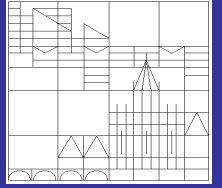




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The Interdependence between Audit Market Structure and the Quality of Financial Reporting: The Case of Non-Audit Services

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Abstract

Recently, the Commission of the European Communities has put up for discussion various reform proposals intended to enhance the reliability of audits and to re-establish trust in the financial market. In particular, the EU Commission seeks to strengthen auditor independence and to decrease 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 could thus lead to ill-advised 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 average probability that managers will misreport increases. Our model predicts the opposite effects for a prohibition on audit-related consulting services that managers purchase in order to tempt auditors to compromise their independence. The effects of a ban on “single-provider” auditing and consulting thus depend on the kind of services an auditor is allowed to offer and, in particular, on the point in time at which consulting services are negotiated.

Keywords

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

JEL-Classification

D43, L11, M42

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 many of the financially distressed institutions had only just received unqualified opinions from their auditors, the Commission of the European Communities has begun to direct its focus toward 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 the auditing process could make a greater contribution to the stabilization of the financial system.² In November 2011, the EU Commission issued a proposal regarding regulatory reforms intended to improve the quality of audits of public-interest entities,³ as well as a proposal for a directive that will attempt to expand the internal market for statutory audits by improving the conditions for small and medium-sized firms.⁴

In the current debate, the EU Commission places high priority on the strengthening of *auditor independence*, i.e., the willingness of statutory auditors to communicate any errors they uncover in financial statements to the public. The EU Commission therefore proposes the implementation of a limitation on the fees an audit firm can earn from the provision of related financial audit services to an audited entity of at most 10% of the fees paid by that entity for the statutory audit. In addition, the Commission suggests implementing a cap on the total fees from audit and related financial audit services received from a specific public-interest entity of 15% (as a proportion of an audit firm’s total revenue) over two consecutive years. Moreover, the more frequent use of joint audits and the adoption of mandatory audit firm rotation for public-interest entities after a maximum period of six years (exceptionally eight years) in addition to rotation of the key audit partner(s) after seven years are discussed, among other measures. Furthermore, the EU Commission suggests a restriction on the joint provision of non-audit services.⁵ More precisely, the EU Commission proposes that in all cases statutory

¹ See Commission of the European Communities 2010.

² However, thus far there has been no concrete evidence to suggest that failures in the audit process were 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 with regard 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 in cases in which an objective, reasonable, and informed third party would draw the conclusion that their independence was at risk, auditors should not provide audit services. However, Article 22, which also addresses the provision of non-audit ser-

auditors should be prevented from providing their audit clients with non-audit services that are assessed as incompatible with the independent public-interest function of auditing.⁶ In contrast, for non-audit services that are not fundamentally incompatible with the audit function, 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 however, audit-related financial services could 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. In theory, auditor independence is enhanced when consulting profits contingent on decisions regarding the audit certification are not at stake (“threat of self-interest”), and when auditors must not assess the results of their own services (“threat of self-review”). Consequently, the EU Commission argues that large audit firms should not be allowed to supply any non-audit services to public-interest entities and ought not to belong to a network that provides non-audit services within the European 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 auditing listed companies.¹⁰ In most of the internal audit markets of EU Member States, the so-called “Big 4”¹¹ provide audit services to more than 90% of listed companies.¹² Taking into consid-

ices, has been differently implemented 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.

⁶ See Commission of the European Communities 2011b, Article 10.3.a. These services include expert services unrelated to the audit; tax consultancy; general management and other advisory services; bookkeeping and preparation of accounting records and financial statements; designing and implementing internal control or risk management; procedures related to the preparation and/or control of financial information included in 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 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 include 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 of compliance with tax requirements where such attestation is required by national law, and any other statutory duty related to audit work imposed by European Union legislation on 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 within the European Union of more than € 1,500,000,000.

¹⁰ Quick/Wolz 2003 and Bigus/Zimmermann 2008 provide concentration studies of the German audit market, and Stefani 2006 investigates the Swiss market for audit services. The General Accounting Office 2008 analyzes the situation in the US, and Ewert/London Economics 2006 and Le Vourc’h/Morand 2011 present evidence regarding audit market concentration within the EU.

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

eration the industry specialization of audit companies, in reality only very few suppliers are capable of auditing complex financial institutions. For example, in Germany, auditing and consulting services for banks and insurance companies are dominated by only two of the Big 4 firms.¹³ In addition, there is evidence that market concentration is increasing over time.¹⁴ Most critically, 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. There is also 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 follows a two-pronged policy in which “auditor independence” and “market concentration” are generally 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 the abolition of “single-provider” auditing and consulting, a measure intended to strengthen auditor independence, can also have adverse effects on 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 Com-

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

¹³ Le Vourc’h/Morand 2011 document similar findings in their analysis of market concentration by category of industry in 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 audit quality and the high concentration of suppliers in the UK’s national audit market. The OFT notes that in 2010 the Big 4 firms in aggregate accounted for 99% (98.5%) of the audit fees paid by FTSE-100 (FTSE-250) companies. As a result, 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 intended to counteract the fact that market shares are unequally distributed between large and small audit firms.

mission or in the academic literature.¹⁶ The failure to anticipate mutual interference of the proposed measures could lead to counterproductive regulatory decisions.

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 their firms' bad economic conditions, as well as the auditors' incentives to exert high audit effort (in order to detect misreporting) and to correctly report their findings to the public. We assume that the auditors' effort costs depend on their specialization with regard to the clients' audit-relevant characteristics. We determine the auditors' *ex ante* expected costs for 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 in the market for audit services.

Regulation regarding the scope of services the auditor is allowed to provide differs significantly across the EU Member States, and in some countries the provision of consulting services is not significantly restricted. In its proposals, the EU Commission differentiates between non-audit services (services that are incompatible with the audit function) and related financial audit services. Thus, we analyze three different scenarios:

First, we consider the case in which audit firms are not allowed to provide non-audit services to their audit clients. To show the effects of the proposed ban on "single-provider" auditing, we use the results of *Case I* as a reference point, i.e., we compare *Case I* with two additional scenarios in which audit firms are permitted to offer different kinds of non-audit services.

Second, we investigate a scenario in which audit firms are allowed to supply general non-audit-related consulting services in addition to the audit. Since audit and consulting services are negotiated simultaneously and fees are sunk at the point in time in which decisions during the audit process are made, non-audit fees do not affect auditor independence in our single-period setting. However, the option to provide general, non-audit-related consulting services increases audit firms' profit contributions and thus the equilibrium number of audit firms. The resulting increase in the degree of auditor industry specialization tends to reduce the addition-

¹⁶ Comunale/Sexton 2005 investigate the effects of mandatory auditor rotation and 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 market structure.

al cost of exerting high audit effort; this, in turn, decreases the *average* probability that managers will misrepresent negative economic circumstances. 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 is actually higher in a situation in which "single-provider" auditing and 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 than when audit firms provide audit services only. Overall, the prohibition of audit firms providing consulting services would actually *increase* concentration (i.e., reduce the number of audit firms) and simultaneously *decrease* the quality of financial reporting (i.e., increase the percentage of deceptive financial reports). This result is the exact opposite of the aims the Commission has outlined in its recent reform proposals.

Third, we analyze a scenario in which managers request audit-related non-audit services in order to tempt auditors to compromise their independence. More precisely, audit-related consulting services are purchased in return for a clean audit opinion 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 auditors benefit from the additional supply of non-audit services, the *individual* probability that managers will misreport decreases; as was the case with the provision of general consulting services, the managers' payoffs and thus the auditors' strategy remain unchanged. Thus, auditors' expected costs (but also their audit fees and their profit contribution) decrease as a result of 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 would thus 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 the prohibition of non-audit services are taken into account, a ban on "single-provider" auditing and consulting might even have adverse effects on the quality of audited financial statements. Third, the effects outlined above depend on the kind of non-audit services the auditor is allowed to offer, and, crucially, on the point in time at which these services are negotiated.

The paper is organized into five sections. In Section 2, we briefly review the relevant literature. Section 3 presents our model and an 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

To date, only a few analytical papers have directly addressed the effects of the joint supply of audit and non-audit services. Wu 2006, for example, presents a model in which accounting firms provide both audit and non-audit services, examining how competitive behavior in the markets for audit services and for non-audit services, respectively, affects oligopolistic competition in the 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 audit firms' strategies in the other market ("competition crossovers"), knowledge spillovers can thus 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. In contrast to our paper, Wu 2006 emphasizes the resulting market equilibrium rather than 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"). Consequently, 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 empirical evidence re-

garding the existence of knowledge spillovers is mixed,¹⁷ our model neglects both information effects and direct cost reductions resulting from the joint supply of the two services, focusing instead on the effects on market structure.

DeAngelo 1981 defines 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 an auditor derives from one client (the "quasi-rent") and the sum of the economic advantages earned from providing services to all clients is crucial for auditor independence. The provision of non-audit services can increase the profit contribution derived from one specific client, thus raising the economic advantage auditors would put at risk should they deviate from an unqualified audit opinion.

In line with this argument, Beck et al. 1988 analyzes the relationship between non-audit services and auditor independence, demonstrating 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 in order for non-audit services to increase the client-specific quasi-rent, the authors do not specifically determine the ratio of quasi-rents that indicates a threat to auditor independence, as neither the behavior of other clients nor the effect of allowing or prohibiting non-audit services on an auditor's market share 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 investigation of the relationship 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.

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 the result of knowledge spillovers. However, models taking the endogeneity between non-audit fees and audit fees into account 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 contradictory results). In addition, studies based on audit staff hours 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).

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

The idea of applying a market matching model to the audit market has also been proposed by Chan 1999 and by Simons/Zein 2011. To model auditors' decisions regarding the level of audit quality they will supply (i.e., quality-related audit market segmentation), Simons/Zein 2011 adopt a linear market matching model based on Hotelling 1929. One interesting finding 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 low-balling. However, neither Chan 1999 nor Simons/Zein 2011 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. However, the focus of Bleibtreu/Stefani 2011 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 is that the strategic interaction between managers and auditors is not explicitly modeled; in the present paper, we address managers' reporting decisions and auditors' effort choices, and thus directly investigate the effect the scope of services has 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, and (2) the strateg-

ic 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 the decision-making of the auditor and the company to be audited in the phase of preparing and auditing financial statements, i.e., after the two parties have entered into an audit contract. In this game, managers make decisions 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 findings uncovered during the audit). We apply backwards induction to derive the managers' and auditors' optimal strategies regarding financial reporting and audit quality, respectively.

In addition, we apply the *circular location model* proposed by Salop 1979 to analyze audit fee price-setting during the negotiating process. More precisely, we embed the optimal decisions from the strategic game between auditors and clients, which determine expected audit costs and reputational effects, into a market matching model. This allows us to derive the actual level of audit fees, the equilibrium matching between clients and audit firms, and the resulting market share distribution.

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, conversely, how the incentive-influenced strategic interaction of players affects the market shares of audit firms. Our model allows simultaneous consideration of both audit market concentration and the quality of audited financial statements. 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 auditing and consulting services, we consider three scenarios with different approaches to 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 the benchmark case. In *Case II*, audit firms offer general, non-audit-related consulting services. Consulting services and audit services are simultaneously negotiated. In *Case III*, audit firms can extend the audit by audit-related non-audit services; in contrast to *Case II*, non-audit services are negotiated only after the auditor has detected the manager's misrepresentation of the firm's economic condition. We assume that clients are legally obligated to demand audits, but

that purchasing of non-audit services in *Case III* is optional. For simplicity, we assume in *Case II* that general consulting services are valuable for all clients, and thus all clients actually 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 that determines the audit fee, fee_A . 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 that emerge as the 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 timeline of the players' decisions, their respective information sets, and the payoffs resulting from the players' 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; 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 the poor performance of their predecessors in the case of a change in the board of executive directors,²⁰ or to set aside earnings for future fiscal years if managers' bonuses are already

¹⁹ However, our results would remain unchanged if only some clients bought non-audit services, provided that each audit firm has an identical share in the market for consulting services.

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 an executive change and increase earnings the following year. Wilson/Wang 2010 found significant income-decreasing earnings management in years in which both a change of CEO and a change of board chairperson took place. However, Murphy/Zimmerman 1993 found discretionary influence on turnover-related changes in R&D, advertising, capital expenditures, and accounting accruals only in poorly performing firms experiencing a non-routine change in CEO.

maxed out.²¹ In our model, managers thus always report G truthfully, i.e., $r(G) = G$. However, if the economic condition of the company is bad, managers must decide whether they should report truthfully ($r(B) = B$) or falsely report that the firm is in good shape ($r(B) = G$): (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 to bad news or as a reduction in managers' 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 accept the risk that auditors will detect their misreporting and refuse to issue a clean audit opinion for their financial statements. A qualified or adverse audit report would result in a decrease of d_d in the managers' utility, signifying a loss of reputation, a decrease in performance-based compensation, or adverse reactions by 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 for a manager who honestly and voluntarily admits the bad economic condition of the corporation. We denote the probability that managers will distort financial statements (i.e., $r(B) = G$) as 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 allows misstatements in the client's financial reports to remain undetected. Exerting high audit effort induces higher audit costs than low audit effort, i.e., $c_{he} > c_{le}$. We describe these costs in more detail in the next section.

We assume that auditors cannot observe their client's economic condition prior to conducting the audit. If, however, managers have truthfully reported negative economic conditions, 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 $fee_A - c_{le}$ for the audit. 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

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 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.

their audit effort: (1) If auditors exert low effort, they cannot determine whether the actual situation is G or B , i.e., they cannot prove that $r(B)=G$ is misleading. Thus, auditors will have to issue a clean audit report on $r(B)=G$ as well as on $r(G)=G$. If it later turns out that the economic condition was actually B and that $r(B)=G$ was therefore deceptive, auditors will face a loss of RL (e.g., reputational damages or legal action initiated by third parties), which must be subtracted from the profit contribution, $fee_A - c_{le}$.²⁴ (2) If auditors exert high audit effort, they can perfectly reveal the actual economic situation of the firm. Thus, they will know that $r(G)=G$ is true and issue a clean audit opinion, but will only earn the lower profit contribution, $fee_A - c_{he}$. Auditors exerting high effort can also prove that the report $r(B)=G$ is misleading and can then decide whether they will 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 knowingly issuing an unearned clean audit opinion for $r(B)=G$, they risk reputational losses of RL , which must be subtracted from the profit contribution. We define $RG + RL \equiv R$, Pr_{he} as the probability that auditors will choose a high effort level after having observed $r(B)=G$ or $r(G)=G$, and Pr_r as the probability that the auditor will not issue a clean audit opinion after uncovering a misstated report of $r(B)=G$ (i.e., the probability that the auditor will remain independent).

We make the standard assumptions of risk neutrality, perfect rationality, and common knowledge of these attributes and 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 will truthfully report their eventual findings that a manager's report of $r(B)=G$ misstates the eco-

²⁴ The most prominent example is perhaps the financial scandal involving Enron, which resulted in heavy damage to the reputation of Arthur Andersen, a wave of clients changing their statutory auditor following Arthur Andersen's indictment, and finally the audit firm's demise soon after convictions were obtained. Chaney/Philipich 2002, Krishnamurthy et al. 2006, and Asthana et al. 2010, among others, found that the market reacted negatively to Andersen clients after news of the indictment was released.

conomic 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 in costs $c_{he} - c_{le} \equiv \Delta c$ for auditing the 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 managers have decided how to report, 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 of distorted 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

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

because at this level, auditors are indifferent about whether to exert high or low effort after observing reports of good economic conditions. We assume that reputational effects are relatively large in comparison to the difference in audit costs, i.e., $\theta_B \cdot R > \Delta c$. Consequently, managers randomize between their pure strategies ($Pr_d^* < 1$).

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

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

These probabilities specify the Nash equilibrium in mixed strategies. Our model resembles the Matching Pennies games that have frequently been applied to study problems inherent to

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 at issue.

accounting and auditing.²⁶ As in these Matching Pennies games, the probability that the auditor will exert high audit effort depends only on the manager's payoffs, whereas the manager's probability of misreporting depends only 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, industry diversification, number of business areas, geographic dispersion of operations, corporate structure, listing status, or accounting standard in use. We assume 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 ($i = 1, 2, \dots, n$) 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 a 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 (i.e., the larger the distance x between client and auditor on the unit circle), the higher the costs for auditing this specific client.²⁹ Thus, we assume that the audit costs c_{he} and c_{le} described above increase linearly with the distance x ,³⁰ and that the costs $c_{he}(x)$ for exerting high audit effort increase at a faster rate than the costs $c_{le}(x)$ for low audit effort. More pre-

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, as have Matsumura/Tucker 1995 and 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 document experimental results regarding their predictive power.

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.

cisely, 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

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

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 $i-1$, located next to each other on the unit circle, and an arbitrary client located in between the two audit firms, at 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 incurred by audit firm i for auditing the client at distance x' are $a_{he} \cdot x'$ when high audit effort is exerted and $a_{le} \cdot x'$ for low audit effort.

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

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

$Pr_d^*(x)$ 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

$$\partial^2 Pr_d^*(x)/\partial x^2 = \frac{(1-\theta_B)}{\theta_B} \cdot \frac{2 \cdot (\Delta a)^2 \cdot R}{(R - \Delta a \cdot x)^3} > 0. \text{ Because additionally exerting high audit effort}$$

becomes comparatively more expensive the less specialized the audit firm is in its client's business, the client's option of misreporting becomes more attractive with larger values of x . The probability of a deceptive report, $Pr_d^*(x)$, increases with a_{he} and decreases with 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 $\theta_B \cdot R > \Delta a/2$, because 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., they exert high audit effort with probability Pr_{he}^*), and clients randomize between their pure reporting strategies (i.e., they 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 at a distance $x' < 1/2n$ away from audit firm i are thus given by

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

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

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 will misreport bad economic conditions is higher for clients at a great 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 with the distance between the audit firm and its client. Overall, for clients at a distance $x' < 1/2n$, the expected audit costs of audit firm i are always lower than the expected audit costs of its competitor $i-1$ ($E[c^i(x')] < E[c^{i-1}(1/n - x')]$).

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:

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

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

Again, the expected reputational effects become more severe as the distance between audit firm and client increases ($\partial Pr_d^*(x)/\partial x > 0$). Whether the expected reputational effect is positive or negative depends on the sign of the term $Pr_{he}^* \cdot R - RL = \frac{d_t - m}{d_d} \cdot (RG + RL) - RL$. Intuitively, the expected reputational effect will be negative (positive) for relatively high (low) values of RL and low (high) values of RG . Moreover, an auditor's expected reputational effect will be negative (positive) for relatively high (low) values of a manager's decrease in utility resulting from an adverse audit opinion, d_d , and for high (low) values of a manager's effort costs for misrepresentation of a bad economic situation m (because the probability that

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

auditors will exert high effort decreases with both d_d and m). The expected reputational effect is also negative (positive) when d_t , the decrease in utility affecting managers who truthfully report a bad economic condition, is relatively low (high) (because the probability that auditors will exert high effort decreases with d_t). In the following analysis, we assume $Pr_{he}^* \cdot R - RL < 0$, i.e., the reputational effect acts as a disincentive to auditors who might 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 at distance $x' < 1/2n$ is less severe than that for audit firm $i-1$, i.e., $E[Re^i(x')] > E[Re^{i-1}(1/n - x')]$. The (negative) reputational effect must be subtracted from the expected audit costs in order to calculate *expected reputation-adjusted audit costs*.

In equilibrium, auditors select a probability of exerting high effort that renders clients indifferent with respect to misreporting or truthfully reporting the bad economic condition of their company. The utility that a client can expect after having engaged an audit firm can thus be calculated as

$$(6) \quad E[U^M] = -\theta_b \cdot d_t,$$

since the audit fee, $fee^i(x)$, can be regarded as sunk after the contract has been signed. Because $E[U^M]$ 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 i and $i-1$ undercut each other's fee offers up to the point at which 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 at distance $x' < 1/2n$, i.e., a company always selects the audit firm located nearest to the client.

These results for a client at a specific distance x' can be generalized to all clients 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 $i-1$ located nearest 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 a client at distance $x \leq 1/2n$ are given by

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

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

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

The reputation-adjusted audit costs of audit firm i increase with the distance x between audit firm i and the client, while audit fees increase (decrease) with 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 $x \leq 1/2n$ can be calculated by subtracting the expected reputation-adjusted audit costs of audit firm i from the audit fees demanded:

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

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

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

which can be simplified to

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

Since $\partial E[PC^i(n)] / \partial n < 0$, the expected overall profit contribution of an arbitrary audit firm decreases with 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, $E[PC^i(n)]$, allows calculation of an audit firm's 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

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

for n^* . We consider the probability that the manager's published financial statements will accurately reflect the economic condition of the audited company, i.e.,

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

as a measure of the quality of a specific client's audited financial statements. Given the payoffs for *Case I*, auditors are always independent ($Pr_r^* = 1$), i.e., Φ reduces to $1 - \theta_B \cdot Pr_d^*(x) \cdot (1 - Pr_{he}^*)$. This formulation has two interpretations. First, the quality of audited financial statements is not identical across an audit firm's clients: The greater the distance x , the larger the individual probability $Pr_d^*(x)$ that the manager will misreport (

³² The current estimation is that the sector for audits of large companies 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 For example, the General Accounting Office 2003 discusses the fact that a number of small audit firms exited the market after the introduction of the Sarbanes-Oxley Act, because of the increase in the costs of auditing public corporations. Thus, one of the consequences of the act was a decrease in the competition for small mandates.

$\partial Pr_d^*(x)/\partial x > 0$), and the lower the quality Φ of disclosed information ($\partial\Phi/\partial x < 0$).³⁴

Second, the quality of audited financial statements also depends on the equilibrium number n of audit firms active in the market: Since the maximum possible distance between audit firm and auditee ($x^{max} = 1/2n$) decreases with n , the upper value for the probability that managers will misreport bad economic conditions at their firms also decreases with n :

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

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

Intuitively, a low number of audit firms active in the market (i.e., a high level of audit market concentration) means that there is a comparatively large number of clients unable to find an audit firm located nearby (i.e., there is a lack of specialist audit firms). Since the probability $Pr_d^*(x)$ of misreporting increases with the distance x , and the maximum possible distance is larger when there are only few audit firms, the average quality of audited financial statements decreases with 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 underlying reason is not that audit firms skimp on audit effort, because they believe that their dominant market position protects them from punishment (as they are “too big to fail”), but rather that managers exploit the fact that exerting high audit effort becomes more costly as the distance between auditor and client increases. The average probability of misrepresenting bad economic conditions and thus the expected percentage of distorted financial reports can be calculated as

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

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

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

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

which decreases with $\overline{Pr_d^*(n^*)}$ and – because $\overline{\partial Pr_d^*(n^*)}/\partial n^* < 0$ – *increases* with n^* . That is, the greater the number of active audit firms in 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 of the joint provision of consulting services 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 begin with *Case II*, in which audit firms are only allowed to offer general, non-audit-related consulting services that are clearly distinct from the audit service. Because in *Case II* both audit and non-audit fees are negotiated 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

³⁵ In our model, an increase in auditor-client “economic bonding” due to non-audit fees would impair auditor independence only in a multi-period setting, provided that the client has an incentive to replace an auditor who has refused to issue a clean opinion. For this incentive to evolve endogenously, additional assumptions would be necessary, since the incumbent auditor is always cost-efficient. However, there is 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 issuing restatements and a control group; that is, the idea that non-audit services affect audit quality (leading to the need for restatements) is not supported. Hay et al. 2006a did not find evidence that the provision of non-audit services impairs auditor independence, 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).

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

$$(14) \quad E[PC_{GC}^i(n)] = 2 \cdot \int_0^{1/2n} [E[pc^i(x)] + \pi_{GC}] dx \\ = E[PC^i(n)] + \pi_{GC}/n.$$

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

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

for n_{GC}^* , where c_{FGC} denotes the fixed costs additionally incurred by 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 is greater than that found in *Case I*, i.e., $n_{GC}^* > n^*$. Thus, the number of audit firms is larger when there is an opportunity to win profitable consulting contracts. In other words, 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, has not taken the possibility of an intermediate-term reduction in the number of suppliers into account. On the contrary, it argues that concerns of independence require that the provision of non-audit services to a certain company should preclude an audit firm from carrying out the statutory audit of that company. The consequence would be a reduction in the

³⁶ Provided that audit firms have identical market shares from providing consulting services, we obtain 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 its 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.

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 decided to leave the audit market to focus on non-audit services (see Le Vourc'h/Morand 2011, p. 200).

number of audit firms available to provide statutory audits (for large public-interest entities in particular). To secure a minimum number of audit firms available to 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 However, our model predicts that this reform would lead to a further increase in the level of audit market concentration.

Our results also contradict the EU Commission’s expectation that the prohibition of non-audit services will increase the quality of audited financial statements: Since $\frac{\partial \overline{Pr_d^*}(n^*)}{\partial n^*} < 0$, it is clear that the percentage of distorted financial reports in *Case II* is lower than that found in *Case I* (in which consulting services were prohibited), i.e.,

$$(16) \quad \overline{Pr_d^*}(n_{GC}^*) < \overline{Pr_d^*}(n^*)$$

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

$$(17) \quad \Phi_{GC} = 1 - \theta_B \cdot \overline{Pr_d^*}(n_{GC}^*) \cdot (1 - Pr_{he}^*) > \Phi = 1 - \theta_B \cdot \overline{Pr_d^*}(n^*) \cdot (1 - Pr_{he}^*).$$

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 can be matched with a specialist audit firm, which decreases the additional costs of exerting high audit effort; this, in turn, decreases the managers’ average probability of misreporting.⁴¹

An additional effect of the joint provision of audit and non-audit services is that average audit fees are lower: 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 competitors. A prohibition of the joint supply of audit and general consulting services would thus increase audit fees. In sum, the implementation of a ban on “single-provider” auditing and consulting would have undesirable effects on the level of supplier concentration and also on the average quality of audited financial statements. These effects would be even more pronounced if we

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

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

explicitly assumed that the additional costs for exerting high audit effort would 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 would impair auditor independence.⁴² In general, there are two lines of reasoning: First, non-audit services could negatively affect auditor independence because auditors would risk losing a possibly substantial amount of non-audit fees in addition to the audit fee if they truthfully report errors and misstatements in their client's financial reporting to the public ("economic bonding"). Second, clients might directly use non-audit fees to "bribe" their auditor to not report unfavorable findings. In this section, we focus on the second argument, assuming that managers can buy additional non-audit services *after* an auditor has detected misrepresentations of a company's bad economic position.⁴³ If, however, the demand for non-audit services results primarily from managers' attempts to influence auditors to issue clean audit opinions, managers will presumably buy audit-related non-audit services rather than general consulting services, either because the audit committee would not have to approve this decision, or because the committee would be less skeptical of such a move than of a sudden additional demand for general consulting services.

We regard the costs audit firms must 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 an audit has already invested some distance-dependent costs in order to become familiar with the client's business operations. We assume that the auditor demands a fixed mark-up in order to issue a clean audit opinion against his or her better knowledge, i.e., we consider the profit contribution from non-audit services to be distance-independent. In our model, the client's motive in buying 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

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 relatively high consultancy fees are more likely to receive a clean audit opinion.

⁴³ We implicitly assume that if a contract for non-audit services is signed, auditors would rather issue a clean opinion against 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 precluded if the manager's disutility after truthfully reporting a bad economic condition were taken into account in setting non-audit fees. Doing so, however, would not yield additional insight.

⁴⁴ However, Lau/Mensah 2009 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

other than their auditor for non-audit services. Particularly in the case of audit-related consulting services, the demand of the two services from the same supplier can be frequently observed in business practice.

Consider the situation in which the auditor has exerted high audit effort and thus was able to detect that the client had misreported. In contrast to *Case I*, in which an auditor would refuse to issue a clean opinion when aware of a client's false report, the auditor and the client now have the option to use a consulting contract as a valuable consideration in determining the auditor's decision. Such a contract is acceptable for the client if the additional non-audit fee, fee_{ARC} , does not exceed the decrease in utility resulting from 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 as $R \leq \pi_{ARC} \leq fee_{ARC} \leq d_d$. The respective decisions of the players are as follows:

When managers truthfully report $r(B) = B$, auditors still always choose low audit effort. Provided that the auditor and the client agree upon a non-audit services contract after the auditor detects fraudulence in the manager's report of $r(B) = G$, the auditor will not report this finding to the public, i.e., $Pr_r = 0$. When managers report $r(G) = G$ or $r(B) = G$, auditors will exert high audit effort if the probability of a distortion in the financial statements, Pr_{dARC} , is relatively high. Auditors are indifferent with respect to conducting high or low effort if managers report $r(B) = G$ with probability

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

The possibility to buy audit-related consulting services during the audit process thus tends to decrease the *individual* probability that a specific client will misreport, since the auditor's payoff after observing 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.

indeed seems to provide value to the firm. Even if non-audit fees are primarily intended to compromise auditor independence, the value obtained by the client may thus justify their use.

Managers, however, also consider the (valuable) possibility of getting a clean audit opinion even after having misreported. They are indifferent with respect to misreporting or truthfully reporting a bad economic condition if the probability of auditors exerting high effort after observing a report of a good economic condition is

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

After having misreported, managers must pay additional non-audit fees in order to get a clean audit opinion, but at the same time they avoid the decrease in utility d_d resulting 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 probability that the auditors will exert high effort. To ensure that $Pr_{heARC}^* < 1$ holds, we assume $fee_{ARC} > d_t - m$.

These probabilities specify the Nash equilibrium in mixed strategies for *Case III*. *Ceteris paribus*, the individual probabilities of false reports of $r(B) = G$ tend to decrease, whereas the probabilities for high audit effort tend to increase in comparison 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 obtain the benefits resulting from the joint supply of audit-related consulting services, i.e., $fee_{ARC} = d_d$ and $\pi_{ARC} > R$. The optimal strategies are therefore

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

$$(19a) \quad Pr_{heARC}^* = \frac{d_t - m}{d_d} = Pr_{he}^*.$$

Due to their superior bargaining power, exclusively auditors benefit from the additional supply of non-audit services; managers – in order to render auditors indifferent regarding their pure audit effort strategies – react with a decrease in their probability to misreport; managers' payoffs and thus auditors' strategies remain unchanged.

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

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

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

In calculating the expected reputational effects, we must take into account the fact 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 do not detect the false report due to their low audit effort, or because they accept the loss in order to gain a consulting contract). For simplicity, we assume that the loss RL for the two scenarios is identical; that is, for reputational damages and legal liability, it does not matter whether the incorrect audit opinion results from low effort or from impaired independence. The expected reputational effect is thus given by

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

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

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

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

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

Since $\pi_{ARC} > R$, the consulting-adjusted reputational effect for one specific client in *Case III* is less severe than its equivalent in *Case I*, i.e., $E[Re^i(x)] < E[Re_{ARC}^{adj\ i}(x)]$. Moreover, $E[Re_{ARC}^{adj\ i}(x)]$ is no longer necessarily negative; the term is positive for $\frac{d_t - m}{d_d} \cdot \pi_{ARC} > RL$, which would indicate that expected reputational losses are more than offset by the profit contribution earned from non-audit services.

The expected reputation-adjusted audit costs are thus

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

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

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

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

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 represented by

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

Integration and consideration of both sides of the unit circle leads to the overall profit contribution:

$$(27) \quad \begin{aligned} E[PC_{ARC}^i(n)] &= 2 \cdot \int_0^{1/2n} E[pc_{ARC}^i(x)] dx \\ &= a_{le}/2n^2 + (1 - \theta_B) \cdot Pr_{he}^* \cdot \Delta a / 2n^2 \\ &+ 2 \cdot \theta_B \cdot Pr_{he}^* \cdot \Delta a \cdot \int_0^{1/2n} [Pr_{dARC}^*(1/n - x) \cdot (1/n - x) - Pr_{dARC}^*(x) \cdot x] dx \\ &- 2 \cdot \theta_B \cdot (Pr_{he}^* \cdot \pi_{ARC} - RL) \cdot \int_0^{1/2n} [Pr_{dARC}^*(1/n - x) - Pr_{dARC}^*(x)] dx, \end{aligned}$$

which can be simplified to

$$(27a) \quad \begin{aligned} E[PC_{ARC}^i(n)] &= 2 \cdot \int_0^{1/2n} E[pc_{ARC}^i(x)] dx \\ &= \frac{a_{le}}{2n^2} + 2 \cdot (1 - \theta_B) \cdot \left(\frac{\pi_{ARC}}{\Delta a} \cdot RL \right) \cdot \ln \left[1 + \frac{(\Delta a / 2n)^2}{\pi_{ARC}^2 - \pi_{ARC} \cdot \Delta a / n} \right]. \end{aligned}$$

Compared to *Case I*, the overall audit costs and thus also the audit fees demanded are smaller when the auditor can supply additional audit-related consulting services. However, 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., $E[PC_{ARC}^i(n)] < E[PC^i(n)]$ as $\partial E[PC_{ARC}^i(n)]/\partial \pi_{ARC} < 0$. This result is illustrated in Figure 4 (again, for simplicity we assume linear costs).

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}^* :

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

As $\partial PC_{ARC}^i(n)/\partial n < 0$, the equilibrium number of audit firms in the three 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 clients in comparison 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. This raises the question of whether a ban on “single-provider” auditing and consulting would also improve the quality of audited financial statements and should therefore be implemented.⁴⁶

The average probability that a manager will misrepresent a bad economic condition in his or her firm and thus the expected percentage of distorted financial reports can be calculated by

$$(29) \quad \overline{Pr_{dARC}^*(n_{ARC}^*)} = 2 \cdot n_{ARC}^* \cdot \int_0^{1/2n^*} Pr_{dARC}^*(x) dx \\ = \frac{(1-\theta_B)}{\theta_B} \cdot \left[2 \cdot n_{ARC}^* \cdot \frac{\pi_{ARC}}{\Delta a} \cdot \ln \left(\frac{\pi_{ARC}}{\pi_{ARC} - \Delta a / 2n_{ARC}^*} \right) - 1 \right].$$

⁴⁵ In order to avoid additional complexity, we refrain from introducing additional fixed costs for offering audit-related consulting services.

⁴⁶ The empirical evidence on the question of 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 present evidence 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.

However, as $\frac{\partial \overline{Pr_{dARC}^*(n_{ARC}^*)}}{\partial n_{ARC}^*} < 0$ and $\frac{\partial \overline{Pr_{dARC}^*(n_{ARC}^*)}}{\partial \pi_{ARC}} < 0$, we do not have a clear comparison between *Case III* and *Case I* regarding the average distortion probability. 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 probability of deception.

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

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

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

We can make the following qualitative comparison of *Cases II* and *III*: In *Case II*, the provision of profitable consulting services increases the audit firms' profit contributions, given a certain number n of audit firms. The managers' individual probability of misreporting 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 of misreporting decreases in order to render the auditor indifferent with respect to exerting high or 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 the joint provision of audit and non-audit services could have on the level of audit market supplier concentration and on the quality of audited financial statements. Specifically, we embed the optimal decisions from a strategic auditor-manager game (in which expected audit costs and

reputational effects are determined) into a market matching model. Our two-stage set-up allows us to simultaneously analyze the various 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 the two services on the quality of audited financial statements (i.e., the managers' optimal reporting decisions and the auditors' optimal decisions regarding audit effort and independence). Second, we can predict the qualitative effects on the equilibrium structure of the audit market, effects that depend on audit firms' profits and thus on the scope of services audit firms are permitted to provide. Third, our model allows investigation of the interdependencies between audit firms' market shares and the quality of audited financial statements. As a result, our work contributes to the recent discussion of regulatory reforms intended to 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 the two services can have negative effects on the quality of audited financial statements, since the managers' average probability of misreporting increases. These effects are diametrically opposed to the aims the Commission has outlined in its Green Paper. With regard to the prohibition of audit-related consulting services demanded in order to "bribe" auditors, we predict a resulting increase in the equilibrium number of audit firms. However, the effect on the quality of audited financial statements 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 argument that a high level of audit market concentration does not necessarily mean that audit quality is low.⁴⁸ The effects of a ban on "single-provider" auditing and consulting crucially depend on the point in time at which consulting services are negotiated.

Our analysis has several limitations. First, depending on the parameter constellations chosen, a wide variety of outcomes are possible; however, we demonstrate that not all of these outcomes 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' adap-

⁴⁷ See Commission of the European Communities 2010.

⁴⁸ For example, the Swiss Federal Audit Oversight Authority 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), indicating that a high level of supplier concentration does not necessarily imply a low level of audit quality. The chairman of the PCAOB, James Doty, also speculated that measures to promote competition might have a negative effect on audit quality (see Doty 2011).

tive reactions to regulatory changes. With regard to some of these aspects, there is to date only limited empirical evidence. Third, the situations in Member States can greatly vary, such that one may question 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.

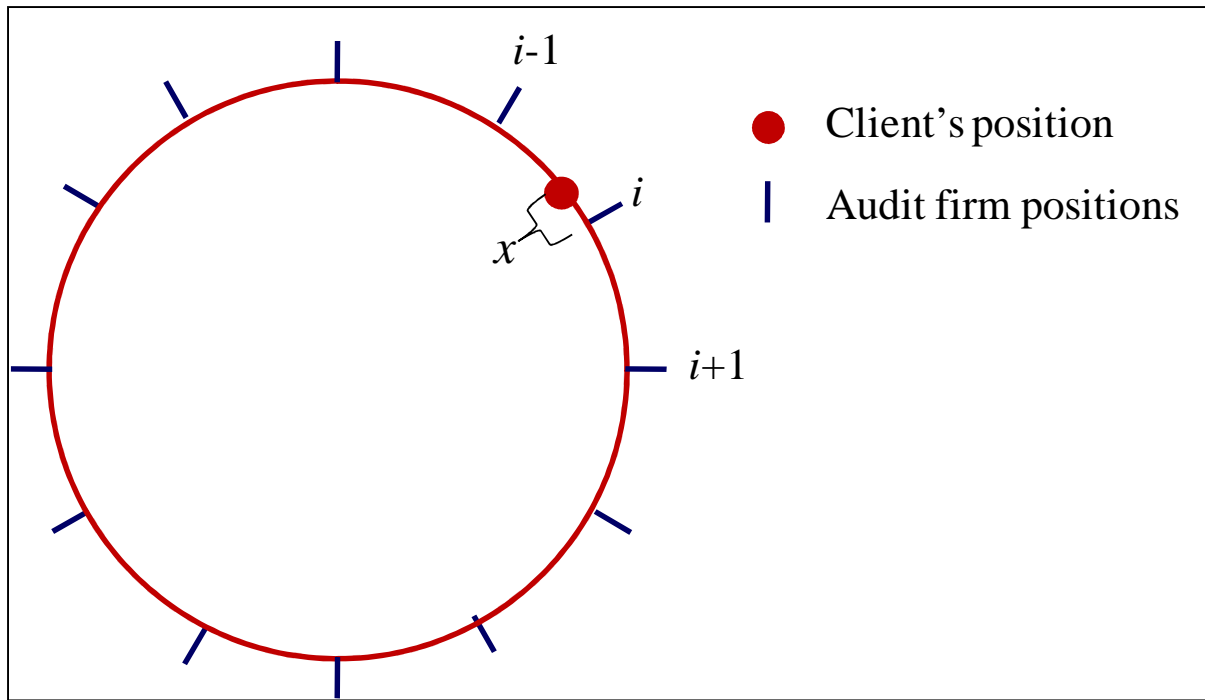


Figure 2: Audit firms and clients on the unit circle

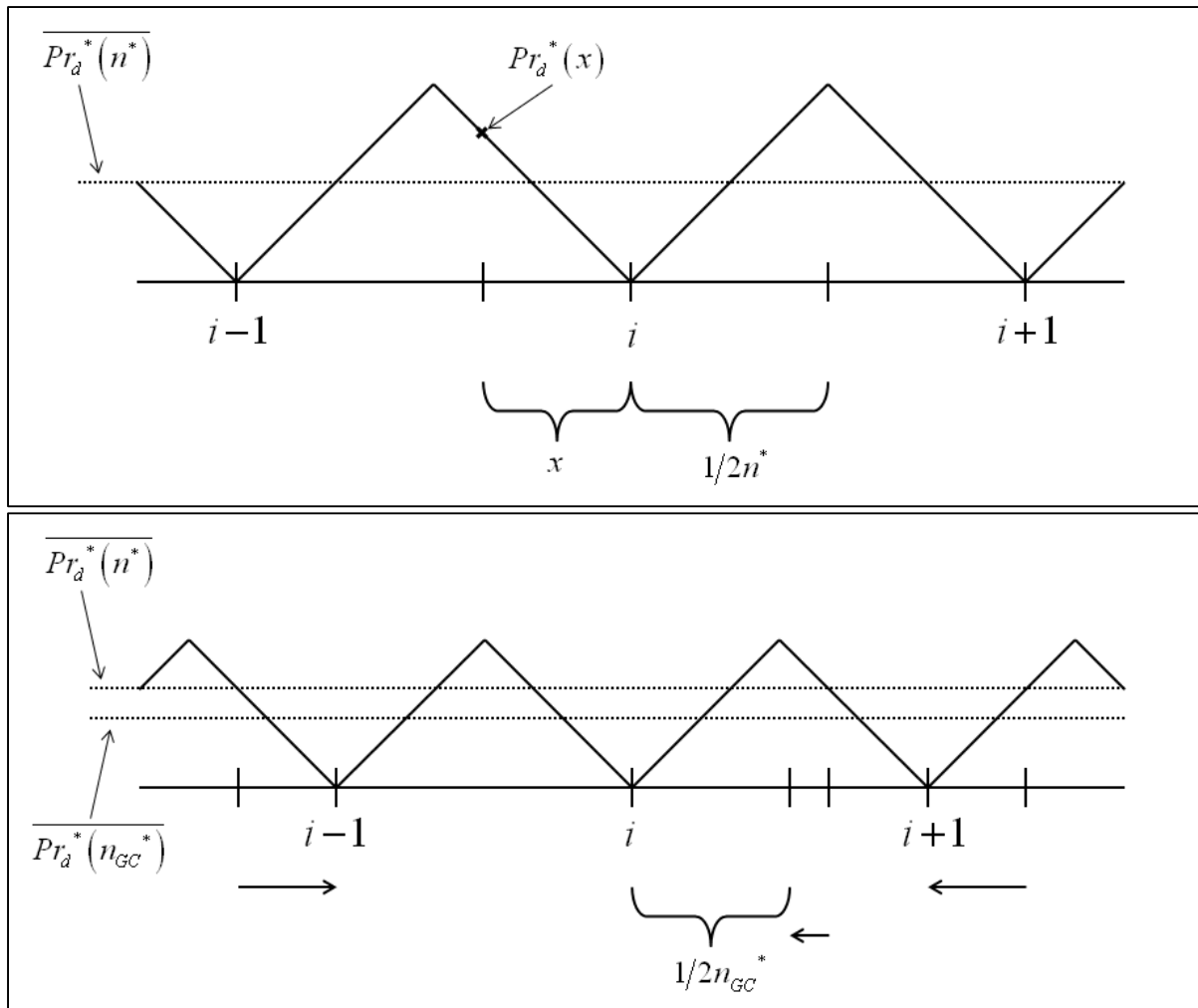


Figure 3: The probability that managers will misreport a bad economic condition, given a low number n^* (above) or a high number n_{GC}^* (below) of audit firms

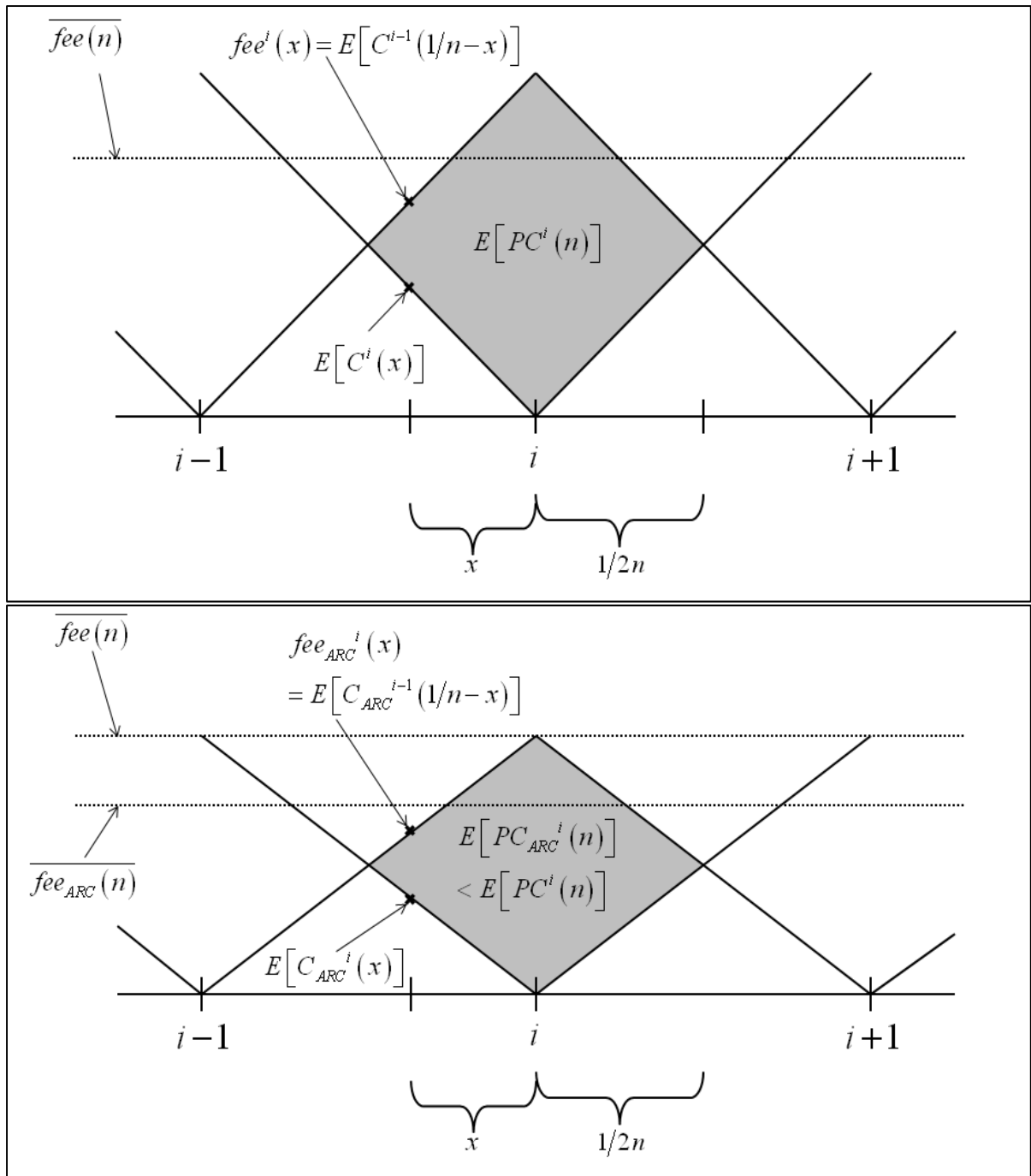


Figure 4: An audit firm's overall profit contributions in *Case I* (above) and *Case III*, given a certain number of audit firms n .

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