The larger the difference between a client's characteristics and an audit firm's specialization is (i.e., the larger the distance x between client and auditor on the unit circle), the higher are the costs for auditing this specific client.[29] Thus, we assume that the audit costs c_{he} and c_{le} mentioned above increase linearly in the distance x,[30] and that the costs $c_{he}(x)$ for exerting high audit effort increase at a larger rate than the costs $c_{le}(x)$ for low audit effort. More precisely, we presume that the respective costs for exerting high and low effort in auditing a specific client located x units away from its audit firm are

(3) $\quad c_{he}(x) = a_{he} \cdot x$ and $c_{le}(x) = a_{le} \cdot x$ with $a_{he} > a_{le}$ and $a_{he} - a_{le} \equiv \Delta a$.

To derive equilibrium audit fees, we provisionally use a fixed number n of audit firms active in the market. We consider two arbitrary audit firms, i and $i-1$, which are located next to each other on the unit circle, and an arbitrary client located in between the positions of both audit firms, and with a distance of $x' < 1/2n$ to audit firm i. Thus, audit firm i is more specialized in the potential client's characteristics than audit firm $i-1$ is, and therefore has a cost advantage over audit firm $i-1$. The costs of audit firm i for auditing the client in distance x' are $a_{he} \cdot x'$ if high and $a_{le} \cdot x'$ if low audit effort is provided.

Given the cost structure outlined above, the managers' equilibrium individual probability to misreport is not identical across clients, since $Pr_d^*(x)$ depends on the distance x to the audit firm:

---

[28] The uniform distribution of audit firms also emerges in equilibrium (see Salop 1979).

[29] O'Keefe et al. 1994 found that client characteristics explain more than 80% of the cross-sectional variation in the quantity of professional labor input. Audit fee pricing studies also confirm that the characteristics of the client and the auditor-client relationship explain the variance in audit fees to a large extent (for a meta-analysis of the audit fee studies, see Hay et al. 2006b.

[30] Our results would be qualitatively similar if we assumed a concave or a convex cost function.

(1') $$Pr_d^*(x) = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta a \cdot x}{R - \Delta a \cdot x}.$$

$Pr_d^*(x)$ is a convex function of x, since $\partial Pr_d^*(x)/\partial x = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta a \cdot R}{(R-\Delta a \cdot x)^2} > 0$ and $\partial^2 Pr_d^*(x)/\partial x^2 = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{2 \cdot (\Delta a)^2 \cdot R}{(R-\Delta a \cdot x)^3} > 0$. Because additionally exerting high audit effort gets comparatively more expensive the less specialized the audit firm is in its client's business, the client's option to misreport gets more attractive the larger x is. The probability of a deceptive report, $Pr_d^*(x)$, increases in a_{he} and decreases in a_{le}. To ensure $Pr_d^*(x) < 1$ for every possible distance x, we adjust our assumption $\theta_B \cdot R > \Delta c$ from above to $\theta_B \cdot R > \Delta a/2$, as in our model $x = 1/2$ is the largest possible distance between an audit firm and its client $(n=1)$.

As derived in the preceding section, audit firms randomize between exerting high and low audit effort (i.e., exert high audit effort with probability Pr_{he}^*), and clients randomize between their pure reporting strategies (i.e., misreport a bad economic condition with probability $Pr_d^*(x)$).[31] The respective costs audit firms i and $i-1$ can ex ante expect from performing an audit for a client in distance $x' < 1/2n$ to audit firm i are thus given by

(4) $$E\left[c^i(x')\right] = \left[a_{le} + (1-\theta_B) \cdot Pr_{he}^* \cdot \Delta a + \theta_B \cdot Pr_{he}^* \cdot \Delta a \cdot Pr_d^*(x')\right] \cdot x' \text{ and}$$

$$E\left[c^{i-1}(1/n - x')\right] = \left[a_{le} + (1-\theta_B) \cdot Pr_{he}^* \cdot \Delta a + \theta_B \cdot Pr_{he}^* \cdot \Delta a \cdot Pr_d^*(1/n - x')\right] \cdot (1/n - x').$$

The probability of misreporting, $Pr_d^*(x)$, has an aggravating influence on the expected audit effort costs. Since $\partial Pr_d^*(x)/\partial x > 0$, the probability that managers misreport a bad economic condition is higher for clients in a large distance than for clients located near the audit firm. In addition, audit effort costs $c_{he}(x) = a_{he} \cdot x$ and $c_{le}(x) = a_{le} \cdot x$, and thus also $\Delta c = \Delta a \cdot x$, directly increase in the distance between the audit firm and its client. Taken together, for clients

[31] If $x = 0$, managers apply a pure strategy (i.e., $Pr_d^*(0) = 0$). This, however, does not affect our results, since we assume a continuous distribution of clients on the unit circle.

in distance $x' < 1/2n$, the expected audit costs of audit firm i are always lower than the expected audit costs of its competitor $i-1$ ($E\left[c^{i}\left(x'\right)\right] < E\left[c^{i-1}\left(1/n - x'\right)\right]$).

In addition to the direct audit effort costs, the respective reputational effects audit firms i and $i-1$ expect ex ante must also be taken into account:

(5) $E\left[Re^{i}\left(x'\right)\right] = \theta_B \cdot \left(Pr_{he}^{*} \cdot R - RL\right) \cdot Pr_{d}^{*}\left(x'\right)$ and

$$E\left[Re^{i-1}\left(1/n - x'\right)\right] = \theta_B \cdot \left(Pr_{he}^{*} \cdot R - RL\right) \cdot Pr_{d}^{*}\left(1/n - x'\right).$$

Again, the expected reputational effects get more severe in the distance between audit firm and client ($\partial Pr_{d}^{*}\left(x\right)/\partial x > 0$). Whether the expected reputational effect is positive or negative depends on the sign of the term $Pr_{he}^{*} \cdot R - RL = \frac{d_t - m}{d_d} \cdot \left(RG + RL\right) - RL$. Intuitively, the expected reputational effect is negative (positive) for relatively high (low) values of RL and low (high) values of RG. Moreover, the auditors' expected reputational effect is negative (positive) for relatively high (low) values of the managers' decrease in utility that occurs after having received an adverse audit opinion, d_d, and for high (low) values of the managers effort costs necessary to misrepresent a bad economic situation, m (since the probability that auditors exert high effort decreases in d_d and in m). The expected reputational effect is also negative (positive) if d_t, the decrease in utility managers suffer after having truthfully reported a bad economic condition, is relatively low (high) (since the probability that auditors exert high effort decreases in d_t). In the following, we assume $Pr_{he}^{*} \cdot R - RL < 0$, i.e., the reputational effect is some kind of threat against auditors that fail to exert high effort (or to report their findings correctly). Given this assumption, the expected reputational effect for audit firm i from auditing the client in distance $x' < 1/2n$ is less severe than that for audit firm $i-1$, i.e., $E\left[Re^{i}\left(x'\right)\right] > E\left[Re^{i-1}\left(1/n - x'\right)\right]$. The (negative) reputational effect must be subtracted from the expected audit costs in order to calculate "expected reputation-adjusted audit costs".

In equilibrium, auditors choose a probability for high effort that makes clients indifferent between misreporting and truthfully reporting a bad economic condition of their company. The utility that a client can expect after having contracted with an audit firm can thus be calculated to

(6) $$E\left[U^M\right] = -\theta_B \cdot d_t,$$

since the audit fee, $fee^i(x)$, can be regarded as sunk after the contract has been signed. Because $E\left[U^M\right]$ does not depend on the distance between the client and its audit firm, managers simply choose the audit firm offering the lowest fee. To determine audit fees, we assume *Bertrand* price competition, i.e., audit firms undercut each other's fee offers up to the point where one audit firm reaches its own expected reputation-adjusted audit costs. As audit effort costs are lower and expected reputational effects are less severe for audit firm i than for audit firm $i-1$, audit firm i gets the contracts with clients in distance $x' < 1/2n$, i.e., a company always selects the audit firm most closely located to the client.

These results for a client at a specific distance x' can be generalized to all clients that are located in the region $x \leq 1/2n$ in between two arbitrary audit firms i and $i-1$. The highest fee audit firm i can demand is equal to the expected reputation-adjusted audit costs of the competitor $i-1$ which is most closely located to audit firm i, since this competitor's expected costs are the last fee offer of that audit firm. The expected reputation-adjusted audit costs for audit firm i for auditing the client in distance $x \leq 1/2n$ are given by

$$\begin{aligned} E\left[C^i(x)\right] &= E\left[c^i(x)\right] - E\left[Re^i(x)\right] \\ &= \left[a_{le} + (1-\theta_B) \cdot Pr_{he}^* \cdot \Delta a + \theta_B \cdot Pr_{he}^* \cdot \Delta a \cdot Pr_d^*(x)\right] \cdot x \\ &\quad - \theta_B \cdot \left(Pr_{he}^* \cdot R - RL\right) \cdot Pr_d^*(x), \end{aligned} \tag{7}$$

whereas the expected reputation-adjusted audit costs for audit firm $i-1$ (and thus the fee audit firm i can demand) are

$$\begin{aligned} fee^i(x) &= E\left[C^{i-1}(1/n - x)\right] \\ &= \left[a_{le} + (1-\theta_B) \cdot Pr_{he}^* \cdot \Delta a + \theta_B \cdot Pr_{he}^* \cdot \Delta a \cdot Pr_d^*(1/n - x')\right] \cdot (1/n - x') \\ &\quad - \theta_B \cdot \left(Pr_{he}^* \cdot R - RL\right) \cdot Pr_d^*(1/n - x). \end{aligned} \tag{8}$$

Whereas the reputation-adjusted audit costs of audit firm i increase in the distance x between audit firm i and the client, audit fees increase (decrease) in the distance between audit firm $i-1$ (audit firm i) and the client.

The expected profit contribution of audit firm i from auditing some client at distance $x \le 1/2n$ can be calculated by subtracting the expected reputation-adjusted audit costs of audit firm i from the audit fees demanded:

$$
\begin{aligned}
E\left[pc^i(x)\right] &= fee^i(x) - E\left[C^i(x)\right] \\
&= a_{le}\cdot\left(1/n - 2x\right) + \left(1-\theta_B\right)\cdot Pr_{he}^{\ *}\cdot\Delta a\cdot\left(1/n-2x\right) \\
&+ \theta_B\cdot Pr_{he}^{\ *}\cdot\Delta a\cdot\left[Pr_d^{\ *}\left(1/n-x\right)\cdot\left(1/n-x\right) - Pr_d^{\ *}(x)\cdot x\right] \\
&- \theta_B\cdot\left(Pr_{he}^{\ *}\cdot R - RL\right)\cdot\left[Pr_d^{\ *}\left(1/n-x\right) - Pr_d^{\ *}(x)\right].
\end{aligned}
\tag{9}
$$

The expected overall profit contribution of audit firm i, given a certain number n of audit firms on the market, can be computed by integration and multiplication by 2 (in order to take both sides of the unit circle into account):

$$
\begin{aligned}
E\left[PC^i(n)\right] &= 2\cdot\int_0^{1/2n} E\left[pc^i(x)\right]dx \\
&= a_{le}/2n^2 + \left(1-\theta_B\right)\cdot Pr_{he}^{\ *}\cdot\Delta a/2n^2 \\
&+ 2\cdot\theta_B\cdot Pr_{he}^{\ *}\cdot\Delta a\cdot\int_0^{1/2n}\left[Pr_d^{\ *}\left(1/n-x\right)\cdot\left(1/n-x\right) - Pr_d^{\ *}(x)\cdot x\right]dx \\
&- 2\cdot\theta_B\cdot\left(Pr_{he}^{\ *}\cdot R - RL\right)\cdot\int_0^{1/2n}\left[Pr_d^{\ *}\left(1/n-x\right) - Pr_d^{\ *}(x)\right]dx,
\end{aligned}
\tag{10}
$$

which can be simplified to

$$
\begin{aligned}
E\left[PC^i(n)\right] &= 2\cdot\int_0^{1/2n} E\left[pc^i(x)\right]dx \\
&= \frac{a_{le}}{2n^2} + 2\cdot\left(1-\theta_B\right)\cdot\left(\frac{R}{\Delta a}\cdot RL\right)\cdot\left[1+\frac{\left(\Delta a/2n\right)^2}{R^2 - R\cdot\Delta a/n}\right].
\end{aligned}
\tag{10'}
$$

Since $\partial E\left[PC^i(n)\right]/\partial n < 0$, the expected overall profit contribution of some arbitrary audit firm decreases in the number of audit firms n.

We assume that every audit firm incurs some fixed costs c_{FA} in addition to the expected direct audit effort costs and reputational effects. These fixed costs can also be interpreted as a market entry barrier. Subtracting the fixed costs c_{FA} from the expected overall profit contribution, $E\left[PC^i(n)\right]$, leads to the audit firms' expected profits. If audit firms can earn positive

profits, new suppliers will enter the market.[32] If profits are negative, audit firms will leave the market.[33] Thus, the equilibrium number of audit firms, n^*, can be calculated by solving

$$(11) \qquad E\left[PC^i\left(n^*\right)\right] = c_{FA}$$

for n^*. We consider the probability for the publication of correct assertions regarding the economic condition of the audited company, i.e.,

$$(12) \qquad \Phi = 1 - \theta_B \cdot Pr_d^*(x) \cdot \left[\left(1 - Pr_{he}^*\right) + Pr_{he}^*\left(1 - Pr_r^*\right)\right],$$

as a measure for the quality of a specific client's audited financial statements. Given the pay-offs for *Case I*, auditors are always independent ($Pr_r^* = 1$), i.e., Φ reduces to $1 - \theta_B \cdot Pr_d^*(x) \cdot \left(1 - Pr_{he}^*\right)$. This formulation has two interpretations: First, the quality of audited financial statements is not identical across the audit firm's clients: The larger the distance x, the larger the individual probability $Pr_d^*(x)$ for the manager to misreport ($\partial Pr_d^*(x)/\partial x > 0$), and the lower the quality Φ of audited information disclosed ($\partial\Phi/\partial x < 0$).[34] Second, the quality of audited financial statements also depends on the equilibrium number n of audit firms active on the market: Since the maximum possible distance between audit firm and auditee, $x^{max} = 1/2n$, decreases in n, the upper value for the probability that managers misreport a bad economic condition of their firm also decreases in n:

$$(1'') \qquad Pr_d^*\left(x^{max}, n\right) = \frac{\left(1 - \theta_B\right)}{\theta_B} \cdot \frac{\Delta a/2n}{R - \Delta a/2n} \text{ with}$$

$$\partial Pr_d^*\left(x^{max}, n\right)/\partial n = -\frac{\left(1 - \theta_B\right)}{\theta_B} \cdot \frac{\Delta a/2n^2 \cdot R}{\left(R - \Delta a/2n\right)^2} < 0 .$$

Intuitively, a low number of audit firms active on the market (i.e., a high level of audit market concentration) means that there are comparatively many clients unable to find an audit firm

[32] The current estimation is that the sector for large companies' audits is not attractive enough to encourage additional providers to enter the market, i.e., the potential risks and returns do not justify the necessary investment (see PricewaterhouseCoopers 2010, par. 17).

[33] The General Accounting Office 2003, for example, discusses that a number of small audit firms, because of the increase in costs of auditing public corporations, did exit the market after the introduction of the Sarbanes-Oxley Act. Thus, one of the consequences was a decrease in the competition for small mandates.

[34] For clients that perfectly fit the auditor's industry specialization ($x = 0$), the quality of audited financial statements is at its maximum, since $\Phi = 1 - \theta_B \cdot Pr_d^*(0) \cdot \left(1 - Pr_{he}^*\right) = 1$ (manager's report always is appropriate).

that is located closely to them (i.e., there is a lack of specialist audit firms). Since the probability $Pr_d^*(x)$ to misreport increases in the distance x, and the maximum possible distance is larger if there are only few audit firms, the average quality of audited financial statements decreases in the number n of audit firms. Figure 3 illustrates this effect (for simplicity, $Pr_d^*(x)$ in Figure 3 is assumed to be linear, which is a reasonable approximation given relatively high values of R).

Figure 3

Thus, a high level of audit market concentration can indeed have *negative* consequences on the quality of financial information disclosed. In our model, however, the reason is not that audit firms shirk on audit effort, anticipating that they might be "too big to fail", but that managers exploit the fact that exerting high audit effort gets comparatively costly. The average probability of misrepresenting a bad economic condition of the firm and thus the expected percentage of distorted financial reports can be calculated to

$$(13) \qquad \overline{Pr_d^*(n^*)} = 2n^* \cdot \int_0^{1/2n^*} Pr_d^*(x)\,dx = \frac{(1-\theta_B)}{\theta_B} \cdot \left[2 \cdot n^* \cdot \frac{R}{\Delta a} \cdot ln\left(\frac{R}{R - \Delta a / 2n^*} \right) - 1 \right]$$

with $\partial \overline{Pr_d^*(n^*)} / \partial n^* < 0$. The respective measure for the average quality of audited financial statements is

$$(12') \qquad \begin{aligned} \Phi &= 1 - \theta_B \cdot \overline{Pr_d^*(n^*)} \cdot \left(1 - Pr_{he}^*\right) \\ &= 1 - (1-\theta_B) \cdot \left[2 \cdot n^* \cdot \frac{R}{\Delta a} \cdot ln\left(\frac{R}{R - \Delta a / 2n^*} \right) - 1 \right] \cdot \left(1 - \frac{d_t - m}{d_d} \right), \end{aligned}$$

which decreases in $\overline{Pr_d^*(n^*)}$, and because of $\partial \overline{Pr_d^*(n^*)} / \partial n^* < 0$, *increases* in n^*: The more audit firms are active on the market, the higher the average quality of audited financial statements.

4. The Effect of Non-audit Services

4.1. *Case II*: General Consulting Services

In this section, we investigate the effects the joint provision of consulting services has on audit fees, on the equilibrium number of audit firms, and on the quality of audited financial

statements. As mentioned above, we differentiate between two scenarios regarding the scope of non-audit services audit firms are permitted to supply to their audit clients. We start with *Case II*, in which audit firms are allowed to offer only general, non-audit-related consulting services that are clearly distinct from the audit service. Since in *Case II* both audit and non-audit fees are contracted upon at the beginning of the period, they can be regarded as sunk in the game between auditors and clients. Therefore, non-audit fees do not have any immediate influence on the players' decisions; in particular, non-audit fees do not affect auditor independence.[35] Moreover, we assume that the provision of consulting services does not directly affect audit costs, e.g., through knowledge spillovers. As audit firms in our model are homogeneous except for their location on the unit circle, we assume that each audit firm has the same share of $1/n$ of the market for consulting services.[36] In addition, we assume that auditors earn some fixed profit contribution π_{GC} per client from the provision of consulting services.[37]

Taking this positive profit contribution from the provision of consulting services into account, the total profit contribution of an arbitrary audit firm i can be calculated to

$$(14) \qquad \begin{aligned} E\left[PC_{GC}^{i}(n)\right] &= 2\cdot\int_{0}^{1/2n}\left[E\left[pc^{i}(x)\right]+\pi_{GC}\right]dx \\ &= E\left[PC^{i}(n)\right]+\pi_{GC}/n. \end{aligned}$$

For a given number of audit firms n, $E\left[PC_{GC}^{i}(n)\right]$ for *Case II* is clearly larger than $E\left[PC^{i}(n)\right]$ for *Case I* (where the provision of non-audit services was not allowed). The equilibrium number n_{GC}^{*} of audit firms can again be found by solving

$$(15) \qquad E\left[PC_{GC}^{i}\left(n_{GC}^{*}\right)\right]=c_{FA}+c_{FGC}$$

---

[35] In our model, an increase in auditor-client "economic bonding" due to non-audit fees would impair auditor independence only in a multiperiod-setting, provided the client has an incentive to change an auditor who has refused to issue a clean opinion. For this incentive to evolve endogenously, additional assumptions would be needed, since the incumbent auditor is always cost-efficient. There is, however, also empirical evidence showing that independence is not necessarily impaired: Raghunandan et al. 2003 did not find significant differences in unexpected non-audit fees, fee ratios, and total fees between firms with restatements and a control group, i.e., concerns that non-audit services affect audit quality, thus leading to restatements, are not supported. Hay et al. 2006a did not find evidence that the provision of non-audit services impairs auditor independence of mind, and DeFond et al. 2002 did not find a significant association between non-audit fees and impaired auditor independence (measured by auditors' propensity to issue going concern audit opinions).

[36] Provided that audit firms have identical market shares from providing consulting services, we get qualitatively similar results even if not all clients demand consulting services. Furthermore, our results do not depend on whether an audit firm offers consulting services to own audit clients or to the competitors' clients.

[37] We would obtain similar results if we assumed the profit contribution to be dependent on the distance between audit firm and client.

for n_{GC}^{*}, where c_{FGC} denotes the fixed costs additionally occurring for audit firms that also offer general consulting services. In line with anecdotal evidence from business practice, we assume that the provision of consulting services is quite profitable for audit firms, i.e., $\pi_{GC} / n^{*} > c_{FGC}$.[38] Consequently, the equilibrium number of audit firms increases as compared to *Case I*, i.e., $n_{GC}{}^{*} > n^{*}$. Thus, the number of audit firms is larger when there is the opportunity to earn profitable consulting contracts. Put differently, the prohibition of the joint supply of audit and general consulting services would *decrease* the number of suppliers, i.e., further *increase* the already high level of audit market concentration.[39] The EU Commission, however, does not take the argument of an intermediate-term reduction in the number of suppliers into account. To the contrary, it argues that, due to independence concerns, the provision of non-audit services would prevent the audit firm from carrying out the statutory audit of that particular company. The consequence would be a reduction of the audit firms available for providing the statutory audit (in particular for large public-interest entities). To secure a minimum number of audit firms available for large public-interest entities, the EU Commission thus requests "that audit firms of significant dimension focus their professional activity on the carrying out of statutory audit and are not allowed to undertake other services unconnected to their statutory audit function such as consultancy or advisory services".[40] Our model, however, predicts that this reform would lead to a further increase in the level of audit market concentration.

Our results are also in contrast to the EU Commission's expectation of an increase in the quality of audited financial statements due to the prohibition of non-audit services: Since $\partial \overline{Pr_d^{*}\left(n^{*}\right)} / \partial n^{*} < 0$, it gets obvious that the percentage of distorted financial reports in *Case II* is *lower* than that in *Case I* where consulting services were prohibited, i.e.,

$$(16) \qquad \overline{Pr_d^{*}\left(n_{GC}{}^{*}\right)} < \overline{Pr_d^{*}\left(n^{*}\right)}$$

(see also Figure 3). For *Case II*, the average quality of audited financial statements is therefore higher than in *Case I*, i.e.,

$$(17) \qquad \Phi_{GC} = 1 - \theta_B \cdot \overline{P\,r_d^{*}\left(n_{GC}{}^{*}\right)} \cdot \left(1 - Pr_{he}{}^{*}\right) > \Phi = 1 - \theta_B \cdot \overline{P\,r_d^{*}\left(n^{*}\right)} \cdot \left(1 - Pr_{he}{}^{*}\right).$$

[38] It has often been argued that audit firms lower audit fees to get a foot in the door in order to sell the more profitable non-audit services, i.e., auditing serves as a "loss leader" (see Antle et al. 2006; Knechel 2007).

[39] This effect would be intensified if some audit firms would decide to leave the audit market to focus on non-audit services (see Le Vourc'h/Morand 2011, p. 200).

[40] Commission of the European Communities 2011b, p. 15.

The reasoning behind this result is that the additional profit contribution earned from providing non-audit services increases the number of audit firms (i.e., decreases the level of audit market concentration). Thus, comparatively more clients are matched with a specialist audit firm, which decreases the additional costs of exerting high audit effort, which, in turn, decreases the managers' average probability to misreport.[41]

An additional effect of the joint provision of audit and non-audit services is that average audit fees are lower, as every auditor's nearest competitor has lower fee-determining costs than in *Case I*, since additional suppliers lead to a decrease in the distance between the competitors. A prohibition of the joint supply of audit and general consulting services would thus increase audit fees. To sum up, the implementation of "single-provider" auditing and consulting would have undesirable effects on the level of supplier concentration as well as on the average quality of audited financial statements. These effects would be even more pronounced if we would explicitly assume that the additional costs for exerting high audit effort decrease due to beneficial knowledge spillovers from non-audit to audit services.

4.2. *Case III*: Audit-Related Consulting Services

In this section, we address the concern that non-audit services impair auditor independence.[42] In general, there are two lines of reasoning: The first one is that non-audit services negatively affect auditor independence because auditors risk losing a possibly substantial amount of non-audit fees in addition to the audit fee if they would truthfully report errors and misstatements in their client's financial reporting to the public ("economic bonding"). The second one is that clients directly use non-audit fees to "bribe" their auditor not to report unfavorable findings. In this section, we focus on the second argument and assume that managers can buy additional non-audit services *after* the auditor has detected that the manager has misrepresented the company's bad economic condition.[43] If, however, the demand for non-audit services results primarily from the managers' attempt to prompt auditors to issue a clean audit opinion, managers will presumably buy audit-related non-audit services rather than gen-

[41] Lim/Tan 2008 found that audit quality (i.e., the propensity to issue going-concern opinions, the propensity to miss analysts' forecasts, and the earnings-response coefficient) increases with the level of non-audit services acquired from industry specialist auditors compared to non-specialist auditors.

[42] Sharma/Sidhu 2001 and Frankel et al. 2002 provide evidence that auditor independence might be compromised when clients pay relatively high non-audit fees. Firth 2003 finds that companies paying quite high consultancy fees are more likely to receive a clean audit opinion.

[43] We implicitly assume that if a contract for non-audit services gets signed, auditors rather issue a clean opinion contrary to their better knowledge than push the manager to correct a misleading report. In our model, a correction of a report of $r(B) = G$ to $r(B) = B$ could be excluded if the manager's disutility after having truthfully reported a bad economic condition would be taken into account in setting non-audit fees. Doing so, however, would not yield additional insights.

eral consulting services, because the audit committee either does not have to approve this decision or is less skeptical than of a sudden additional demand for general consulting services.

We regard the costs audit firms have to incur for supplying audit-related consulting services as independent from the distance x between audit firm and client. This assumption is motivated by the fact that an auditor who has conducted the audit already has invested some distance-dependent costs to get familiar with the client's business. We assume that the auditor demands a fixed mark-up in order to issue a clean audit opinion against better knowledge, i.e., we consider the profit contribution from non-audit services to be distance-independent. In our model, the client's motive to buy non-audit services is to influence the auditor's reporting strategy rather than to derive some additional utility from the consumption of non-audit services.[44] Thus, clients will not choose a supplier different from their auditor for conducting non-audit services. Particularly in the case of audit-related consulting services, the demand of the two services from the same supplier can also be frequently observed in business practice.

Consider the situation where the auditor has exerted high audit effort and thus was able to detect that his/her client had misreported. Contrary to *Case I*, where auditors refuse to issue a clean opinion if they are aware of the client's false report, the auditor and the client now can agree on a consulting contract as a valuable consideration for a clean audit opinion. Such a contract is acceptable for the client if the additional non-audit fee, fee_{ARC}, does not exceed the decrease in utility due to a qualified opinion, i.e., if $fee_{ARC} \leq d_d$. The auditor would agree on such a contract if the profit contribution from offering non-audit services, π_{ARC}, is at least as high as possible reputational effects, i.e., if $\pi_{ARC} \geq R$. Obviously, the profit contribution from non-audit services cannot exceed non-audit fees. Thus, we summarize our conditions to $R \leq \pi_{ARC} \leq fee_{ARC} \leq d_d$.

The respective decisions are as follows:

If managers truthfully report $r(B) = B$, auditors still always choose low audit effort. Provided the auditor and the client agree upon a non-audit services contract after the auditor has detected that the manager's report of $r(B) = G$ is not applicable, the auditor does not report

[44] Lau/Mensah 2009, however, found that payments to auditors for non-audit services are positively related to the client's one-period ahead sales growth, i.e., the provision of non-audit services by the statutory auditor indeed seems to provide value to the firm. Even if non-audit fees are intended primarily to compromise auditor independence, the value obtained by the client may thus justify their hiring.

this finding to the public, i.e., $Pr_r = 0$. If managers report $r(G) = G$ or $r(B) = G$, auditors exert high audit effort if the probability of a distortion of financial statements, Pr_{dARC}, is relatively high. Auditors are indifferent between conducting high and low effort if managers report $r(B) = G$ with probability

$$(18) \qquad Pr_{dARC}^{*}(x) = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta a \cdot x}{\pi_{ARC} - \Delta a \cdot x} \leq Pr_d^{*} = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta a \cdot x}{R - \Delta a \cdot x} \text{ since } \pi_{ARC} \geq R.$$

The possibility to buy audit-related consulting services during the audit process thus tends to decrease the individual probability of a specific client to misreport, since the auditor's payoff after having observed that financial statements are misleading increases by the additional profit contribution from non-audit services. $Pr_{dARC}^{*} < 1$ is always fulfilled as $Pr_d^{*} < 1$ is assumed to hold.

Managers, however, also consider the (valuable) possibility of getting a clean audit opinion even after having misreported. They are indifferent between misreporting and truthfully reporting a bad economic condition if auditors exert high effort after having observed a report of a good economic condition with probability

$$(19) \qquad Pr_{heARC}^{*} = \frac{d_t - m}{fee_{ARC}} \geq Pr_{he}^{*} = \frac{d_t - m}{d_d} \text{ since } fee_{ARC} \leq d_d.$$

After having misreported, managers have to pay additional non-audit fees in order to get a clean audit opinion, but at the same time avoid the decrease in disutility d_d from receiving a qualified audit opinion. Since $fee_{ARC} \leq d_d$, the managers' net payoff after misreporting does not decrease, which, in turn, tends to increase the auditors' probability to exert high effort. To ensure $Pr_{heARC}^{*} < 1$ to hold, we assume $fee_{ARC} > d_t - m$.

These probabilities specify the Nash equilibrium in mixed strategies for *Case III*. Ceteris paribus, the individual probabilities for false reports of $r(B) = G$ tend to decrease, whereas the probabilities for high audit effort tend to increase as compared to *Case I*, given an arbitrary pair of audit firm and client.

In order to compare *Case III* with *Case I*, we assume that audit firms have superior bargaining power and thus achieve to get the total benefits resulting from the joint supply of au-

dit-related consulting services, i.e., $fee_{ARC} = d_d$ and $\pi_{ARC} > R$. The optimal strategies therefore are

(18') $$Pr_{dARC}^{*}(x) = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{\Delta a \cdot x}{\pi_{ARC} - \Delta a \cdot x} < Pr_d^{*}(x) \text{ and}$$

(19') $$Pr_{heARC}^{*} = \frac{d_t - m}{d_d} = Pr_{he}^{*}:$$

Since due to their superior bargaining power exclusively auditors gain from the additional supply of non-audit services, managers – in order to make auditors indifferent between their pure audit effort strategies – react with a decrease in their probability to misreport, whereas the managers' payoffs and thus the auditors' strategy remain unchanged.

The expected direct audit costs of audit firm i can be calculated to:

(20) $$E\left[c_{ARC}^{i}(x)\right] = \left[a_{le} + (1-\theta_B) \cdot Pr_{heARC}^{*} \cdot \Delta a + \theta_B \cdot Pr_{heARC}^{*} \cdot \Delta a \cdot Pr_{dARC}^{*}(x)\right] \cdot x .$$

Since $Pr_{dARC}^{*}(x) < Pr_d^{*}(x)$, the expected direct costs of conducting the audit are lower than in *Case I*, i.e., $E\left[c_{ARC}^{i}(x)\right] < E\left[c^{i}(x)\right]$.

In calculating the expected reputational effects, we have to take into account that if the economic condition of the firm is bad and managers misreport, audit firms in any case suffer the loss RL, either because they have not detected the false report due to their low audit effort, or because they accept the loss in order to gain the consulting contract. For simplicity, we assume that the loss RL for both decisions is identical, i.e., for reputational damages and legal liability it does not matter whether the incorrect audit opinion is due to low effort or due to an independence impairment. The expected reputational effect is thus given by

(21) $$E\left[Re_{ARC}^{i}(x)\right] = \theta_B \cdot (-RL) \cdot Pr_{dARC}^{*}(x) .$$

The opportunity to additionally earn the (positive) profit contribution from non-audit services, π_{ARC}, is given by

(22) $$E\left[Opp_{ARC}^{i}(x)\right] = \theta_B \cdot Pr_{heARC}^{*} \cdot \pi_{ARC} \cdot Pr_{dARC}^{*}(x) .$$

Combining (21) and (22) leads to the expected consulting-adjusted reputational effect:

$$E\left[Re_{ARC}^{adj\ i}(x)\right] = E\left[Re_{ARC}^{\ i}(x)\right] + E\left[Opp_{ARC}^{\ i}(x)\right] = \theta_B \cdot \left(Pr_{heARC}^{\ *} \cdot \pi_{ARC} - RL\right) \cdot Pr_{dARC}^{\ *}(x) \quad (23)$$

Since $\pi_{ARC} > R$, the consulting-adjusted reputational effect for one specific client is less severe than its equivalent for *Case I*, i.e., $E\left[Re^{i}(x)\right] < E\left[Re_{ARC}^{adj\ i}(x)\right]$. Moreover, $E\left[Re_{ARC}^{adj\ i}(x)\right]$ is not necessarily negative anymore (it even gets positive for $\frac{d_t - m}{d_d} \cdot \pi_{ARC} > RL$, which would mean that expected reputational losses are more than offset by the profit contribution earned from non-audit services).

The expected reputation-adjusted audit costs then are

$$\begin{aligned} E\left[C_{ARC}^{\ i}(x)\right] &= E\left[c_{ARC}^{\ i}(x)\right] - E\left[Re_{ARC}^{adj\ i}(x)\right] \\ &= \left[a_{le} + (1-\theta_B) \cdot Pr_{heARC}^{\ *} \cdot \Delta a + \theta_B \cdot Pr_{heARC}^{\ *} \cdot \Delta a \cdot Pr_{dARC}^{\ *}(x)\right] \cdot x \,. \\ &\quad - \theta_B \cdot \left(Pr_{heARC}^{\ *} \cdot \pi_{ARC} - RL\right) \cdot Pr_{dARC}^{\ *}(x) \end{aligned} \quad (24)$$

If the auditor can sell additional non-audit services, both the effects of a decrease in expected direct audit effort costs $\left(E\left[c_{ARC}^{i}(x)\right] < E\left[c^{i}(x)\right]\right)$ and the attenuation of the consulting-adjusted reputational effect $\left(E\left[Re^{i}(x)\right] < E\left[Re_{ARC}^{adj\ i}(x)\right]\right)$ result in a decrease in the expected overall audit costs $\left(E\left[C_{ARC}^{\ i}(x)\right] < E\left[C^{i}(x)\right]\right)$.

The audit fees of audit firm i again are determined by the expected reputation-adjusted audit costs of the nearest competitor $i-1$:

$$fee_{ARC}^{\ i}(x) = E\left[C_{ARC}^{\ i-1}(1/n - x)\right]. \quad (25)$$

Given a certain number n of audit firms, we can conclude that the average demanded audit fees in *Case III* are lower than in *Case I*, as the competitors' expected overall costs also decrease, i.e., $fee_{ARC}^{\ i}(x) < fee^{i}(x)$.

The profit contribution of audit firm i can be calculated to

$$E\left[pc_{ARC}^{\ i}(x)\right] = fee_{ARC}^{\ i}(x) - E\left[C_{ARC}^{\ i}(x)\right]. \quad (26)$$

Integration and taking both sides on the unit circle into account leads to the overall profit contribution:

$$
\begin{aligned}
E\left[PC_{ARC}{}^{i}(n)\right] &= 2\cdot\int_{0}^{1/2n} E\left[pc_{ARC}{}^{i}(x)\right]dx \\
&= a_{le}/2n^2 + (1-\theta_B)\cdot Pr_{he}{}^{*}\cdot\Delta a/2n^2 \\
&+ 2\cdot\theta_B\cdot Pr_{he}{}^{*}\cdot\Delta a\cdot\int_{0}^{1/2n}\left[Pr_{dARC}{}^{*}(1/n-x)\cdot(1/n-x) - Pr_{dARC}{}^{*}(x)\cdot x\right]dx \\
&- 2\cdot\theta_B\cdot\left(Pr_{he}{}^{*}\cdot\pi_{ARC} - RL\right)\cdot\int_{0}^{1/2n}\left[Pr_{dARC}{}^{*}(1/n-x) - Pr_{dARC}{}^{*}(x)\right]dx,
\end{aligned}
\tag{27}
$$

which can be simplified to

$$
\begin{aligned}
E\left[PC_{ARC}{}^{i}(n)\right] &= 2\cdot\int_{0}^{1/2n} E\left[pc_{ARC}{}^{i}(x)\right]dx \\
&= \frac{a_{le}}{2n^2} + 2\cdot(1-\theta_B)\cdot\left(\frac{\pi_{ARC}}{\Delta a}\cdot RL\right)\cdot ln\left[1+\frac{(\Delta a/2n)^2}{\pi_{ARC}{}^{2} - \pi_{ARC}\cdot\Delta a/n}\right].
\end{aligned}
\tag{27'}
$$

Compared to *Case I*, the overall audit costs and thus also the audit fess demanded are smaller if the auditor can supply additional audit-related consulting services. But given a certain number n of audit firms, the overall profit contribution of an arbitrary audit firm is smaller for the case with audit-related consulting services than for the initial case without consulting, i.e., $E\left[PC_{ARC}{}^{i}(n)\right] < E\left[PC^{i}(n)\right]$ as $\partial E\left[PC_{ARC}{}^{i}(n)\right]/\partial\pi_{ARC} < 0$. This result is illustrated in Figure 4 (again, we assume linear costs for simplicity).

Figure 4

Taking the fixed costs into account and solving for n leads to the equilibrium number of audit firms on the market, $n_{ARC}{}^{*}$:

$$E\left[PC_{ARC}{}^{i}\left(n_{ARC}{}^{*}\right)\right] = c_{FA}.^{45} \tag{28}$$

As $\partial PC_{ARC}{}^{i}(n)/\partial n < 0$, the equilibrium number of audit firms for the different cases can be ordered as follows: $n_{ARC}{}^{*} < n^{*} < n_{GC}{}^{*}$. Thus, the equilibrium number of audit firms is *smaller* when audit firms are allowed to offer audit-related non-audit services to their audit

[45] In order to avoid the distinction of further cases, we refrain from introducing additional fixed costs for offering audit-related consulting services.

clients, as compared to a situation in which consulting is prohibited. A ban on this kind of consulting services would thus indeed *increase* the number of audit firms active in the market, i.e., *reduce* the level of supplier concentration. Therefore, the question arises whether "single-provider" auditing and consulting indeed would also improve the quality of audited financial statements and should therefore be implemented:[46]

The average probability of misrepresenting a bad economic condition of the firm and thus the expected percentage of distorted financial reports can be calculated to

$$\begin{aligned}\overline{Pr_{dARC}{}^{*}\left(n_{ARC}{}^{*}\right)} &= 2\cdot n_{ARC}^{*}\cdot\int_{0}^{1/2n^{*}} Pr_{dARC}^{*}(x)\,dx \\ &= \frac{(1-\theta_B)}{\theta_B}\cdot\left[2\cdot n_{ARC}^{*}\cdot\frac{\pi_{ARC}}{\Delta a}\cdot ln\left(\frac{\pi_{ARC}}{\pi_{ARC}-\Delta a/2n_{ARC}{}^{*}}\right)-1\right].\end{aligned} \tag{29}$$

As $\partial\overline{Pr_{dARC}{}^{*}\left(n_{ARC}{}^{*}\right)}/\partial n_{ARC}{}^{*}<0$ and $\partial\overline{Pr_{dARC}{}^{*}\left(n_{ARC}{}^{*}\right)}/\partial\pi_{ARC}<0$, however, we do not have a clear result regarding a comparison of the average distortion probability between *Case III* and *Case I*. On the one hand, the number of audit firms is lower in *Case III*, which leads to a larger number of distorted financial reports, *ceteris paribus*. On the other hand, the lower profit contribution in *Case III* leads to a decrease in the average deception probability.

In determining the quality of audited financial statements, we have to take into account that a distorted financial statement never gets publicly observable, either because auditors do not detect false reports due to their low audit effort or because auditors compromise their independence. The respective measure for the quality of audited financial statements can be adjusted to

$$\begin{aligned}\Phi_{ARC} &= 1-\theta_B\cdot\overline{Pr_{dARC}{}^{*}\left(n_{ARC}{}^{*}\right)} \\ &= 1-(1-\theta_B)\cdot\left[2\cdot n_{ARC}{}^{*}\cdot\frac{\pi_{ARC}}{\Delta a}\cdot ln\left(\frac{\pi_{ARC}}{\pi_{ARC}-\Delta a/2n_{ARC}{}^{*}}\right)-1\right].\end{aligned} \tag{30}$$

Again, we cannot predict a clear effect, but for most of the parameter constellations the quality of audited financial statements decreases.

[46] The empirical evidence on the question whether non-audit services impair auditor independence and audit quality is mixed: Ruddock et al. 2006 found that higher than expected levels of non-audit services are not associated with reduced news-based conservatism. Ashbaugh et al. 2003 document that non-audit fees do not affect performance-adjusted discretionary current accruals and that there is no statistically significant association between firms meeting analyst forecasts and auditor fees.

We can make the following qualitative comparison of the *Cases II* and *III*: In *Case II*, the provision of profitable consulting services increases the audit firms' profit contribution, given a certain number n of audit firms. The managers' individual probability to misreport, however, remains constant for a given distance x and a given number n of audit firms. The higher profit contribution, however, increases the equilibrium number of audit firms. Thus, the average distance between audit firms and clients, and thus the average probability to misreport, decreases. In *Case III*, in contrast, the managers' individual probability to misreport decreases in order to make the auditor indifferent between exerting high and low audit effort. This decreases audit costs, audit fees, and the profit contribution derived from auditing. Thus, the equilibrium number of audit firms decreases.

5. Summary and Conclusion

In the present paper, we use a formal model to analyze the effects that a ban on non-audit services can have on the level of audit market supplier concentration and on the quality of audited financial statements. In particular, we embed the optimal decisions made within a strategic auditor-manager game, determining expected audit costs and reputational effects, into a market matching model. Our two-stage set-up allows us simultaneously analyzing the different effects of a joint provision of audit and non-audit services: First, we are able to investigate the direct effect of a joint supply of both services on the quality of audited financial statements (i.e., the managers' optimal reporting decisions and the auditors' optimal decisions regarding audit effort and auditor independence). Second, we can predict the qualitative effects on the equilibrium structure of the audit market, which depend on audit firms' profits and thus on the scope of services audit firms are permitted to provide. Third, our model allows studying the interdependencies between audit firms' market shares and the quality of audited financial statements. Thus, we intend to contribute to the recent discussion of regulatory reforms that simultaneously address both the structure of the audit market and concerns regarding auditor independence.[47]

Our results indicate that a ban on general consulting services reduces audit firms' profits and thus decreases the equilibrium number of audit firms (i.e., increases market concentration). Moreover, a prohibition of the joint provision of both services can have negative effects on the quality of audited financial statements, since the managers' average probability to misreport increases. These effects are in direct contrast to the aims the Commission has outlined

[47] See Commission of the European Communities 2010.

in its Green Paper. Regarding the prohibition of audit-related consulting services that are demanded in order to "bribe" auditors, however, we predict an increase in the equilibrium number of audit firms. The effect on the quality of audited financial statements, however, cannot be exactly determined, so we cannot confirm the Commission's expectation of a clear positive effect. Moreover, our results are in line with the opinion that a high level of audit market concentration does not necessarily mean that audit quality is low.[48] To sum up, the effects of "single-provider" auditing and consulting crucially depend on the point in time when consulting services are contracted upon.

Our analysis has several limitations. First, depending on the parameter constellations chosen, a wide variety of outcomes are possible. We show, however, that not all of them are desirable from the regulator's perspective. Second, the determination of the specific outcome that will occur depends largely on the players' payoffs, the allocation of bargaining power, the level of competition, the suppliers' cost structures, and audit firms' adaptive reactions to regulatory changes. However, with regard to some of these aspects, there is to date only limited empirical evidence. Third, the situations in Member States can greatly differ, such that it becomes questionable whether, from an economic perspective, a meaningful EU-wide solution can be found. It is likely that if implemented as proposed, these new regulations will result in the need for additional corrective legislation in the future.

[48] The Swiss Federal Audit Oversight Authority, for example, argues that it "identified a larger average number of deficiencies per firm review at the small to medium-sized state-regulated audit firms than at the annually-inspected Big 3" (Federal Audit Oversight Authority FAOA 2010, p. 20), and therefore a high level of supplier concentration does not imply a low level of audit quality. The chairman of the PCAOB James Doty, also questioned that measures to promote competition might have a negative effect on audit quality (see Doty 2011).

Figures

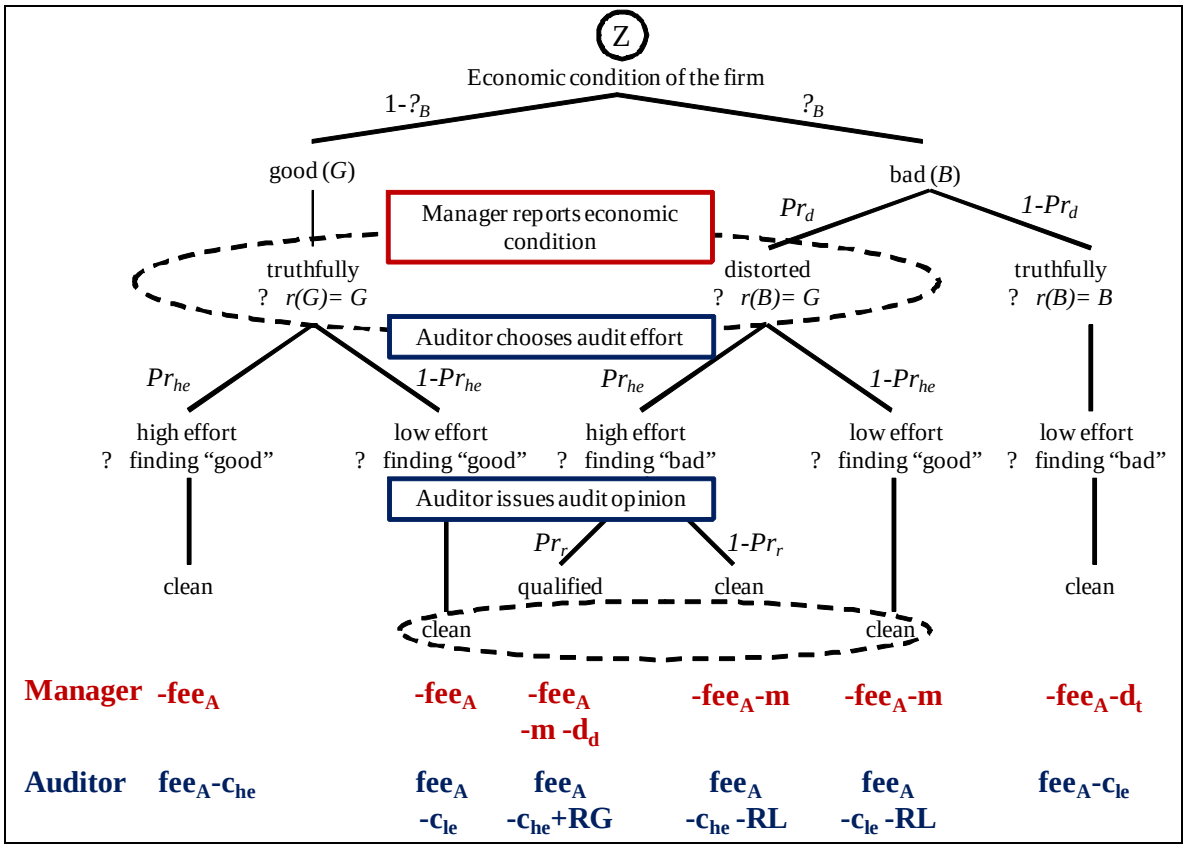

Figure 1: Decisions and payoffs for the game analyzing the strategic auditor-client interaction

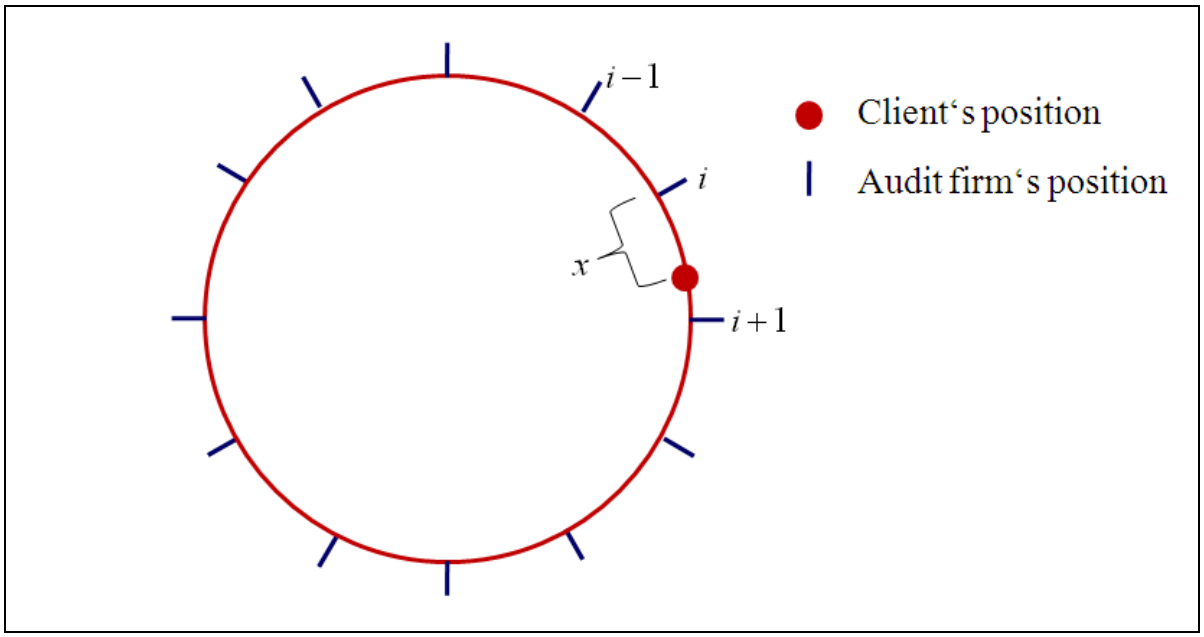

Figure 2: Audit firms and clients on the unit circle

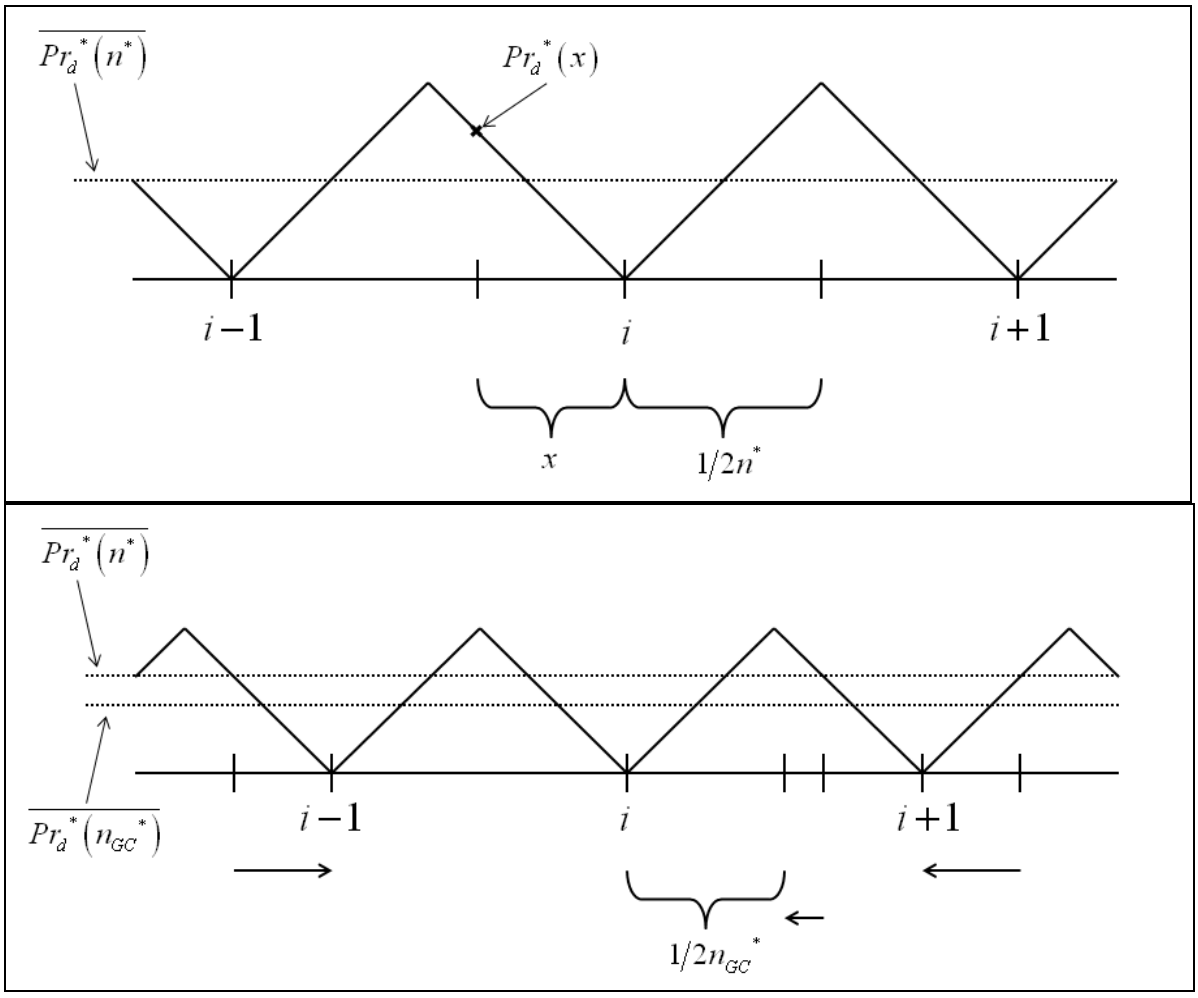

Figure 3: The managers' probability to misreport a bad economic condition of the company, given a low number n^* (upper part) or a high number n_{GC}^* (lower part) of audit firms

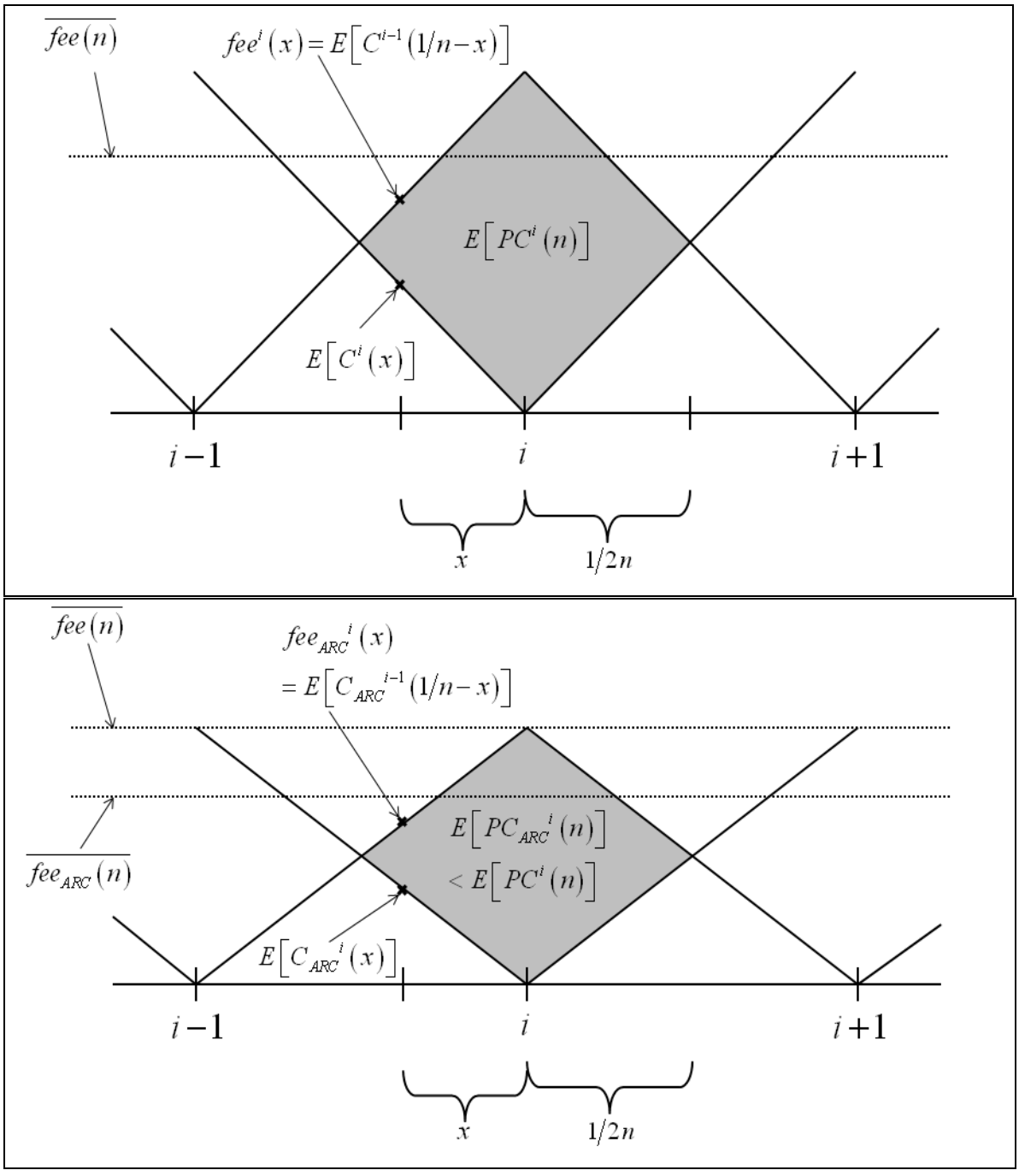

Figure 4: An audit firm's overall profit contribution for *Case I* and *Case III*, given a certain number of audit firms n.

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