Stockholm School of Economics
Master Thesis
Accounting & Financial Management
Spring 2018

Do the Ends Justify the Means?

An Estimation of the Costs of Audit Firm Tenure Restrictions and of Big 4 Audit Firm
Exits from the Audit Industry as Perceived by the Client Firms

Abstract

This thesis evaluates the effects of newly imposed policy regulations in the audit industry that restricts the tenure of audit firms. We do this through a mixed logit estimation, whereby we estimate the client firms' perceived cost of audit firm tenure restrictions set to ten years and relate this to an alternative scenario involving the exit of a Big 4 audit firm from the audit industry. We base our research on 367 Swedish firms listed on OMXS Large-, Mid- and Small Cap between 2002-2016, totaling 3,180 firm years. We find that the client firms' perceived cost of audit firm tenure restrictions exceed the average perceived cost of an exit of a Big 4 audit firm from the audit industry. We estimate these costs to be 1,578 and 1,299 million SEK respectively in 2016. Our results fills the academic void around quantitative analyses of audit industry regulation and provides policy makers with an evaluation method for a quantitative analysis of how audit industry regulation affects the clients of audit firms.

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1 Introduction

The audit industry is dominated by four global audit firms - KPMG, PWC, Deloitte and EY - commonly referred to as the Big 4. The role of an audit firm is to ensure that the financial statements of a client firm accurately reflect the state of its business activities and are compliant with statutory audit standards (Jensen & Meckling 1976). Capital markets will typically base their assessment of a firm's performance, and their consequential valuation of the firm, on the information presented in the financial statements. The consolidated market structure for audit services, along with the crucial role that financial statements play in facilitating functioning capital markets, thus places the integrity of the capital markets into the hands of four private firms. Given that the audit firms are paid for and appointed by the client firms they are mandated to audit, the integrity of capital markets is exposed to conflicts of interest. Readers of financial statements thus rely on the audit firms' ability and intention to withstand compromising the authenticity of their client firms' financial reporting.

When audit firms have given in to the interests of client firms wishing to manage their earnings, major audit scandals have occasionally ensued, with such illustrious examples as the audit failures of Enron, Worldcom or Lehman Brothers, all culminating in bankruptcies and shareholder losses of billions of dollars. To ensure that audit firms conduct high quality audits in the face of agency conflicts, their work is overseen by supervisory bodies such as the Committee of European Auditing Oversight Bodies (CEAOB) or Revisorsinspektionen in Sweden. These institutions monitor the audit industry to ensure that audit statutes are honored, and are authorized to enforce coercive actions against audit firms that fail to comply with regulation (Revisorsinspektionen 2017). An example of such coercive action is the criminal indictment and subsequent exit of the formerly dominant audit firm Arthur Andersen, following their involvement in the Enron scandal, further consolidating the industry structure from a Big 5 constellation to the Big 4 and resulting in significant audit fee increases (Feldman 2006).

Regulators are continuously attempting to safeguard the quality of audits and the independence of audit firms by mitigating the conflicts of interest that arise between the client firm and the audit firm, without further consolidating an already oligopolistic market. Consequently, regulators are reluctant to the idea of revoking the audit license for yet another dominant audit firm as a response for fraudulent audit practice. One of the more recent regulatory changes in the audit industry occurred in June 2016 when the Swedish audit statutes were altered to require audit firm tenure restrictions in response to an EU directive approved in 2013 (Council of The European Union 2013). The regulations require that when the tenure of

an audit firm has reached ten years, client firms in the financial services industry are required to switch audit firm, while non-financial client firms are required to conduct and open tender process after which the maximum tenure is set to twenty years (ibid). The aim of the audit firm tenure restriction policy is to increase the independence of audit firms by limiting economic and social bonding in client-audit firm relationships that compromise audit independence (Bell, Causholli & Knechel 2015).

However, regulatory and coercive actions to restrict audit firm appointments in order to safeguard the quality of financial statements may instead lower reporting quality, because client firms will appoint an audit firm both based on the audit firm's competence and its presumed willingness to allow discretion in the financial reporting (Blay & Geiger 2013; Bell, Causholli & Knechel 2015). If regulation prevents a client firm from appointing the audit firm that best comprehends the firm's business activities and confers the highest assurance of truthful financial reporting to capital markets, audit quality invariably suffers. Concerning the relationship between audit quality and audit tenure, a number of studies conclude that increased tenure allows the audit firms to synthesize previously acquired knowledge of their client firms, improving audit quality, and that capital markets tend to perceive financial statements audited by audit firms with longer tenure as more trustworthy (Myers, Myers & Omer 2003; Ghosh & Moon 2005; Mansi, Maxwell & Miller 2004). If audit quality in turn is a determinant of firm value, then both the client firms and their shareholders are worse off if regulatory restriction on tenure prevent client firms from appointing the most suitable audit firm.

Regulators' trade-off between imposing audit firm tenure restrictions and allowing the market to self-regulate thus represents an interesting policy dilemma. The benefits of regulation can be quantified by emphasizing how it can prevent costs associated with audit failures of the likes of Enron. To quantify the cost of regulation, on the other hand, is more difficult, as it involves assigning a monetary value to the client firms' ability to appoint an audit firm in a pre-regulatory setting versus a post-regulatory one. In addition to potential changes in audit fees as a consequence of imposed regulation, client firms might also have differing audit firm preferences that are difficult to translate to a monetary value. Since these costs are difficult to quantify, cost-benefit analyses of audit regulations are cumbersome to conduct. To tackle this issue, Gerakos & Syverson (2015) investigated the effects of audit firm tenure restrictions in a US setting by introducing a method for quantifying the perceived costs based on a mixed logit estimation. Moreover, Gietzmann and Sen (2002) propose that the desirability of audit firm tenure restrictions are greater in audit industries with relatively few large client firms. This makes it interesting to conduct an investigation of audit firm tenure restrictions on the Swedish

market, where we estimate that the audit fees for the twenty largest client firms on the OMXS constitute 46% of all audit fees collected from the OMXS in 2016.

An additional dimension to evaluate is whether audit firm tenure restrictions are preferable to the alternative of enforcing current regulation and revoking audit licenses for audit firms caught facilitating fraudulent financial reporting. If the perceived cost of audit firm tenure restrictions exceeds the perceived cost of a Big 4 audit firm exit, then the cost of the regulation may outweigh its potential benefits. The objective to quantify the client firms' perceived cost of audit firm tenure restrictions and comparing that to the perceived cost of a Big 4 audit firm exit, thus forms the basis of our research question:

"What are the client firms' perceived cost of imposing audit firm tenure restrictions and of the exit of a Big 4 audit firm from the audit industry?"

To answer our research question, we estimate the required compensation for 367 firms listed on the OMXS Large-, Mid- and Small-Cap to be equally satisfied in a setting where they are no longer able to appoint their most preferred audit firm in 2016. We determine client firms' audit firm preferences by estimating probabilities of audit firm appointments conditional on audit fees and observable characteristics of the client- and audit firms. We estimate these probabilities by using a mixed logit model and observations on audit firm appointments made by our 367 client firms during 2002-2016, retrieved from the respective client firms' financial statements.   .

Disregarding any potential audit fee changes following audit firm tenure restrictions or the exit of a Big 4 audit firm, we estimate the client firms' perceived total cost of audit firm tenure restrictions of ten years to 1,578 million SEK, or 17.7 million SEK per affected client firm, in 2016. Additionally, we estimate the perceived total cost of a Big 4 audit firm exit to 1,299 million SEK, or 11.1 million SEK per affected client firm, 2016. However, the perceived cost of a Big 4 audit firm exit varies depending on what audit firm exits the market. We estimate the exit of PWC to result in the highest perceived total cost, 1,769 million SEK, or 11.3 million SEK per affected client firm in 2016. Moreover, we estimate the exit of Deloitte to result in the lowest perceived total cost, 17 million SEK, or 4.2 million SEK per affected client firm in 2016.

This thesis thus fills the academic void around quantifications of client firms' perceived costs of audit regulations imposing restrictions on audit firm appointments, and provides an alternative and insightful approach for evaluating the effects of policy changes in the audit industry in markets with similar characteristics to the Swedish setting.

2 Theoretical framework

2.1 Determinants of audit quality

A multitude of empirical research on the association between the quality of a client firm's financial statements and market value shows that capital markets are prone to discount firm value if they question the reliability of the financial statements (Penman & Zhang 2002; Mansi, Maxwell & Miller 2004). The reliability of a client firm's audited financial statements is typically measured by evaluating the level of discretionary accruals (Dechow, Ge & Schrand 2010; Kwon, Lim & Simnett 2014). Depending on the level of discretionary accruals, a client firm's financial statements can be assigned with a level of earnings quality, where low levels of accruals indicate a high level of earnings quality (Jones 1991).

To assess an audit firm's contribution to financial statements with high earnings quality, Francis (2011) proposes to test whether there are systematic differences in earnings quality conditional on certain audit firm characteristics. Given that a set of audit firm characteristics consistently produce a specific effect on a firm's earnings quality, those characteristics can be used as indicators of audit quality, audit firms' skill in validating that their client firms produce financial reports that accurately reflect their business activities. Consequently, audit quality directly influences a client firm's level of earnings quality.

DeAngelo (1981a) argues that the value of audit services relies in part on an audit firm's perceived audit independence, its perceived ability to "withstand client pressures to disclose selectively" in order to manage earnings to portray the client firm advantageously (DeAngelo 1981a, p.115). As the value of audit services depends on capital markets' perceptions about an audit firm's propensity to discover and report errors or breaches in the financial statements, audit firms with lower perceived audit independence will be less trusted by capital markets, and hence in less demand by potential client firms (DeAngelo, 1981a). Accordingly, audit firms are faced with an optimization problem; whether to maximize perceived audit independence by reporting and correcting misleading accounting or to provide benevolent opinions of their client firms' financial statements in order to retain their client firm relationships. Bell, Causholli and Knechel (2015) categorize how the client- audit firm relationship can impair audit independence in two forms of bonding: economic bonding, becoming financially dependent on fees from the client firm, and social bonding, becoming naively trusting of client firm management.

The existence of economic bonding is contingent on the audit firm's expectations about future economic benefits from a continued client- audit firm relationship. As such, an audit firm without incentives to retain its client firm, or who knows that the relationship is

persistent, stands no risk of compromising its audit independence. However, in a scenario where an audit firm expects future economic benefits from the client- audit firm relationship, while also facing the risk of termination from refusing to vouch for misleading financial statements, the audit firm is exposed to potential economic bonding (DeAngelo 1981a).

Blay and Geiger (2013) investigate the prevalence of economic bonding between audit firms and their client firms by evaluating the association between future audit fees and audit firms' going concern opinions on distressed client firms. They find that audit firms issue significantly fewer negative going concern opinions in the current period to client firms paying higher audit fees in the periods after, suggesting audit firms compromise their audit independence to capitalize on existing client- audit firm relationships. Additionally Antle, Gordon, Narayanamoorthy and Zhou (2006) find a significant positive association between audit fees and abnormal accruals for their samples of US- and UK companies. However, they do not find causal effects from abnormal accruals on audit fees.

In contrast to Blay and Geiger (2013) and Antle et al. (2006), Frankel, Johnson and Nelson (2002) find a negative association between audit fees and a set of earnings management indicators, suggesting compromised audit independence is not a concern as audit fees increase, but that higher audit fees are indicative of a more thorough audit process. They do however find a positive association between purchases of non-audit services (NAS), such as tax advisory or consulting services provided by an audit firm, and earnings quality. This implies that services provided by audit firms have differing effects on audit quality.

Moreover, Robinson (2008) examines the impact of tax advisory fees on audit quality by investigating how tax advisory services provided by the audit firm affect an audit firm's probability of correctly issuing a going concern opinion prior to its client firm's bankruptcy. Robinson (2008) finds a significant positive relationship between the level of tax advisory fees and the audit firm's probability of correctly predicting bankruptcy, suggesting that tax advisory services generate knowledge spill-overs that positively affect audit quality. Her results echo those of Kinney, Palmrose and Scholz (2004) who find that some types of NAS positively affect audit quality whereas others have the opposite effect.

To evaluate the results laid forward by Frankel, Johnson and Nelson (2002), Ashbaugh, LaFond and Mayhew (2003) carry out the same tests but also control for client firm performance by partitioning discretionary accruals into income increasing- and income decreasing accruals. Income-decreasing accruals are often a result of a conservative application of accounting principles, which is typically not an issue for capital markets (ibid). They find that after partitioning the accruals, increased NAS-fees only increase the income decreasing

accruals. Their results hence question the formation of economic bonding in the client- audit firm relationship as a result of both audit- and NAS fees.

Further challenging the association between audit fees and audit quality, Chung and Kallapur (2003) use ratios of client firm's audit- and NAS fees relative to their audit firm's total revenues as proxies for client firm importance. Controlling for different client firm characteristics, they show that there is no systematic association between abnormal accruals and client firm importance.

In addition to the possible impairment of audit independence due to economic bonding, regulators have also argued that social bonding between the client and audit firm "erodes professional skepticism and induces audit firm complacency" (Bell, Causholli & Knechel 2015, p.462). Quadackers, Groot and Wright (2014) investigate the audit firms' attitude to client firm financial statements in the audit process, to assess the extent to which social bonding impairs audit independence. They find that audit firms predominantly view client firm reports with presumptive doubt, rather than as truthful, suggesting audit independence is not compromised from social bonding. Contrasting these findings, Bowlin, Hobson and Piercey (2015) evaluate audit firm behavior, and let audit firms and client firms engage in a strategic game where they are asked to make auditing and financial decisions simultaneously. In a setting without audit firm tenure restrictions, the authors find that audit firms tend to overestimate client firm honesty and that client firms use this gullibility to their advantage. These results thereby suggest audit firms in fact are susceptible to social bonding.

2.2 Audit tenure and its effects on audit quality

The possible prevalence of economic and social bonding in the client- audit firm relationship has spurred research into what might determine their magnitude. Audit firm tenure has been subject to much concern. Scholars argue that audit firm tenure has two effects on audit quality; a positive effect as an audit firm attains client firm specific knowledge, allowing for a better representation of its client firms' business activities, and also a negative effect as longer audit firm tenure induces economic bonding (Bell, Causholli & Knechel 2015; Knechel & Vanstraelen 2007).

Examining the prevalence of positive effects from audit firm tenure, Carcello and Nagy (2004) use a matched set of US firms cited with fraudulent reporting of financial statements and non-fraudulent US firms to examine the association between audit firm tenure and fraudulent reporting. They find that fraudulent reporting is more likely to occur in the nativity of a client- audit firm relationship than after any period later on. These results suggest

that the reduction in information asymmetry in the client- audit firm relationship has a stronger effect on audit quality than economic bonding, as a result of long audit firm tenure. Myers, Myers and Omer (2003) find that the magnitude of both discretionary and current accruals decline with audit firm tenure and that longer audit firm tenure is associated with lower accruals. Their results suggest that audit firm tenure has a positive impact on audit quality, echoing the results of Johnson, Khurana and Reynolds (2002).

Showing that audit firm tenure improves audit quality both empirically and perceptively in the eyes of capital markets, Mansi, Maxwell and Miller (2004) and Ghosh and Moon (2005) both find that capital markets are appreciative of longer audit firm tenures. Mansi, Maxwell and Miller (2004) examine the relation between audit firm tenure and the cost of debt financing using data on bond yields and find a negative relation between the required rate of return on bonds and audit firm tenure. The authors are also able single out how the effect from the credibility of an audit firm's opinion differs from the effect of the information that the financial reporting provides on capital markets' perception of the client firms. This result shows that capital markets become increasingly trustful of audit firms as their tenure increases, challenging the argumentation that capital markets grow weary of economic bonding as a result of longer audit firm tenure. Ghosh and Moon (2005) regress stock returns and earnings forecasts to earnings releases and use the strength of their relationships as indicators for capital markets' perceptions of earnings quality. They also evaluate whether the strength of these relationships increases with longer tenure and find that the magnitude of earnings responses is positively associated with audit firm tenure. Addressing the critique that audit firms with high audit independence terminate relationships with client firms that compromise their audit quality, Ghosh and Moon (2005) also conduct a partitioned test where client- audit firm relationships have lasted for at least five years and find their initial results robust to the change. Ghosh's & Moon's (2005) results thus show that capital markets look favorably on longer audit firm tenure.

However, Kealey, Lee and Stein (2007) find a positive association between audit fees charged by the successor-audit firm of previous Arthur Anderson client firms and those client firms' tenure with Arthur Andersen. Notwithstanding the possibility that this association was an isolated response to manage client firms whose previous audit firm had lower audit quality, something Cahan, Zhang and Veenman (2011) find is not true, the response of succeeding audit firms suggests longer audit tenure is coupled with lower audit quality. Gietzmann and Sen (2002) moreover suggest audit firms operating in smaller and more concentrated markets are more susceptible to economic bonding since fewer potential client firms result in a higher reliance on their existing client- audit firm relationships.

Additionally, Davis, Soo and Trompeter (2009) evaluate the association between audit firm tenure and a higher propensity of meeting analyst earnings forecasts. The authors thus propose that as audit firm tenure increases, audit firm's tolerance for earnings management might increase. In a sample of US data, the authors find an increased use of discretionary accruals to meet earnings forecasts in the period preceding the Sarbanes Oxley act of 2002 (SOX), but not during the period after. Bell, Causholli and Knechel (2015) assess the association between audit firm tenure and audit quality for a selection of US private and public firms by evaluating how the impact of stricter regulation has circumscribed or enhanced economic bonding. The authors find that for public firms, audit quality consistently improves with audit firm tenure, whereas private firms exhibit an increasing, then gradually decreasing audit quality as audit firm tenure increases. The results support a circumscribing effect on economic bonding for US publicly listed companies affected by the SOX. Moreover, as the results also show a concave relationship between audit firm tenure and audit quality for private firms, their findings suggest that in the absence of regulation, economic bonding is present.

2.3 Responses to the adverse effects of audit firm tenure

Regulatory pressure aims to promote audit quality by implementing measures that inhibit inappropriate client- audit firm relationships. When SOX was implemented in 2002, government oversight of audit firms significantly increased (Boone, Khurana & Raman 2014). When investigating audit quality for a Big 4 audit firm in the US, regulation has been effective at promoting audit quality even as audit firm tenure becomes very long (Bell, Causholli & Knechel 2015). Consequently, greater regulatory pressures increase the costs of audit failures sufficiently to prompt audit firms to abstain from compromising audit quality. The findings of Davis, Soo and Trompeter (2009), that the SOX curbed audit firms' tendency to tolerate earnings management, indicate that conclusions regarding the relationship between audit firm tenure and audit quality should be made with respect to prevalent regulation.

The exit Arthur Andersen from the audit industry further increased the concentration of an already consolidated market, as the dominant Big 5 became the increasingly dominant Big 4. This consolidation was accompanied by an increase in audit fees and scale economies for the remaining audit firms, however without a corresponding effect on audit quality (Feldman 2006). The audit industry is particularly susceptible to the exercise of market power, as regulation forces client firms to appoint an audit firm, meaning demand is mandated by law. Moreover, valuing the certification effect associated with reputable audit firms, client firms will prefer dominating audit firms, increasing entry barriers and protecting the Big 4 audit

firms from rivalry (Gong, Li, Lin & Wu 2015; Feldman 2006; Bell, Causholli & Knechel 2015). As a result, client firms in certain industries may have to decide between only one or two viable audit firm options, given that they place a high value on industry specialization and certification effects (Gerakos & Syverson 2015; GAO 2008).

Further, the threat of suspension of an audit firms' license to provide audit services has a questionable effect on mitigating fraudulent audit practices as audit partners, who handle the audit firms' relationships with their client firms, may transfer to new audit firms and bring their old client firms with them (Blouin, Grein & Rountree 2007). In cases of regulatory intervention resulting in forced audit firm switches, client firms with greater earnings management activities have been shown to be prone to follow their audit partners to new audit firms, after which the client firms' financial statements become even more aggressive in the following two years (Chen, Su & Wu 2009). The questionable association between audit quality and threat of audit license suspensions, along with irreversible costs of an increasingly consolidated audit industry, as illustrated by Feldman (2006) who estimates the audit fee increases after Arthur Andersen's indictment to 27% for S&P 500 client firms, contributes to regulators' reluctance to revoke audit licenses as a way to promote audit quality (Gerakos & Syverson 2015). Consequently, audit firms have avoided criminal indictments in several high profile cases, such as EY facilitating the systematic de-levering of Lehman Brothers when preparing their financial statements prior to their bankruptcy. Regulators' reluctance of turning the Big 4 into the Big 3 may thereby contribute to their ineffectiveness in mitigating fraudulent audit activities (Gerakos & Syverson 2015). In the case of Arthur Andersen, its audit quality prior to the collapse of Enron has been shown to be on par with other Big 5 peers (Cahan, Zhang & Veenman 2011). Evidence is therefore split on whether Arthur Andersen as a firm had lower audit quality than its peers prior to the Enron scandal, and whether its failure with Enron should be viewed as an isolated incident or a sign of firm-wide unethical practices.

2.4 The case for market self-regulation

Since client firms assess audit quality through evaluating the historical accuracy of audit firms, reputation is a key determinant of their audit firm preferences. The reputation of an audit firm will therefore be negatively impacted by past accounting restatements, which have shown to be inversely related to subsequent changes in local market shares, as client firms avoid contaminated audit offices (Swanquist & Whited, 2015). This was displayed by the lower audit fee growth for Deloitte, relative to other Big 4 audit firms, after the PCAOB imposed a civil penalty of $1m on Deloitte in 2007, for failing to adhere to statutory standards in its audit of

Ligand (Boone, Khurana & Raman 2015). Moreover, audit firms losing client firms that are prominent in an industry have also been shown to experience increased client firm losses in the same industry over the subsequent two years (Francis, Mehta & Zhao 2017). The association reluctance with contaminated audit offices is moreover amplified for client firms receiving significant exposure in capital markets, who are more prone to discard contaminated audit firms (Barton 2005). The devastating impact of reputational contamination from accounting restatements thus yields economic incentives for audit firms to provide high quality audits.

The reputational concerns of audit firms suggest that when audit firms perceive the litigation risk of a given client firm to be high, the benefits from stricter audits will increase and thus result in lower abnormal accruals (Defond & Subramanyam 1998; Cahan & Zhang 2006). This was evident in the audits conducted on former Arthur Andersen client firms after 2002, where successor audit firms tolerated less abnormal accruals due to the higher perceived litigation risk of former Arthur Andersen client firms (Cahan & Zhang 2006). If lower levels of abnormal accruals act as a proxy for audit quality (Kwon, Lim & Simnett 2014), then this would indicate that audit firms respond to heightened business risks by improving audit quality.

2.5 Adverse effects of regulatory policies

In addition to being potentially ineffective in curbing economic and social bonding in client-audit firm relationships, research has also begun evaluating the costs of regulation to the audit industry. In a study on the potential effects of both audit firm tenure restrictions and the exit of a Big 4 audit firm, Gerakos and Syverson (2015) find that the total perceived cost to US listed firms from audit firm tenure restrictions ranges between $2.7-$5.0 billion, depending on the tenure of the restriction, and the perceived cost of a Big 4 audit firm exiting the market to range between $1.4-$1.8 billion. Furthermore, the authors also estimate that the additional cost of audit fee increases following the two scenarios would be in the ranges of $0.75-$1.3 and $0.47-$0.58 billion respectively.

The case for introducing audit firm tenure restrictions has been promoted as a way of increasing audit quality by utilizing the professional skepticism of an audit firm with a fresh perspective (Kwon, Lim & Simnett 2014). Opponents of audit firm tenure restrictions argue that incoming audit firms may lack detailed knowledge of new client firms' operations, resulting in increased costs of initial engagements that will be passed to the client firms (Carey & Simnett 2006; Myers, Myers & Omer 2003; Kwon, Lim & Simnett 2014). The opponents argue that audit firms' incentives to uphold a high perceived audit quality to please capital markets are sufficient to maintain a high level of audit quality (Geiger & Raghunandan 2002).

Considering the new EU directive approved in December 2013, which restricts audit firm tenure, new interest has grown around the estimated consequences of the new regulatory requirements. Historically, research on the effects of audit firm tenure restrictions on audit quality has been limited by the fact that only a few countries, such as Spain, Italy and South Korea, have introduced such restrictions for extended periods of time (Ruiz-Barbadillo, Gómez-Aguilar & Carrera 2009; Kwon, Lim & Simnett 2014). Audit firm tenure restrictions were imposed in Spain 1988-1995, where audit firm tenures were limited to nine years. Although the restrictions were lifted before any audit firm switches due to the restriction had occurred, the years preceding the regulatory reversal allow Ruiz-Barbadillo, Gómez-Aguilar and Carrera (2009) to examine the effect of the regulation on audit firm behavior. They find that the audit firm tenure restriction was not associated with any changes in the propensity to issue qualified going concern opinions. They thereby conclude that the audit firm tenure restriction in Spain did not yield any positive effects on audit independence. The results of Ruiz-Barbadillo Gómez-Aguilar and Carrera (2009) echo those of Kwon, Lim and Simnett (2014) who investigate the impact of audit firm tenure restrictions in South Korea in 2006-2010 and find no significant change in audit quality after imposing audit firm tenure restrictions, although they resulted in increased audit fees.

When investigating the effect from imposing audit firm tenure restrictions from a capital markets perspective, Reid and Carcello (2016) find that capital markets in the US reacted negatively to events that that increased the probability of the PCAOB implementing audit firm tenure restrictions during 2011-2013, when the subject was intensely discussed by US regulators. The negative market reactions were furthermore found to be amplified in cases of long audit firm tenures and when involving a Big 4 audit firm, suggesting capital markets do not have a negative perception of long audit firm tenures, while they value the certification effect of Big 4 audit firms. This is noteworthy considering the objective of audit firm tenure restrictions are to improve audit quality by protecting audit independence, ultimately to the benefit of amongst others capital markets, who however appear to deem the costs of the regulation to outweigh its potential benefits.

3 Hypothesis

The decision to impose audit firm tenure restrictions in Sweden merits a discussion around on its expected effects on the audit industry. With our research question in mind, our theory section outlines the basis for our hypothesis regarding client firms' perceived costs of introducing audit firm tenure restrictions. Research has previously documented both the positive and negative associations between audit firm tenure and audit quality (Myers Myers & Omer 2003; Davis, Soo & Trompeter 2009), as well as capital markets' negative perception of the idea of imposing audit firm tenure restrictions (Reid & Carcello 2016). However, research concerning client firms' perceived cost of audit services has been much less developed, with the exception of Gerakos and Syverson (2015). We therefore formulate our first hypothesis of whether audit firm tenure restrictions result in perceived costs to client firms when they are no longer able to appoint their most preferred audit firm:

H1a: The introduction of audit firm tenure restrictions will result in a perceived cost to client firms

Assessing the implications of enforcing current regulation by revoking the audit license of a Big 4 audit firm following evidence of fraudulent audits, we are also interested in the perceived costs of a Big 4 audit firm exit from the industry. Considering that the market share of Big 4 audit firms in the US is 67%, which is lower than their market share of 93% in Sweden, measured on number of client firms, and that the estimated perceived costs of a Big 4 audit firm exit in the US were substantial, the exit of a Big 4 audit firm is likely to have an even greater impact in Sweden (Gerakos & Syverson 2015; Retriever Business 2018). We therefore formulate our second hypothesis:

H1b: The exit of a Big 4 audit firm will result in a perceived cost to client firms

In an attempt to weigh the perceived costs of introducing audit firm tenure restrictions against the perceived costs of a Big 4 audit firm exiting the market, we consider both the concentrated demand- and supply structure of the Swedish audit industry. We consequently refer to DeAngelo (1981b) and Carey and Simnett (2006) who respectively conclude larger client firms increasingly value the certification effects of Big 4 audit firms and that the costs of knowledge gaps from forced audit firm switches are low and transitory. Hence, we formulate our third hypothesis:

H2: The client firms' perceived costs from the exit of a Big 4 audit firm will be greater than from audit firm tenure restrictions

4. Empirical Setting

4.1 Regulatory Framework

In December 2013, the Council of the European Union endorsed a new regulatory framework for the audit industry. The new regulations strive to increase transparency in the audit industry and credibility in audited financial statements, as well as to decrease capital markets' exposure to low quality audits (Council of The European Union 2013; SOU 2015:49; Regeringskansliet 2015/2016:162). The regulations apply to audits of client firms known as public interest entities (PIEs) defined as "companies with a significant public interest because of the nature of their business, their size, their number of employees or their corporate status, including banks, insurance companies and listed companies" (Council of The European Union 2013 p.1). The new directive was subsequently implemented on June 2016 in Sweden, when the audit statutes were altered in accordance with the new regulations and harmonized in line with audit regulations on the EU level. The assessment of the Swedish government was that the new regulations would increase capital markets' trust in the audit industry, as well as increase competitiveness of both the audit industry and the PIEs (Regeringskansliet 2015/2016:162).

The responsibility of appointing an audit firm befalls the PIEs' audit committees, which are constituted by members of the PIEs' board of directors. In addition, members of the audit committee are required to inform the board about the progression and outcome of the audit (SOU 2015:49). The new regulations impose restrictions on the tenure of an audit firm and discriminates between financial PIEs and non-financial PIEs by restricting the audit firm tenure of financial PIEs to ten years, whereas the non-financial PIEs audit firm tenure is restricted to twenty years given that the PIEs' audit committees conduct a public tendering after ten years. For non-financial PIEs there is moreover a clause stating that in the case of a joint audit in the second term, that audit services are conducted by two audit firms, the total tenure may reach twenty-four years. After a PIE has switched audit firm, the former audit firm is barred from being appointed by the PIE until a period of four years has passed (SOU 2015:49). Whereas the first fiscal year in which the regulation is applicable is 2017, tenure is not counted retroactively, meaning the first year PIEs will be forced to switch audit firm is 2027.

Moreover, the regulations also impose a cap on the provision of NAS from the audit firm, such that NAS-fees may not exceed 70% of the audit fees charged in a given year. The provision of NAS was restricted in order to mitigate potential conflicts of interest that may arise as audit firms capitalize on their client-audit firm relationships, compromising their ability to remain objective in their audits of client firms (SOU 2015:49).

The former Swedish audit statutes imposed a restriction of the tenure of audit

partners in charge of audits of listed PIEs to seven years, but imposed no restrictions on the tenure of the audit firm itself (SOU 2015:49). Additionally, the audit statutes contained no corresponding limit to the provision of NAS by the main audit firm (ibid). Therefore, the new regulations represent a substantial transformation of the Swedish audit industry, with implications that that are difficult to quantify (Regeringskansliet 2015/2016:162).

4.2 Delimitations

Given that there is an academic void concerning the effect on client firms' perceived costs due to audit firm tenure restrictions, and that Swedish audit regulation recently has been altered to restrict the tenure of audit firms, an investigation into client firms' perceived costs of this regulation represents an intriguing topic to research. Although the new audit statutes regulate multiple aspects of the client-audit firm relationship, such as audit firm tenure restrictions, the provision of NAS, or administrative documentation, we have chosen to only consider the effect of audit firm tenure restrictions on the Swedish audit industry. Moreover, our analysis is restricted to client firms with headquarters in Sweden, so that the corporate group falls under the Swedish audit regulatory regime.

Whereas the new regulations affect all client firms that fall under the definition of PIEs, we only consider Swedish client firms listed on the OMXS Large- Mid- and Small in our analysis. These client firms fall under the definition of PIEs and are thus required to adhere to the new audit firm tenure restrictions. In addition, these client firms apply IFRS in their financial reporting, which requires that they disclose the audit fees and NAS-fees charged each year by the main audit firm as well as by additional audit firms.

We evaluate the perceived cost of audit firm tenure restrictions based on a restriction of ten years. A restriction of ten years represents the audit firm tenure restriction of all financial PIEs. Further, ten years is also the audit firm tenure restriction for non-financial PIEs, unless they conduct an open tender process for the provision of audit services after ten years, or appoint an additional audit firm to audit their consolidated statements. Additionally, limitations in our dataset effectively prevent us from estimating the perceived cost of audit firm tenure restrictions for tenures longer than sixteen years. Our sample period is 2002-2016 and we do not have access to information regarding audit firm appointments prior to 2001. For client firms that were listed before 2001 we therefore use 2001 as the starting date for their client-audit firm relationship. Furthermore, for client firms that were listed during our observation period, we consider their first year as a public client firm as the first year in their client- audit firm relationship. Consequently, we evaluate the perceived cost of an audit firm tenure

restriction as a restriction imposed after ten years, and we also provide the corresponding estimations for a nine and eleven year restriction for reference.

Since audit firm tenure is not counted retroactively, such that the first forced audit firm switches will come into effect 2027, we quantify client firms' perceived costs of audit firm tenure restrictions and of a Big 4 audit firm exit in the year the regulations were imposed, 2016. This is furthermore the most recent financial year for which there are widely available financial reports. We also provide the corresponding perceived costs in 2015 for reference.

Finally, we only consider client firms' perceived costs of no longer being able to appoint their most preferred audit firm on account of audit firm tenure restrictions and of the exit of a Big 4 audit firm. We therefore disregard any potential audit fee changes that may arise as a consequence of the two restricted settings. Additionally, we make no efforts to estimate any potential benefits from the regulations, such as effects on audit quality. Consequently, our estimations should not be interpreted as a cost-benefit analysis of the comprehensive policy implications from audit firm tenure restrictions or of a Big 4 audit firm exit from the audit industry, as the estimations only assess the perceived cost to client firms'.

5 Methodology

5.1 Data collection

The dataset on which we base this thesis on was collected from the population of Swedish firms listed on the OMXS Small-, Mid- and Large-Cap during 2002-2016. We chose the first year in our sampling period as the first year after Arthur Andersen had exited the audit industry, to keep the set of audit firm alternatives constant. Although the disappearance of Arthur Andersen in Sweden caused only a limited redistribution of client- audit firm relationships, requiring only fifteen client firms in our sample to switch audit firm, the redistribution serves as a good starting point for our investigation. We retrieved the data regarding appointed audit firms and annual audit- and NAS fees directly from the financial statements for all the firm years of our sampled client firms.

Fundamental financial data concerning the client firms, such as market capitalization and the market-to-book value of equity ratio, were retrieved from the Thomson Reuters database Eikon. In cases where financial data regarding a client firm was not available in the Thomson Retuers Eikon database, or in which we were unable to retrieve the historical financial statements of a client firm, the firm year observation was eliminated from our sample. After excluding client firms with headquarters located outside Sweden, 367 unique client firms subsequently remain from the initial population of 400 client firms, constituting 3,180 firm

years. Descriptive statistics of our sample including the distribution of audit fees, market shares of the different audit firms and how characteristics of the audit firms' client firms differ are presented in Tables A1-A4 in Appendix A.

5.2 Multinomial logit model

We aim to measure the benefit to client firm i from the provision of audit services by audit firm j. Ideally we would want to measure this benefit directly. Unfortunately, the benefit a client firm receives from audit services is unobservable because the audit fee a client firm pays for audit services does not necessarily equal the benefit. The way we tackle the impossibility of measuring the benefit of audit services directly is by instead estimating probabilities of client firms appointing different audit firms, and then inferring their benefit of appointing those audit firms from our estimated probabilities. We estimate the probability of appointing a specific audit firm through a multinomial logit model (McFadden 1973). The model lets us evaluate scenarios where there are more than two options available to choose between, in our case, each of the Big 4 audit firms and an amalgam of Non-Big 4 audit firms.

We can express the probability of client i appointing audit firm j, P_{ij}, relative to all other audit firms as an odds ratio: $\frac{P_{ij}}{\sum_J P_{ik}}, k \neq j$. Suppose we can specify the natural logarithm of this odds ratio, denoted V_{ij}, as a function of observable determinants, such as client firm size, in the appointment of audit firms: $\ln\left(\frac{P_{ij}}{\sum_J P_{ik}}\right) = V_{ij}$, then $\frac{P_{ij}}{\sum_J P_{ik}} = e^{V_{ij}}$. As demonstrated in Train (2009), we can then express the probability of appointing an audit firm as:

$$P_{ij} = \frac{e^{V_{ij}}}{\sum_J e^{V_{ij}}}, J = 1,2,\ldots j$$

The expression above specifies the multinomial logit model and lets us assess how observable determinants of the attractiveness of audit firm j relative to the other audit firms determines the probability of client firm i appointing audit firm j.

Part of what determines which audit firm a client firm appoints will be related to how a client firm perceives characteristics specific to the different audit firms, which in turn might differ depending on characteristics of the client firm. An example would be the impact of client firms' size on their perception of a Big 4 audit firm, as research has shown that larger client firms are more prone to appoint Big 4 audit firms (Hay, Knechel & Wong 2006). To incorporate how systematic differences in client firms' characteristics impact how they perceive the different audit firms, we interact how client firms perceive each audit firm, β_j, with respect

to observable characteristics of the client firms', x_{ij}, which we specify in section 5.7.1, in our specification of V_{ij}. Moreover, there might be unobserved client firm characteristics that also impact how they perceive the different audit firms. We can control for how these unobserved client firm characteristics impact their perception of an audit firm by including any residual systematic effects after controlling for x_{ij} as a 'brand effect', δ_j, that captures the combined effects of an audit firm's reputation, skill and other qualities, in our specification of V_{ij}.

Further, we can specify how the audit fee charged by an audit firm, AF_{ij}, will affect the client firms' probability of appointing that audit firm, with the marginal effect denoted as α. As opposed to our parameters δ_j and β_j, we let changes in AF_{ij} have the same effect on P_{ij}, such that α affects all audit firm alternatives in the same way, with the motivation that giving up an amount of money in the form of audit fees has the same effect on the client firm, irrespective of what audit firm the payment is made to. Additionally, reflecting the assumption that client firms are only willing to spend an amount proportional to their expected benefit of the audit services, such that an increase in audit fees necessitates a proportional increase in benefit from the audit services, we specify the marginal effect of AF_{ij}, α, as linear.

Finally, we incorporate the effect of audit firm tenure, which we denote T_{ij}, on P_{ij}, and define it as the number of consecutive years of a client- audit firm relationship prior to the current year. We expect the magnitude of the effect from T_{ij}, γ, to be substantial and positively influence the probability of a client firm appointing an audit firm because our sample exhibits a very high degree of audit firm retention over the years, between 84-97% (see Table 2 under section 5.7.1). The resulting specification of V_{ij} is as follows:

$$V_{ij} = \delta_j - \alpha\left(AF_{ij}\right) + \gamma\left(T_{ij}\right) + \beta_j\left(x_{ij}\right)$$

Rather than reflecting an absolute value, V_{ij} reflects how much more or less attractive an audit firm is than the alternatives. As is practice in multinomial logit estimations, we evaluate each alternative against a common reference and measure the relative attractiveness of each alternative. Since an interest of our thesis concerns the perceived cost of a Big 4 audit firm exit, we have chosen to evaluate the attractiveness of each Big 4 audit firm in relation to a base alternative consisting of an amalgam of all Non-Big 4 audit firms. Therefore, we measure δ_j and β_j as the differences between the evaluated Big 4 audit firms and the amalgam of Non-Big 4 audit firms: $\delta_j = \delta_{Big\ 4} - \delta_{Non-Big\ 4}$ and $\beta_j = \beta_{Big\ 4} - \beta_{Non-Big\ 4}$. This means δ_j and β_j can be both positive and negative depending on whether the brand effects and interaction

effects of appointing a Big 4 audit firm are greater or lesser than from appointing a Non-Big 4 audit firm. Consequently, we can normalize $\delta_{Non-Big\ 4} = \beta_{Non-Big\ 4} = 0$, meaning the expression for $V_{iNon-Big\ 4}$ collapses to:

$$V_{iNon-Big\ 4} = -\alpha\left(p_{iNon-Big\ 4}\right) + \gamma\left(T_{iNon-Big\ 4}\right)$$

As we compare each Big 4 audit firm alternative against the same reference, we can measure the differences between the Big 4 audit firms by measuring how their attractiveness relative to the Non-Big 4 audit firms deviate.

5.3 Specification of model assumptions

The applicability of the multinomial logit model relies on assumptions about client firms' identical appreciation of the different δ_j. Specifically, for the model to predict correct probabilities, individual client firms are not allowed to perceive δ_j for a particular audit firm differently. To exemplify, the client firms are allowed perceive the brand effect of KPMG as more valuable than that of EY ($\delta_{KPMG} > \delta_{EY}$), but if there is a variance in how individual client firms perceive δ_{KPMG}, then a single measure of the impact of δ_{KPMG} on V_{iKPMG} will not render correct estimations of P_{iKPMG}. To increase the predictive power of our estimations of P_{ij} we need to relax the assumption about identical brand effects and allow individual client firms to perceive the same δ_j differently, δ_{ij}. If we allow each client firm to appreciate δ_j differently, then the mean δ_j will be given by a frequency distribution with the weights given by δ_{ij}. This means P_{ij} will in turn depend on the frequency distribution of δ_{ij}. If we let δ_{ij} be continuous, we can evaluate $P_{ij} = \frac{e^{V_{ij}}}{\sum e^{V_{ij}}}$ as an integral with respect to the distribution of δ_{ij}:

$$P_{ij} = \int \left(\frac{e^{V_{ij}}}{\sum_J e^{V_{ij}}}\right) f(\delta)d(\delta)$$

This specification of our prediction model is called a mixed logit model (McFadden & Train 2000), and differs from the ordinary multinomial logit model by evaluating P_{ij} at different values of δ_{ij}, with respect to the distribution of δ, $f(\delta)$.

Additionally, in order for us to say something about the probability of appointing one Big 4 audit firm relative to another, the difference in δ_{ij} and β_j between one Big 4 audit firm and the Non-Big 4 audit firm alternative must be proportional to the difference in δ_{ij} and β_j between another Big 4 audit firm and the Non-Big 4 audit firm alternative. Suppose that the choice set consists of two alternatives, KPMG and Non-Big 4 audit firms and that the

probabilities of appointing KPMG, P_{KPMG}, and a Non-Big 4 audit firm, $P_{Non-Big\ 4}$, are 60% and 40%, the odds of appointing KPMG is $P_{KPMG}/P_{Non-Big\ 4} = 0.6/0.4 = 1.5$. If we expand the option of choices to also include EY, then the odds of appointing KPMG instead of a Non-Big 4 audit firm, $P_{KPMG}/P_{Non-Big\ 4}$, should not change even if the probabilities of each alternative change. If the odds change, it implies that there is unknown correlation between the probability of appointing KPMG and EY, such that the introduction of EY alters the probability of appointing KPMG over the Non-Big 4 audit firms. In such cases, we cannot draw conclusions about the relative attractiveness of each audit firm without first detailing the correlation of appointment probabilities between them. However, by using a mixed logit model, we no longer need to assume proportionality between the audit firm choices because we let the probabilities of appointing an audit firm depend on the correlation between the different values of δ_{ij}, which we determine empirically.

In addition to the systematic effects of δ_{ij}, α, γ and β_j, which we control for in V_{ij}, there might also be individual characteristics of a client firm that influence P_{ij}, such as the incidence of personal acquaintance between an audit partner and a member of a client firm's audit committee. We can denote these individual characteristics $\mathcal{E}_{ij}$. The applicability of our mixed logit model relies on the assumption that $\mathcal{E}_{ij}$ are independent and identically distributed. If the effects $\mathcal{E}_{ij}$ for the different alternatives are identical and have no correlation, they will cancel, meaning P_{ij} will only be influenced by V_{ij}.

5.5 Model estimation

We specify the coefficients δ_{ij}, α, γ and β_j for the variables included in V_{ij} in an iterative process, whereby we maximize the log likelihood of the model making correct predictions of audit firm appointments, by testing different values of the coefficients. To illustrate, consider Table 1 below and suppose the estimated probability for the client firm AAK appointing KPMG as audit firm is $P_{KPMG} = 0.40$ when we specify that the coefficient for the variable size is $\beta = 1$ and that $P_{KPMG} = 0.50$ when we change the coefficient to $\beta = 2$. If AAK's actual choice is KPMG, then the model specification where $\beta = 2$ is a better predictor of how size influences audit firm appointments. Suppose also that the probability of Volvo appointing EY as audit firm changes from $P_{EY} = 0.80$ to $P_{EY} = 0.50$ as we change β from $\beta = 2$ to $\beta = 1$. If Volvo appoints EY as audit firm, then the model specification where $\beta = 1$ is the better predictor of how size influences audit firm appointments for the set of observations, because the combined log likelihood of the model is higher when $\beta = 1$. This holds true even though the accuracy of

predicting AAK's appointment of audit firm is greater when $\beta = 2$, as our goal is to specify coefficients that maximize our ability to predict audit firm appointments for all observations.

TABLE 1
Example: Log Likelihood (LL) Maximizations

Client	Choice	β	Size	PWC	EY	KPMG	Deloitte	Non-Big 4
						P_{ij}		
AAK	KPMG	1	100	15%	20%	40%	20%	5%
AAK	KPMG	2	100	20%	15%	50%	10%	5%
Volvo	EY	1	200	5%	80%	5%	5%	5%
Volvo	EY	2	200	10%	50%	15%	20%	5%

Combined LL   **1**   AAK: 0×ln(.15)+0×ln(.20)+1×ln(.40)+0×ln(.20)+0×ln(.05) = **−0.916**
Volvo: 0×ln(.05)+1×ln(.80)+0×ln(.05)+0×ln(.05)+0×ln(.05) = **−0.223**

$\sum_i \sum_j lnP_{ij, \ \beta=1} = \mathbf{-0.916} + \mathbf{-0.223} = \mathbf{-1.139}$

Combined LL   2   AAK: 0×ln(.20)+0×ln(.15)+1×ln(.50)+0×ln(.10)+0×ln(.05) = −0.693
Volvo: 0×ln(.10)+1×ln(.50)+0×ln(.15)+0×ln(.20)+0×ln(.05) = −0.693

$\sum_i \sum_j lnP_{ij, \ \beta=2} = -0.693 + -0.693 = -1.386$

If we evaluate different values of our coefficients to maximize the log likelihood of making correct predictions of audit firm appointments, we can estimate the impact of our variables in V_{ij} on P_{ij}. We do this specification accordingly: If client firm i appoints audit firm j the binary variable y_{ij} assumes the value of one, or zero otherwise and is multiplied with the log likelihood for that specific prediction. We repeat this process for all possible client-audit firm pairs and summarize the outcomes accordingly:

$$LL(\alpha, \beta_j, \delta_{ij}) = \sum_i \sum_j y_{ij} \, lnP_{ij} = \sum_i \sum_j y_{ij} \, ln \int \left(\frac{e^{V_{ij}}}{\sum_J e^{V_{ij}}} \right) f(\delta)d(\delta)$$

Conditional on the estimated coefficients from the log likelihood maximization, we use our mixed logit model to predict probabilities of client firms appointing each of the different audit firms for the year we evaluate the perceived cost of forced audit firm switches, 2016, as well as for the reference year, 2015. For each client firm, we predict that the appointed audit firm is the one with the highest estimated probability of being appointed. Moreover, we specify the audit firm with the second highest estimated probability of being appointed as the audit firm the client firm would appoint if restrictions prevent it from appointing its most preferred audit firm. This means that when we estimate client firms' perceived cost of forced audit firm switches, we compare the benefit the client firms receive from appointing the audit

firm we estimate as the most preferred option, not the observed appointment, with the client firm we estimate as the second most preferred option. The reason we derive perceived costs from estimated appointments and not observed ones is because we want to control for possible bias in our model. Moreover, consider for example Tele 2, which appointed Deloitte as audit firm in 2016, but we predicted to appoint PWC. This means we have estimated a lower perceived benefit for Tele 2 from appointing Deloitte than from appointing PWC. In this case, if we were to use the observed audit firm appointment as the appointment in the unrestricted setting and then force Tele 2 to switch to PWC in the restricted setting, our model would tell us that Tele 2 perceives the forced audit switch as beneficial. To ensure that our estimations reflect perceived switching costs accurately, we must therefore base our perceived cost estimations on the predicted audit firm appointments.

5.6 Perceived cost estimation

Given that we are able to specify the probabilities of appointing an audit firm and that P_{ij} reflects the attractiveness of appointing that audit firm relative to the alternatives, we ought to be able to relate differences in attractiveness between different audit firm alternatives to differences in perceived benefits.

FIGURE 1
Graphic represesentation of the relationship between
Pij and AFij for different audit firms
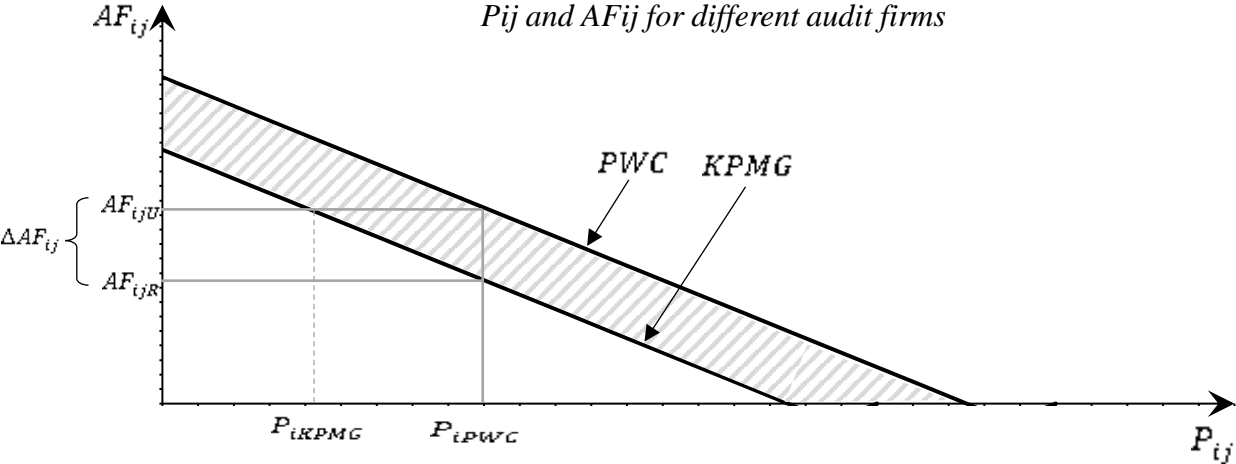
We can express the net benefit of an audit service as the difference between how much a client firm values the provision of audit services from a given audit firm and what it pays for those services as NB_{ij}. Intuitively, when NB_{ij} is high relative to that of the other audit firm alternatives, an audit firm alternative should be attractive, making P_{ij} high. As AF_{ij} increases however, NB_{ij} for that audit firm decreases, causing P_{ij} to drop. We illustrate this

relationship graphically in Figure 1 above.

Referring back to the aim of this study, to calculate the perceived cost of audit firm tenure restrictions and of a forced exit of a Big 4 audit firm, we relate NB_{ij} of appointing the most preferred audit firm in an unrestricted setting, $NB_{ij,U}$ to an alternative restricted setting in which the most preferred option is not eligible, $NB_{ij,R}$. In this way we can measure the difference in ΔNB_{ij} between the two settings. We illustrate the expression ΔNB_{ij} graphically in Figure 1 as the area bound by the two lines in the example of a client firm's probabilities of appointing PWC and KPMG conditional on AF_{ij}. The shaded area illustrates that the client firm always perceives the net benefit of PWC's services as greater than from KPMG, conditional on the same AF_{ij}. When we impose restrictions, the client firm can no longer appoint PWC, so NB_{ij} drops as the client firm now has to settle for the second best option, KPMG. To measure the perceived cost of restrictions, we reduce AF_{ij} in the restricted setting to the point where $\Delta P_{ij} = \Delta NB_{ij} = 0$. The necessary reduction in AF_{ij}, ΔAF_{ij} as such represents the reduction in audit fees, or the monetary compensation a client firm would require in the restricted setting to be equally satisfied as in the unrestricted setting.

When we conduct our mixed logit estimations, we calculate probabilities of the different audit firm appointments, but in order to estimate ΔAF_{ij}, we need to calculate the AF_{ij} that would make the client firm equally satisfied in the restricted setting. This means we need to express the effect of changes in audit fees on the change in probabilities, α, as the inverse – the effect of changes in probabilities to changes in audit fees, $\frac{1}{\alpha}$. Figure 1 illustrates this relationship between AF_{ij} and P_{ij} graphically, with the slope given by $\frac{1}{\alpha}$.

This means we can determine how much a client firm values the net benefit of an audit service in expectation, $E(NB_{ij})$, by evaluating the probability of the client firm appointing an audit firm for all possible combinations of P_{ij} and AF_{ij} along the lines in Figure 1. Since how AF_{ij} changes on account of P_{ij} depends on $\frac{1}{\alpha}$ we can calculate the SEK value of $E(NB_{ij})$ as the integral of P_{ij} contingent on $\frac{1}{\alpha}$, or the area to the left of each line in Figure 1:

$$E(NB_{ij}) = -\frac{1}{\alpha} \int (P_{ij}) = -\frac{1}{\alpha} \int \left(\frac{e^{V_{ij}}}{\sum_J e^{V_{ij}}} \right) dV_{ij}$$

Evaluating the integral, we arrive at:

$(1): \dfrac{e^{V_{ij}}}{\sum_J e^{V_{ij}}} = \dfrac{1}{u}$, $(2): \int \dfrac{1}{u} = \ln(u) + c$, $(3): \ln(u) + c = \ln\left(\sum_J e^{V_{ij}}\right) + c$

$$E\left(NB_{ij}\right) = -\frac{1}{\alpha}\ln\left(\sum_J e^{V_{ij}}\right) + c$$

We are interested in the perceived cost to client firms from audit firm tenure restrictions and from the exit of a Big 4 audit firm, and we calculate that perceived cost as the monetary compensation necessary to undo the harm to client firms from the imposed restrictions. To estimate this compensation we need to calculate the difference in net benefits in the unrestricted and restricted settings and subsequently solve for the monetary compensation, or equivalently the necessary reduction in audit fees, that equates the two net benefits.

$$E\left(NB_{ij,U}\right) - E\left(NB_{ij,R}\right) = -\frac{1}{\alpha}\left[\left(\ln\sum_{j_U=1}^{J_U} e^{V_{ij}} + c\right)_U - \left(\ln\sum_{j_R=1}^{J_R} e^{V_{ij}} + c\right)_R\right]$$

5.7 Variable specification

5.7.1 Interaction variables

In our specification of V_{ij}, we include client firm specific characteristics (x_{ij}) that are expected to influence how client firms perceive each audit firm alternative. We have chosen variables with respect to considerations regarding five categories of determinants of the appointment of audit firm: bonding effects; client firm size; reporting quality; client firm business risk; and client firm industry classification. Our use of these determinant categories is shared with Gerakos & Syverson (2015), who hypothesize that the set of determinants capture how client firm characteristics affect their audit firm preferences. However, Gerakos & Syverson (2015) also control for the breadth of client firms' business activities, which they proxy with variables for the client firms' proportion of sales that are foreign and number of business segments they serve. Since Sweden represents such a small market, most client firms in our sample will have to target an international market. Foreign sales is however a stronger determinant of audit firm appointments in the US, as a larger share of client firms target the US market exclusively, which in itself represents 15.1% of global output (International Monetary Fund 2018). This means there is likely a greater discrepancy in how US client firms will value audit firms on account of their international experience. Additionally, as the Swedish market is smaller than the US market, coverage on the client firms' different business segments is less extensive, preventing

us from controlling for this determinant.

In addition to controlling for the length of tenure through our variable T_{ij}, we also control for how the effect from tenure differs depending on the audit firm. To do so, we interact an audit firm appointment with tenure in a variable we denote XT_{ij}, to capture the differences in the incremental effects of tenure on P_{ij}. To exemplify, in 2015 AAK had an eleven year tenure with PWC, we would then assign XT_{ij} with a value of eleven years for all audit firm alternatives. We observe from Table 2 that Big 4 audit firms have higher client firm retention rates than the Non-Big 4 audit firms, suggesting the effects of XT_{ij} on P_{ij} are stronger for Big 4 audit firms. However, XT_{ij} might also be weaker for Big 4 audit firms relative to the Non-Big 4 audit firms, because we observe in our sample that 40% of the client firms leave the Non-Big 4 audit firms in the first two years of the client- audit firm relationship, such that the effect of XT_{ij} on P_{ij} for those that remain with the Non-Big 4 audit firm is stronger. Table 2 below illustrates the observed switching patterns across all audit firms, for every year during the period 2002-2016.

TABLE 2
Audit Firm Switches

Year t	Year t+1					Total
	PWC	EY	KPMG	Deloitte	Non-Big 4	
PWC	967	15	12	7	0	1,001
	97 %	2 %	1 %	1 %	0 %	
EY	20	620	10	8	4	662
	3 %	94 %	2 %	1 %	1 %	
KPMG	20	17	632	8	1	725
	3 %	3 %	93 %	1 %	0 %	
Deloitte	7	6	5	335	2	355
	2 %	2 %	1 %	94 %	1 %	
Non-Big 4	8	6	6	5	134	159
	5 %	4 %	4%	3 %	84 %	
Total	1,022	664	665	363	141	2,885

The table displays the switching pattern for all client firms evaluated over all firm years. The leftmost column represents the audit firm choice of the client firm in year *t* while the remaining columns display the subsequent choices of audit firm in year *t+1*. The percentages illustrate how the proportion of audit firm appointments in *t* relate to audit firm appointments in year *t+1*. For example, of the 1,001 firm years who appointed PWC as audit firm in year *t*, 967 (97 %) also appointed PWC in year *t+1*, whereas 15 (2 %) switched to EY.

To account for how the effect of bonding from NAS differs, we include the variable NAS_{ij}, which is the amount in million SEK the client firm paid in NAS-fees the previous year. As with XT_{ij}, NAS_{ij} is interacted with each audit firm alternative to measure the

difference in bonding effects due to NAS. From Table A4 in Appendix A, we observe that the Big 4 audit firms on average collect substantially more NAS fees from its client firms, giving reason to suspect that the bonding effects due to NAS fees are stronger for the Big 4 audit firms.

Further expanding x_{ij}, to incorporate the effect of client firm size on the appointment of audit firm, we include the client firm's market capitalization in billion SEK, MC_{ij}. We expect the coefficient for MC_{ij} to be positively correlated with the probability of appointing any of the Big 4 audit firms because we observe that the average market capitalization for the Big 4 audit firms' client firms is between 10-18 times larger than for the Non-Big 4 audit firms' client firms (see Table A4 in Appendix A). Larger client firms warrant additional regulatory and market supervision given that the damaging effects from low quality reporting have a greater negative impact on capital markets. Since capital markets typically perceive Big 4 audit firms as more skillful, the associated certification effect of appointing a Big 4 audit firm is consequently greater than that of appointing a Non-Big 4 audit firm, meaning client firms ought to favor Big 4 audit firms as they grow (Francis & Yu, 2009; DeAngelo 1981b). Moreover, as increased size generates additional complexity of interpreting the client firms' business activities, it may necessitate various audit specialists that smaller audit firms may find difficult to source (Gong et al 2016; Revisorsinspektionen 2017).

To incorporate whether there is an association between reporting quality and the appointment of audit firm, we include the variables IR_{ij} and AP_{ij}, controlling for the level of inventories and accounts receivables relative to total assets and the level of account payables relative to total assets, respectively. A propensity to manage earnings has repeatedly been associated with higher levels of accounting accruals (Dechow, Sloan & Sweeney 1995; Jones 1991), booking higher receivables for cash not yet received from sales and higher payables for costs associated with that sale. The effect on inventories is the opposite but also deteriorates earnings quality, unwarranted write-downs on inventories lead to enhanced gross margins as well as lower asset bases in the case of subsequent inventory sales. Client firms with greater propensities to manage earnings may therefore be more likely to appoint audit firms with a greater tolerance for lower earnings quality, so there is a possibility that these considerations affect the client firms' appointment of audit firm. As Big 4 audit firms have been shown to produce higher quality audits (Gong et al 2016), we expect AP_{ij} to be negatively associated with the appointment of Big 4 audit firms, but cannot predict the relationship for IR_{ij}, as earnings management will affect inventories and receivables oppositely.

Given the higher credibility and verification effect of audits conducted by Big 4

audit firms, relative to Non-Big 4 audit firms (Francis & Yu, 2009), the reputational cost of tarnishing perceived audit quality by misstating a client firm's prospects for going concern will be higher for the Big 4 audit firms. As such, client firms' business risk is likely to have a negative impact on the propensity of Big 4 audit firms' willingness to audit the client firms' financial statements. To control for client firm business risk, we include MB_{ij}, the client firm market-to-book value of equity ratio, to incorporate the market perception of client firm riskiness, as well as ROE_{ij}, the client firm's return on equity, as a proxy for bankruptcy risk. We expect the coefficient for ROE_{ij} to be negative, since Big 4 audit firms will be less likely to take on struggling client firms because they have more to lose (DeAngelo 1981b) and the average returns on equity for client firms audited by a Non-Big 4 audit firm are substantially lower than those audited by Big 4 audit firms (see Table A4 in Appendix A). Moreover, we expect MB_{ij} to be positive as higher values indicate that capital markets value the client firm's book value of equity more.

Finally, we include dummy variables for industry classification, I_{ij}, to account for audit firm specialization on certain client firm industries to generate more persistent market shares in an otherwise largely homogenous audit industry (Gul, Fung & Jaggi 2009; Habib & Bhuiyan 2011; Knechel, Naiker & Pacheco 2007). Moreover, the audit firms' market shares in the client firm industries included in Table A4 in Appendix A deviate substantially from their total market shares, suggesting that audit firms appear to specialize in certain industries. The resulting specification of x_{ij} is consequently:

$$x_{ij} \equiv \{XT_{ij}, \ NAS_{ij}, \ MC_{ij}, \ IR_{ij}, \ AP_{ij}, \ MB_{ij}, \ ROE_{ij}, \ I_{ij}\}$$

5.7.2 Price variable

An observant reader will have noticed that our estimation of P_{ij} for each potential client- audit firm pairing seems impossible to execute, as our estimations of P_{ij} partially hinge on our ability to estimate the effect from audit fees on P_{ij} based on audit fees for client- audit firm pairings that never existed. For all potential audit firm appointments, only the audit fee of the appointed audit firm will be recorded in the client firms' annual statements. To exemplify, the observed audit firm appointed by Volvo in 2016 is PWC, for which they were charged around sixteen million SEK. The fact that Volvo appointed PWC however means that audit fees to the remaining alternatives never existed. Consequently, if we only use the recorded fees in our estimations of audit firm appointments, our estimations will carry a selection bias. To circumvent this selection bias, we therefore use estimated audit fees of what Volvo, or any of

the other client firms would have paid the different audit firms, $E(AF_{ij})$. The resulting specification of V_{ij} is consequently:

$$V_{ij} = \delta_{ij} - \alpha E(AF_{ij}) + \gamma T_{ij} + \beta_{1j} XT_{ij} + \beta_{2j} NAS_{ij} + \beta_{3j} MC_{ij} + \beta_{4j} IR_{ij} + \beta_{5j} AP_{ij} + \beta_{6j} MB_{ij} + \beta_{7j} ROE_{ij} + \beta_j I_{ij}$$

To estimate $E(AF_{ij})$, we specify a regression model to predict audit fees for each client- audit firm relationship for each firm year and use these estimated audit fees as inputs in our estimation of audit firm appointments instead of actual audit fees. We employ a fixed effects regression to predict audit fees, $E(AF_{ijt})$, for the theoretical client- audit firm pairings. In addition to selecting a suitable regression model, the accuracy and predictive power of our predictions of $E(AF_{ijt})$ also hinge on what independent variables are included. To select relevant determinants of audit fees, we use the results from the meta-study carried out by Hay, Knechel and Wong (2006), outlining the most often used categories of determinants in explaining audit fees. We interact all of our variables with each audit firm alternative to capture differences in how they influence $E(AF_{ijt})$. The most cited determinant of audit fees is client firm size (ibid). We therefore include three size measures R_{ijt} – revenue, A_{ijt} – total assets, and MC_{ijt} – market capitalization, all expressed in billion SEK as measures for client firm size to incorporate its effects into $E(AF_{ijt})$. We expect audit fees to increase with client firm size, since the audit process becomes more burdensome as the client firm engages in more transactions and as market participants demand higher audit quality as the value at risk rises. To control for how client firm riskiness affects $E(AF_{ijt})$, we include ROE_{ijt} – return on equity and MB_{ijt} – the market-to-book value of equity ratio. We expect $E(AF_{ijt})$ to be a decreasing function of both ROE_{ijt} and MB_{ijt}, reflecting the increased audit risk as the client firm becomes more susceptible to financial distress (O'Keefe, Simunic & Stein 1994). To control for the impact of audit quality on $E(AF_{ijt})$ we also include the variables IR_{ijt} and AP_{ijt}, identically defined as in our mixed logit model, to measure how audit quality impacts audit fees. Since low levels of accruals typically reflect high audit quality, the variables IR_{ijt} and AP_{ijt} should be a decreasing function of $E(AF_{ijt})$ if client firms value high audit quality. However, because client firms might be willing to pay more for the ability to manage its earnings and still be certified by a high reputation audit firm, the relationship might also be positive. For this reason, it is difficult to predict a sign for the coefficients of IR_{ijt} and AP_{ijt}

We expect the effect of bonding from tenure to be positively associated with audit

fees. As tenure in the client- audit firm relationship increases, the bonding between the client- and audit firm ought to facilitate rising audit fees as audit firms seek to capitalize on their relationship with the client firm. Additionally, previous research has identified 'low-balling' amongst audit firms, meaning they have purposely lowered initial bids for audit appointments to subsequently increase audit fees as the switching costs grow (DeAngelo 1981a). Consequently, we expect the variable XT_{ijt} to be positively associated with $E(AF_{ijt})$. We however expect NAS_{ijt} to display a negative association with $E(AF_{ijt})$ as previous research has documented that audit firms charge lower audit fees, and instead capitalize on the relationship through additional NAS-fees (Blay & Geiger 2013). We specify the complete fixed effects model estimating $E(AF_{ijt})$ of the theoretical client- audit firm pairings below. The results are presented in Table A5 in Appendix A:

$$AF_{ijt} - \overline{AF}_{ij} = \beta_{1j}(R_{ijt} - \bar{R}_{ij}) + \beta_{2j}(A_{ijt} - \bar{A}_{ij}) + \beta_{3j}(MC_{ijt} - \overline{MC}_{ij}) + \beta_{4j}(ROE_{ijt} - \overline{ROE}_{ij}) + \beta_{5j}(MB_{ijt} - \overline{MB}_{ij}) + \beta_{6j}(IR_{ijt} - \overline{IR}_{ij}) + \beta_{7j}(AP_{ijt} - \overline{Ap}_{ij}) + \beta_{8j}(XT_{ijt} - \overline{XT}_{ij}) + \beta_{9j}(NAS_{ijt} - \overline{NAS}_{ij}) + (\varepsilon_{ijt} - \bar{\varepsilon}_{ij})$$

6 Results

6.1 Mixed logit results

The results from the mixed logit model are presented in Table 3. The results display that in line with our expectations and economic intuition, the probability of appointing an audit firm decreases (-0.2499) as AF_{ij} increases for all audit firms. The effects from bonding for all audit firms, displayed by T_{ij} (0.4070) is positive as predicted. Moreover, the incremental effects of tenure, displayed by XT_{ij}, show that the impact on the probabilities of appointing PWC (-0.1690) and Deloitte (-0.2271) from an additional year of tenure is significantly weaker than the impact of an additional year of tenure with a Non-Big 4 audit firm, whereas the difference is insignificant for the other Big 4 audit firms. The effects from NAS_{ij} on P_{ij} is positive and significant for all Big 4 audit firms: PWC (2.0007); EY (1.9888); KPMG (2.0282); and Deloitte (2.0128). This indicates that the impact on the probability of appointing a Big 4 audit firm if that audit firm has performed NAS_{ij} for the client firm in the previous year is stronger than the corresponding impact for Non-Big 4 audit firms.

When interpreting the effects of size on P_{ij}, MC_{ij} shows a positive and significant relationship for all Big 4 audit firms: PWC (0.7290); EY (0.6599); KPMG (0.6887); and Deloitte (0.7248), indicating that Big 4 audit firms become relatively more attractive as client

firms grow, as hypothesized.

Regarding the indicators of audit quality, IR_{ij} and AP_{ij}, the coefficient for IR_{ij} is only significant for KPMG (-2.5756), while the signs for the remaining Big 4 audit firms vary. With respect to AP_{ij}, Deloitte (10.6522) is the only Big 4 audit firm with a significant coefficient. The results indicate that audit quality, as measured by accruals does not affect the appointment of audit firm, or alternatively put, the type of client firm the audit firms chooses to serve.

The effects from our indicators of client firm risk, MB_{ij} and ROE_{ij}, show no significant relationship with the probability of appointing a given Big 4 audit firm, apart from ROE_{ij} on EY (-0.1458). At large, MB_{ij} and ROE_{ij} do not seem to impact P_{ij} when controlling for other variables that might correlate with risk, such as client firm size and industry belonging. This means audit firms do not seem to have client firms with systematically varying risk profiles, such that there is no particular 'distressed client firm specialist'.

Table 3 also presents the estimations of the audit firm brand effects, δ_{ij}, for the Big 4 audit firms. The mean values for the brand effects are positive for PWC (1.2103) and negative for Deloitte (-5.7672), whereas they are not significant for EY or KPMG. The estimated standard deviations illustrate how δ_{ij} of individual Big 4 audit firms vary substantially among client firms, meaning the impact of δ_{ij} on the P_{ij} may be negative or positive depending on individual client firm preferences.

TABLE 3

Mixed Logit Estimation Results for Predictions of Audit Firm Appointments

Variables	Predicted (+/−)	PWC	EY	KPMG	Deloitte	Non-Big 4
AF_{ij}	−	−0.2499***	−0.2499***	−0.2499***	−0.2499***	−0.2499***
		(0.0884)	(0.0884)	(0.0884)	(0.0884)	(0.0884)
T_{ij}	+	0.4070***	0.4070***	0.4070***	0.4070***	0.4070***
		(0.0246)	(0.0246)	(0.0246)	(0.0246)	(0.0246)
XT_{ij}	+/−	−0.1690**	−0.0682	0.0170	−0.2271***	0
		(0.0729)	(0.0721)	(0.0731)	(0.0834)	(0)
NAS_{ij}	+	2.0007***	1.9888***	2.0282***	2.0128***	0
		(0.5902)	(0.5908)	(0.5906)	(0.5906)	(0)
MC_{ij}	+	0.7290***	0.6599***	0.6887***	0.7248***	0
		(0.1210)	(0.1189)	(0.1206)	(0.1209)	(0)
IR_{ij}	+/−	0.0761	−0.1599	−2.5756**	−1.5586	0
		(1.1172)	(1.1026)	(1.0967)	(1.2611)	(0)
AP_{ij}	−	2.3753	4.2999	2.1425	10.6522***	0
		(2.7436)	(2.8110)	(2.7879)	(3.0915)	(0)
ROE_{ij}	−	0.0580	−0.1458**	0.0424	0.0081	0
		(0.1106)	(0.0811)	(0.0865)	(0.0743)	(0)
MB_{ij}	−	−0.0140	−0.0127	−0.0012	−0.0027	0
		(0.0284)	(0.0328)	(0.0328)	(0.0359)	(0)
Cons. Discr.	+/−	2.2926**	2.8931***	1.5718	2.2375*	0
		(1.1510)	(1.0373)	(1.1135)	(1.3592)	(0)
I.T.	+/−	-1.3445*	-3.6505***	0.7750	2.8630***	0
		(0.7619)	(0.7965)	(0.7991)	(1.0309)	(0)
Health Care	+/−	−1.2338	−0.4210	−1.7980**	3.0927***	0
		(0.7833)	(0.7621)	(0.8636)	(1.0497)	(0)
Industrials	+/−	0.3443	0.2660	−0.4418	−0.2149	0
		(0.8087)	(0.8192)	(0.8592)	(0.9854)	(0)
Real Estate	+/−	−1.0199	−0.9719	−2.1209*	2.1677*	0
		(0.9717)	(0.9196)	(1.1573)	(1.1439)	(0)
Fin. Services	+/−	−2.1364**	−1.9288*	0.5452	1.3520	0
		(1.0281)	(1.0281)	(1.0162)	(1.3192)	(0)

Continued

TABLE 3 - *Continued*
Mixed Logit Estimation Results for Predictions of Audit Firm Appointments

Variables	Predicted (+/−)	PWC	EY	KPMG	Deloitte	Non-Big 4
δ_{ij}	+/−	1.2103*	−0.5495	0.3511	−5.7672***	0.0
		(0.7313)	(0.7434)	(0.8038)	(1.1295)	(0.0)
Standard Dev.		6.2874***	5.3144***	3.0863***	7.9809***	0.0
		(0.4846)	(0.4450)	(0.2311)	(0.5938)	(0.0)

The table shows the results from the mixed logit estimations for predicting the impact of various variables on audit firm appointments. The leftmost column displays the variables included in the mixed logit whereas the next column states the predicted signs. The coefficients indicate the impact on client firms' probabilities of appointing a given Big 4 audit firm relative to a Non-Big 4 audit firm, with the probabilities expressed in log odds. AF_{ij} represents the audit fees, T_{ij} represents the tenure in years of a client-audit firm relationship, XT_{ij} represents the tenure in years of a client-audit firm relationship, NAS_{ij} represents the effect of NAS-fees, MC_{ij} represents Market Capitalization, IR_{ij} represents the sum of inventories and receivables as percent of total assets, AP_{ij} represents accounts payable as percent of total assets, ROE_{ij} represents the return of equity, MB_{ij} represents the market to book value of equity ratio. δ_{ij} represents the brand effects of each audit firm alternative. AF_{ij} and T_{ij} are the same for all audit firm alternatives whereas the remaining variables are interacted with each audit firm alternative and compared to the log odds of that Non-Big 4 audit firm, whose variables are normalized to zero. The coefficients thus represent the difference in log odds from the Non-Big 4 audit firm alternative, or the difference in impact on the probability of an audit firm being appointed by the client firm.

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.2 Perceived costs

6.2.1 Audit firm tenure restriction

With respect to our first hypothesis, that the introduction of audit firm tenure restrictions will result in a perceived cost as the client firms are no longer free to appoint their preferred audit firm, the results in Table 4 present the perceived cost from the introduction of audit firm tenure restrictions. To test the sensitivity of our results to the length of tenure, we provide estimates of perceived costs for audit firm tenure restrictions of nine, ten and eleven years. The results show that the perceived cost of audit firm tenure restrictions set to ten years are 1,608 and 1,578 million SEK in 2015 and 2016 respectively and increases to 1,657 and 1,688 million SEK in 2015 and 2016 when tenure is restricted to nine years. When we increase audit firm tenure restrictions to eleven years, the perceived costs decrease to 1,485 and 1,542 million SEK in 2015 and 2016. The perceived cost per affected client firm for a ten year tenure restriction is 16.9 and 17.7 million SEK in 2015 and 2016 respectively. With respect to these results, we confirm our first hypothesis that client firms perceive audit tenure restriction as a cost.

TABLE 4

Estimated perceived costs from audit firm tenure restrictions at 9, 10 and 11 years

Tenure Restriction	9		10		11	
	2016	2015	2016	2015	2016	2015
Cost in MSEK						
Total	1,688	1,675	1,578	1,608	1,542	1,485
Affected Client Firm Avg.	16.6	16.7	17.7	16.9	17.9	17.8
Sample Avg.	6.5	6.7	6.1	6.5	6.0	6.0
Number of Firms						
Affected Client Firms	102	99	89	95	86	84
Sample Total	259	249	259	249	259	249

The table shows the estimated perceived costs associated with audit firm tenure restrictions set to nine, ten and eleven years in 2015 and 2016 respectively. The perceived costs are presented as a total figure, as a client average for the client firms that are directly affected by tenure restrictions at the time of the policy change, and as a sample average with respect to all client firms for the year. The table also presents the total number of client firms directly affected by tenure restrictions as well as the total client firms in the sample for 2016 with 2015 as reference.

6.2.2 Exit of a Big 4 audit firm

The results concerning our second hypothesis, that the exit of a Big 4 audit firm will also result in a perceived cost, are presented in Table 5. The results illustrate the estimated perceived cost from the exit of each Big 4 audit firm in 2015 and 2016. The largest estimated perceived cost adhere to the potential exit of PWC, 1,682 million SEK and 1,769 million SEK in 2015 and 2016 respectively. The corresponding perceived cost for EY are estimated to be 316 and 306 million SEK, and respectively, 775 million SEK and 776 million SEK for KPMG in 2015 and 2016. The perceived cost of an exit by Deloitte is estimated at 17 million SEK in both 2015 and 2016. Inspecting the perceived cost per affected client firm when a Big 4 audit firm exits the market, client firms of KPMG stand out as the most severely affected, who would incur a perceived cost of 12.5 and 11.9 million SEK in 2015 and 2016. Consequently, client firms of KPMG appear to assign the highest value to the relationship with their audit firm. The per client firm perceived costs for client firms of PWC and EY are roughly of the same size as KPMG, whereas client firms of Deloitte only perceive the loss of its most preferred audit firm as a cost of 4.1 and 4.2 million SEK in 2015 and 2016. Supposing the risk of a Big 4 audit firm exiting the market on account of audit failure is the same for all client-audit firm relationships. Then we can calculate the total expected perceived cost of a Big 4 audit firm exit as a weighted mean, with the weights given by the predicted market shares based on the number of client firms. Accordingly, the expected perceived cost of a Big 4 audit firm exit is 1,224 and 1,299 million SEK, or alternatively 11.2 and 11.1 million SEK per affected client firm, in 2015 and 2016 respectively. Overall, the results affirm hypothesis H1b, that client firms perceive the exit of a Big 4 audit firm as a cost, regardless of which audit firms exits the market.

TABLE 5
Estimated perceived costs from the exit of a Big 4 audit firm

Big 4 audit firm	PWC		EY		KPMG		Deloitte		Average	
	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015
Cost in MSEK										
Total	1,769	1,682	306	316	776	775	17	17	1,299	1,224
Affected Client Firm Avg.	11.3	11.4	11.4	10.5	11.9	12.5	4.2	4.1	11.1	11.2
Sample Avg.	6.8	6.8	1.2	1.3	3.0	3.1	0.1	0.1	5.0	4.9
Number of Firms										
Affected Client Firms	157	147	27	30	65	62	4	4	114	106
Sample Total	259	249	259	249	259	249	259	249	259	249

The table shows the estimated perceived costs associated with the exit of any of the Big 4 audit firms, as well as an average figure for a Big 4 audit firm exit with weights given by each audit firm's share of the total number of client firms in 2016, with 2015 as reference. The perceived costs are presented as a total figure, as a client firm average for the client firms that are directly affected at the time of the exit and as a sample average with respect to all client firms for the year. The table also presents the total number of client firms directly affected by the exit the as well as the total client firms in the sample for 2015 and 2016.

6.2.3. Audit firm tenure restriction versus the Exit of a Big 4 audit firm

With respect to our third hypothesis, that the perceived cost from the exit of a Big 4 audit firm will exceed the perceived cost of audit firm tenure restrictions, we observe that the perceived cost of audit firm tenure restrictions is 384 and 279 million SEK higher in 2015 and 2016 respectively, when comparing to the average perceived cost of a Big 4 audit firm exit. When comparing to the event of PWC exiting the audit industry, we find the perceived cost of PWC exiting the audit industry to exceed the perceived cost of a ten year audit firm tenure restriction by 74 and 191 million SEK in 2015 and 2016 respectively. Further, when comparing the perceived cost of Deloitte exiting the audit industry with audit firm tenure restrictions, we find that the perceived cost of a ten year audit firm tenure restriction exceeds the perceived cost of Deloitte exiting the audit industry by 1,591 and 1,561 million SEK in 2015 and 2016 respectively. Finally the perceived cost per affected client firm remains lower for all Big 4 audit firm exits compared to a ten year audit firm tenure restriction. We therefore fail to confirm our third hypothesis, even though the results concerning the potential exit of PWC point in its direction.

7 Discussion

7.1 Evaluation of our results

7.1.1 Audit firm tenure restrictions

The estimated perceived cost of introducing audit firm tenure restrictions after ten years is 1,578 million SEK in 2016, as the client firms are forced to transition into the new regulatory setting.

This is substantial considering it exceeds the combined audit fees in our sample 2016, 1,502 million SEK. Moreover, from our evaluation of a reference scenario, in 2015 and for three different tenure restrictions, we observe that our results are robust to the timing and duration of the audit firm tenure restrictions. These results demonstrate the magnitude of the value that client firms derive from existing client- audit firm relationships and how a forced break up from that relationship considerably affects the value a client firm derives from appointing an audit firm.

Furthermore, one aim of this study has been to estimate the perceived costs of the newly imposed audit firm tenure restrictions in Sweden. The regulation states that after a ten-year period, non-financial client firms have the opportunity to reappoint their audit firms for an additional ten years after a tender process. Since our dataset only goes back sixteen years, we are unable to evaluate the perceived cost of a twenty-year restriction. Instead, we have quantified the perceived cost of imposing audit firm tenure restrictions after ten years as a shorthand for a more accurate representation of the perceived costs of the imposed audit firm restrictions in Sweden.

7.1.2 Exit of a Big 4 audit firm

Reflecting that the different Big 4 audit firms vary in market shares, the perceived cost of their exits from the audit industry will differ accordingly. The perceived cost of the exit of PWC in 2016, 1,769 million SEK, is 106 times greater than the estimated perceived costs from the exit of Deloitte, 17 million SEK. A significant reason to why there is such a substantial perceived cost difference between PWC and Deloitte relates to our model overstating the number of times client firms appoint PWC as audit firm and understating the number of times client firms appoint Deloitte. The high perceived cost of PWC exiting the audit industry is related to the fact that 60% of all client firms (157) are predicted to use PWC as audit firm in 2016, whereas the corresponding number is 1.5% (4) for Deloitte when in reality, PWC accounted for 39% (101) and Deloitte 14% (37).

Our predicted audit firm appointments are based on the probabilities of appointment we assign every audit firm alternative. Consequently, if our model for predicting the probabilities is flawed, it will have a direct effect on our estimations of client firm appointments of audit firms. Table 6 contrasts the predictions of our model with the observed audit firm appointments in the sample. From Table 6 it is evident how our model overstates the times PWC is appointed as audit firm and understates the times that Deloitte, in particular, is appointed. If the model were unbiased, the times each audit firm would be predicted as being

appointed would correspond exactly to the number of observed appointments for each audit firm. To assess the magnitude of this bias, Table 6 also presents the estimated market shares and contrasts these with the observed market shares for each audit firm. We can see that we overestimate the market shares of PWC and KPMG with factors of 1.64 and 1.25 respectively, whereas we underestimate the market shares of EY, Deloitte and Non-Big 4 audit firms with factors of 0.37, 0.05 and 0.70 respectively. The effect of this bias is that when we evaluate the perceived costs of audit firm tenure restrictions and of a Big 4 audit firm exit, the perceived costs will be over- or underestimated on account of our miss-prediction of market shares.

TABLE 6
Audit Firm Choice Predictions

Observed Choice	Predicted Choice					Total
	PWC	EY	KPMG	Deloitte	Non-Big 4	
PWC	942	7	169	1	4	1,123
	84 %	1 %	15 %	0 %	0 %	
EY	289	259	181	0	14	743
	39 %	35 %	24 %	0 %	2 %	
KPMG	280	5	442	4	9	740
	38 %	1 %	60 %	1 %	1 %	
Deloitte	275	6	98	14	11	404
	68 %	1 %	24 %	3 %	3 %	
Non-Big 4	55	1	32	1	91	170
	32 %	1 %	19 %	1 %	48 %	
Total	1,841	278	922	20	119	3,180
Market Share	PWC	EY	KPMG	Deloitte	Non-Big 4	
Observed	35 %	23 %	23 %	13 %	5 %	
Predicted	58 %	9 %	29 %	1 %	4 %	
Market share ratio	1.64	0.37	1.25	0.05	0.70	

The table contrasts the observed audit firm appointments and the appointments as predicted by our model. The observed audit firm appointments are listed in the leftmost column while the other columns display the predicted audit firm choice as stated by our model. For example, our model correctly predicts the audit firm appointment for 84% of the client firms that have been observed to appoint PWC, but predicts that 15% of the client firms that were observed to appoint PWC instead appointed KPMG. The market shares displayed in the bottom of the table, on which 'Market share ratio' is based on are calculated from the number of client firms.

7.1.3 Audit firm tenure restriction versus the Exit of a Big 4 audit firm

We expected the perceived cost of a Big 4 audit firm exit to be greater than from audit firm tenure restrictions with the motivation that the Big 4 audit firms are much more dominant in Sweden than they are in the US, in terms of client firm coverage. Contradictory to our formulated hypothesis, it seems that client firms value the tenure of their relationship with their appointed audit firm more than they value the additional certification effect associated with a

Big 4 audit firm.

A reason for why audit firm tenure restrictions are perceived as more costly is because tenure will be long for all client firms in the case of audit firm tenure restrictions, but not in the case of an exit of a Big 4 audit firm. As our mixed logit model specifies that the net benefit of appointing an audit firm is chiefly determined by tenure, the difference in net benefits between the most preferred audit firm and the remaining alternatives is going to be very high in the event of a client firm being affected by audit firm tenure restrictions, but not necessarily so when affected by the exit of a Big 4 audit firm. This might indicate that the way we have specified our mixed logit model puts too much emphasis on the benefit from tenure, or alternatively, accurately illustrates how much value client firms in fact derive from tenure.

Our results that audit firm tenure restrictions are perceived as more costly than the exit of a Big 4 audit firm are in line with those of Gerakos & Syverson (2015). However, our perceived costs expressed in relation to the total size of the audit industry are greater, 105% for audit firm tenure restrictions and 81% for the exit of a Big 4 audit firm, than those presented in Gerakos & Syverson (2015), whose corresponding perceived costs are 25% and 16%. A reason why our estimation of perceived costs exceed the estimations made by Gerakos & Syverson (2015) might relate to the fact that the Swedish audit industry is more concentrated both in terms of demand and supply. Client firms whose share of the audit firms' total revenues is greater are more likely to successfully pressure their audit firms' to compromise their audit independence. They may thereby perceive the loss of influence over their audit firm when regulation prevents them from reappointing them as more costly than US firms do (Gietzman & Sen 2002). Conversely, because the Big 4 audit firms possess a larger share of the Swedish market than of the US market, 93% and 67% respectively, their exit from the Swedish audit industry affects proportionally more client firms than in the US (Gerakos & Syverson 2015; Retriever Business 2018).

7.2 Relevance of perceived cost estimates
7.2.1 Perceived costs as ground for policy evaluation

To warrant a meaningful discussion of the perceived costs from a policy perspective, it is also necessary to assess the relevance of our estimated perceived cost to client firms as an evaluation tool of whether the net benefit of one scenario outweighs the other. An impeding factor for the relevance of measuring the perceived cost of imposing audit firm tenure restrictions, or revoking the audit license for a Big 4 audit firm, is that whereas the measured perceived costs of the scenarios are borne by the client firms, the benefits in the form of avoided audit failures

and potential general improvements to audit quality befalls to both the client firms and other parties. Thus, irrespective of whether a cost-benefit analysis of the scenarios is net positive in monetary terms, the evaluation must also take into account whether the monetary benefit for one party is proportional to the monetary cost of the other.

Whereas the only beneficiaries of a Big 4 audit firm exit are the remaining audit firms on a more consolidated market (Feldman 2006), a restriction on audit tenure results in a more complex trade-off of costs and benefits. Supposing audit quality improves as existing social and economic bonds between client- and audit firms with long relationships are broken by the introduction of audit firm tenure restrictions, there are numerous beneficiaries. One beneficiary from improved audit quality is the external shareholder. A more reliable depiction of the client firm's business activities means the shareholder can assess the value of the share more accurately, which reduces the dissonance between the intrinsic value of the client firm's shares and the traded price (Penman & Zhang 2002). As improved audit quality reduces share price discounts, the client firm also benefits from the regulation, despite the perceived cost of no longer being unrestricted in its appointment of audit firm. Additionally, if improved audit quality from audit firm tenure restrictions prevents audit failures of the likes of Enron, then the regulation also benefits other parties, including the government who might benefit from avoiding costly litigations, workers whose pension plans might be tied to the performance of the firm and competing firms that might become the subject of unwarranted doubt from capital markets (Francis 2011).

7.2.2 Components of perceived cost

A further consideration that has to be made with respect to the relevance of our estimated perceived costs of audit regulation relates to whether its components represent viable grounds for objection to the restrictions. If forced audit firm switches means that there is a knowledge gap between the incoming audit firm and the previous audit firm, and the previous audit firm's knowledge would improve the depiction of the client firm's business activities (Bell, Causholli & Knechel 2015), then audit quality has suffered and the client firm's costs of, and objections to the audit regulation in question carry merit in a policy evaluation. However, if forced audit firm switches results in the client firm no longer enjoying the opportunity to influence its audit firm in approving opportunistic depictions of its business activities (Blay & Geiger 2013), then that cost represents an unjustifiable excuse for objecting to regulation. When measuring client firms' perceived cost of audit regulations it is impossible to isolate the perceived cost of reduction in audit quality as a consequence of lost knowledge, from the perceived cost of the

audit firms no longer facilitating opportunistic financial reporting. Consequently, as long as audit firms become both more knowledgeable and accepting of accounting malpractice as tenure increases, client firms' perceived cost of audit tenure restriction overstates the perceived cost of regulation and understates the benefit.

7.2.3 Supply-side audit fee increases from regulation

Our estimated costs of audit firm tenure restrictions and Big 4 audit firm exits only take the perceived cost of substitution into account. However, a likely additional cost of both scenarios is audit fee increases following a consolidation of the market (Feldman 2006; Gerakos & Syverson 2015; Kwon, Lim & Simnett 2014). When a forced audit firm switch occurs, the available audit firm alternatives for a client firm will decrease as its preferred audit firm is restricted from being appointed. This increases market consolidation, allowing the remaining audit firms to exercise their market power and increase audit fees. A similar impact would occur from the exit of a Big 4 audit firm, as remaining audit firms would be able to leverage increases in consolidation similarly. An exit of Deloitte in 2016, the smallest of the Big 4 audit firms that year, measured in fees, would have resulted in 12% of the total market for audit services being distributed over the remaining incumbents. Additionally, an audit tenure restriction of ten years introduced retroactively would result in 39% of the client firms not being able to reappoint its audit firm in 2016, instead having to choose between the four remaining alternatives. Our disregard for the audit fee increases, stemming from consolidation effects in the investigated settings, means our estimates of the total costs to client firms is likely understated. Thus, a comprehensive cost estimation of the introduction of audit tenure restriction and of the exit of a Big 4 audit firm necessitates an evaluation of the audit fee increases caused by the regulation in addition to the perceived cost of substitution.

To evaluate the magnitude of audit fee increases from consolidation, we would need to identify an isolated supply shift, allowing us to study the effect on audit fees from exogenously induced changes to audit industry competition. Otherwise, it is difficult to assess whether changes in industry competition in Sweden cause changes in audit fees or vice versa. Such a supply shift could potentially be the disappearance of a dominating audit firm. The disappearance of Arthur Andersen from the Swedish audit industry could constitute such a supply shift. However, unlike in the US, where Arthur Andersen enjoyed a 16% share of the audit industry (Gerakos & Syverson 2015), its disappearance in Sweden after 2001 only forced 15 of the 181 evaluated firms in 2002 to switch audit firm. Such a small redistribution of audit service appointments is insufficient to evaluate as an isolated shift in supply of audit services.

As we failed to identify other disruptive events to the market shares of the Swedish audit industry we were unable to isolate the effect of consolidation on audit fees.

7.3 Accuracy of perceived cost estimations

7.3.1 Measurement methodology

The way we measure perceived cost, using a mixed logit model to estimate probabilities of audit appointment, is but one of a number of approaches to measuring perceived cost. Moreover, depending on what method we use to calculate the perceived costs, results are likely to differ, underscoring the difficulties of dealing with directly unobservable costs. Our estimations are based on historic observations of audit firm appointments in a setting where these appointments are unrestricted. Hence, our estimated perceived costs are a projection of the ex-post perceived costs, based on ex-ante observations where audit firm appointments are unrestricted.

An alternative measurement approach would be to ask each client firm in our sample how they would perceive the cost of no longer being able to freely appoint an audit firm. The benefit of directly asking the client firm about the perceived cost is that the method controls for both overlooked determinants of audit firm appointment in our approach as well as possible miss-estimation of the effects from the determinants we have considered. As the costs we estimate are perceived, the answers a client firm would give are by definition true. An additional benefit is that the answers given by the questioned client firms would have taken the effect of the restricted setting into account, whereas our approach indirectly attempts to estimate the perceived costs of the restrictions based on observations in an unrestricted setting.

A possible flaw of directly asking each client firm about the perceived cost is that there may be a difference between what a respondent may say and actually does. A client firm may state that the introduction of audit firm tenure restrictions would be perceived as a very high perceived cost, but the same firm might still switch audit firm voluntarily, in which case the perceived cost of switching is necessarily lower than the associated benefit. An advantage of our methodology is that it observes actions, rather than hypothetical scenarios. If a client firm is asked about the perceived cost of audit tenure restriction and the exit of a Big 4 audit firm after that change has taken place, its response might vary from the perceived cost of the same changes before they occur. Since we want to estimate the actual, not the expected perceived costs of the evaluated scenarios, our method where we base our estimations on observations rather than speculations about audit firm appointments provides insights that simply asking the client firms misses.

7.3.2 The model's ability to capture real world conditions

The ability of our mixed logit model to correctly capture how audit firm appointments are made will determine our ability to generate accurate estimations of the perceived costs of the evaluated scenarios. One shortcoming of our model is that the choice to appoint an audit firm is mutually exclusive with all other audit firm alternatives, a condition that does not hold in reality, as multiple audit firms may be appointed simultaneously to provide audit services. In our sample, 45% of all client firms appoint more than one audit firm for audit services simultaneously, even though the main audit firms collect 92% of the audit fees. Our model's inability to incorporate the appointment of multiple audit firms simultaneously will therefore distort our perceived cost estimations. The dominating effect of audit tenure on the appointment of audit firms might therefore be overestimated in our model because it only incorporates tenure for the client firm's main audit firm. If tenure has a similar effect on secondary audit firms, we understate the probability that a client firm appoints its secondary audit firm if regulation prevents it from appointing its most preferred audit firm. However, given that 92% of audit fees are still collected by the main audit firm, it is reasonable to believe that the effect from tenure is weaker for secondary audit firms as the relationship with the client firm is much less extensive.

A related issue is the fact that the model is constructed as if a client firm makes a decision about what audit firm to appoint for the year on a yearly basis, whereas in reality, the appointment of an audit firm might also be awarded on a multiple year basis, or at least implicitly, until further notice (Gerakos & Syverson 2015). Consequently, the actual probability that an audit firm audits a client's financial statements a particular year may be conditional on a decision that is not made that year. Since our model treats audit firms appointments as a yearly decision, it does not fully capture the dynamic behavior of audit firm appointments observed in practice.

7.3.3 Predictive power of the model

Whereas much of the predictive power of our mixed logit model comes from our tenure variable, our ability to specify what audit firm is appointed when the preferable option is restricted due to tenure hinges on the ability of the other variables in the model to capture audit firm preferences. One way for us to increase our ability of to capture preferences would be to increase the number of determinants in the model. Unfortunately, to include more variables we need more observations of audit firm choices. In order to observe the effect of, for example, the provision of NAS on the probability of appointing an audit firm, we must observe both the

instance when an audit firm is appointed when it has, and when it has not provided NAS. Otherwise, the estimation would suggest that the provision of NAS by the evaluated audit firm alternative always results in a particular outcome (Allison 2008). As we add more variables to our model specification we increase the likelihood that some sequences of variable-values only have one outcome. To illustrate, consider Figure 2 and suppose our model consists of 100 observations of audit firm appointments and includes a dummy variable for provision of NAS, in which case we have the following outcomes of audit firm appointment:

FIGURE 2
Example: Audit firm appointments and NAS
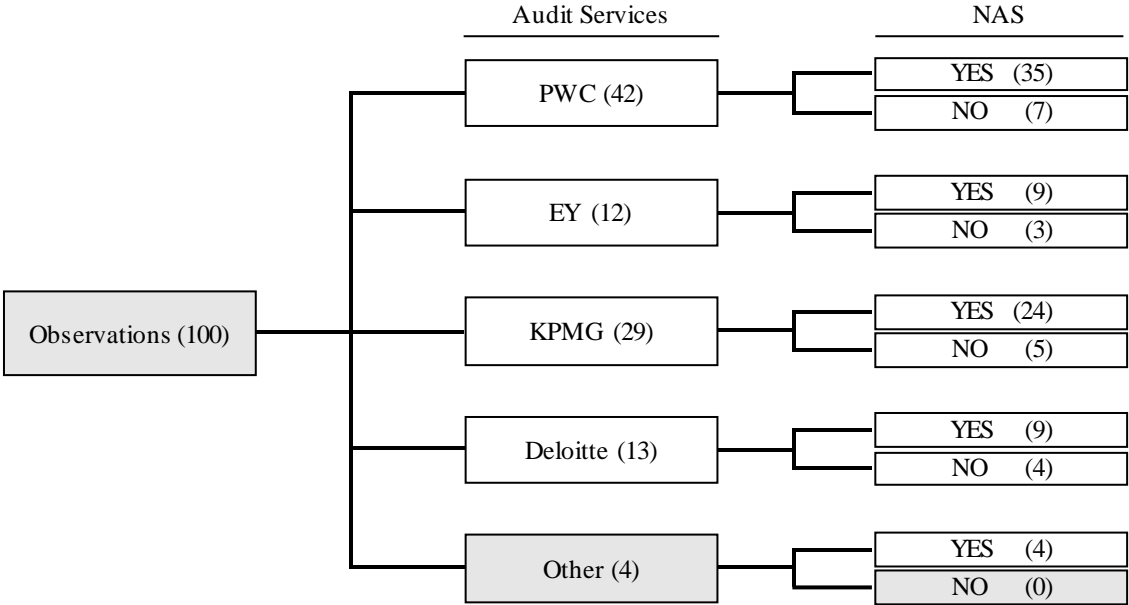
In this case, it is impossible to specify the effect of the provision of NAS from Non-Big 4 audit firms on the probability of appointing Non-Big 4 audit firms because there are no events in which they provide NAS without also being appointed to perform audit services. This dilemma illustrates that when there are few observations, variables that are highly indicative of outcomes can become impossible to estimate (Allison 2008). Therefore, although we can use a mixed logit model to evaluate the determinants of audit firm appointments in a relatively less populated market such as the Swedish setting, the limited sample size restricts how many determinants we can evaluate simultaneously.

An associated problem of the sample size limiting the number of variables we can include in our model is that it reduces our ability to explain preferences when we evaluate a setting where long tenure restricts a client firm's ability to appoint its preferred audit firm. Consider for example AAK's appointment of EY as audit firm in 2015. Our estimated probability of AAK reappointing PWC to audit its financial statements for the 11th consecutive

time is 98% and the estimated probability for the remaining alternatives are 1%, ~0%, ~0% and ~0% for EY, KPMG, Deloitte and a Non-Big 4 audit firm respectively. As there are no observations of Non-Big 4 audit firm appointments in the industry classification AAK belongs to, Consumer Staples, we cannot include that industry classification in our mixed logit. However, for client firms in the Consumer Staples industry, KPMG accounts for 64% of all audit appointments compared to its market share of 28% in our sample, meaning industry belonging is a strong predictor of audit firm appointments in this instance. Consequently, the estimated probability of appointing KPMG when AAK is restricted from appointing PWC is most likely lower than the actual probability, meaning our prediction that AAK will appoint EY in the restricted setting might be incorrect, which in turn will affect the accuracy of our estimations of AAK's perceived costs of the restrictions.

7.3.4 Marginal sensitivity of audit fees

For the predictions of the mixed logit model to be accurate, we rely on the assumption that firms have an α, a marginal sensitivity to audit fees, that is constant. If the client firm values a smaller SEK decrease in audit fees proportionally differently from a greater SEK decrease, then we cannot apply a constant α as we change the audit fees, making our estimation of necessary monetary compensation flawed as we have specified α as linear. To test this assumption, we performed regressions of audit fees against client firm revenue to determine whether larger firms are prepared to pay proportionally more or less as they grow. In a linear pooled OLS regression of the effect of revenue on audit fees for 3,049 firm years with recorded revenue, we record an R^2 of 81.4%, validating our use of a linear α. Additionally, the fact that our estimated perceived cost of regulation is low in proportion to the enterprise value of the client firms in our sample means the marginal sensitivity to changes in income would not change substantially on account of changes in audit fees. This means that potential curvature in α will be negligible and consequently have a small impact on the accuracy of our measurement of the perceived cost of audit firm tenure restrictions or the exit of a Big 4 audit firm (Train 2009).

7.4 Future research

The various limitations to our results present ample opportunities for future research to further the studies of perceived costs of audit regulation. A modification to our method that could strengthen or undermine the validity of our perceived costs would be to expand our model to also consider secondary audit firms. It is not uncommon for client firms to appoint multiple audit firms simultaneously, in which case they specify the audit fees paid to the secondary audit firms as paid to "Others", making it impossible to distribute the audit fees to secondary

unnamed Big 4- and Non-Big 4 audit firms. Providing the audit firms are willing to share information on audit fees from client firms, future researchers could evaluate how important secondary audit appointments are to subsequent appointments as main audit firm.

Further, the assessment of whether our estimations of client firms' perceived costs of audit firm tenure restrictions and a Big 4 audit firm exit are in alignment with what the client firms actually perceive them as also constitutes an interesting topic for future research. Our quantification of perceived costs of audit regulation in a Swedish setting is, to the best of our knowledge, the first of its kind. Hence, it is possible that we have misinterpreted a number of key considerations concerning the determinants of audit firm appointment, and the derived value thereof. By asking the client firm about what makes an audit firm the preferred option, and about the perceived cost of no longer being able to appoint its most preferred audit firm, a researcher can discover what changes can be made to improve our model.

To conduct an even more comprehensive analysis of the costs of audit regulations, we would want to investigate whether the removal of an audit firm would cause audit fee increases, as the remaining audit firms see rivalry decrease and their bargaining power consequently increase even further. We were however unable to estimate future audit fee increases because we were unable to isolate the effects on audit fees from shifts in the supply of audit services. We therefore propose that future research regarding the costs of audit tenure restriction and audit firm exits focus on complementing our analysis by assessing the consequential audit fee increases from the two evaluated scenarios by evaluating possible instruments of audit fees.

An additional aspect to evaluate is how the audit firms would respond to the policy changes. As existing client- audit firm relationships are broken up, opportunities for the remaining audit firms to claim market shares in particular industries, or for client firms of particular sizes, will present themselves. For example, in the event of KPMG exiting the market, 40% of all financial services client firms in the sample will have to switch audit firm. An interesting analysis to conduct is how that market share would be distributed amongst the other audit firms, and what determines the distribution.

8 Conclusion

This thesis has evaluated the effects of audit firm tenure restrictions, imposed by the Swedish government on the 17th of June, 2016. The regulation restricts audit firm tenures to ten years before client firms in the financial services industry have to appoint a new audit firm, and restricts the maximum tenure of a client- audit firm relationship to twenty years for non-financial client firms using a single audit firm. The regulations were imposed in an effort to mitigate audit failures as a consequence of audit quality-impairing relationships between client- and audit firms. If longer audit tenures are a cause of fraudulent reporting, the new policy saves the regulators from having to resort to reactive repercussions in the form of revoking audit licenses, thereby consolidating the market further.

   Much literature has been devoted to assess the effectiveness of regulation concerning the audit industry in general and how the introduction of audit firm tenure restrictions affects audit quality in particular. Whereas a majority of the research on audit firm tenure restrictions concludes that restrictions do not improve audit quality, but deteriorates in the eyes of capital markets and results in increased audit fees, very little effort has been made to quantify the perceived cost to client firms from no longer being unrestricted in the appointment of audit firms. The aim of this study was as such to estimate the perceived cost to client firms from audit firm tenure restrictions and the perceived cost of a Big 4 audit firm exit from the market, to determine whether audit firm tenure restrictions are perceived as less costly to client firms, than a possible Big 4 audit firm exit.

   We sought to answer our research question by estimating the perceived cost of client firms listed on the OMXS Large-, Mid- and Small-cap in 2016 no longer being able to appoint their most preferred audit firm by calculating client firms' required compensation to be equally satisfied in a restricted setting. We determined the relative attractiveness of the different audit firms by calculating probabilities of a client firm appointing PWC, EY, KPMG and Deloitte, and a Non-Big 4 audit firm option consisting of all other audit firms. These probabilities were calculated using a mixed logit model, specifying how characteristics of the client- and audit firms determine the probability of the client firm appointing an audit firm, estimated with data from 367 client firms during 2002-2016, totaling 3,180 firm year observations.

   We found that the total perceived cost of a ten year audit tenure restriction retroactively imposed in 2016 to public firms on the OMXS equaled 1,578 million SEK, alternatively 17.7 million SEK per affected firm. Moreover, we estimated the average perceived total cost of a Big 4 audit firm exit to 1,299 million SEK, or 11.1 million SEK per affected firm,

in 2016. We estimated the exit of PWC to result in the highest perceived total cost, 1,769 million SEK, or 11.3 million SEK per affected firm in 2016. We estimated the exit of Deloitte to result in the lowest perceived total cost, 17 million SEK, or 4.2 million SEK per affected firm in 2016. The fact that client firms' average perceived cost of a Big 4 audit firm exit is substantial underscores why regulators might be reluctant to revoke audit licenses and instead find alternative measures to suppress fraudulent audit behavior. However, our results suggest that audit firm tenure restrictions impose an even greater perceived cost to the client firms.

Our results are useful for a policymaking or policy evaluating purpose as they contribute to the void that exists around the perceived costs of audit regulation in a market in which over 90% of the market is held by the Big 4 audit firms and facilitate a comparison of the perceived costs of the two regulations. The thesis also fills the academic void around client firms' perceived costs of audit regulation, as research previously has been restricted to more qualitative assessments of the costs of regulation, such as tradeoffs between agency and switching costs (Blouin, Grein & Rountree 2007). Our results also evaluate the robustness of Gerakos & Syverson (2015), who like us find that client firms' perceived costs of audit firm tenure restrictions seem to exceed those of a forced Big 4 audit firm exit, showing that their conclusion concerning trade-offs between strict regulation and strict enforcement is valid also in smaller and more concentrated markets, where audit firm tenure restrictions have been suggested as more suitable (Gietzmann & Sen 2002).

Additionally, the benefits from audit firm tenure restrictions and from repercussions that discipline audit firms into compliant auditing are felt by the client firm, its employees and the state, whereas the perceived cost of regulation is borne by the client firm only. Therefore, any net benefit analysis of audit regulation must make an additional evaluation of whether the cost to the client firms is proportional to the benefits of the multiple stakeholders. From a policy perspective, an audit tenure restriction could therefore be attractive even though the perceived costs to the affected client firms outweigh the benefits to the public.

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Appendix

A – Tables

<div align="center">

TABLE A1

Distribution of audit fees, KSEK

</div>

Year	Mean	S. deviation	Q1	Median	Q3	Firms
2001	3,994	8,349	370	920	3,000	174
2002	4,342	8,785	418	1,020	3,585	181
2003	4,508	9,697	405	1,100	3,722	183
2004	4,993	10,987	492	1,212	3,343	183
2005	5,188	11,168	500	1,326	3,700	193
2006	6,392	16,093	511	1,315	4,074	202
2007	6,137	14,171	537	1,352	4,235	208
2008	6,511	13,996	700	1,600	4,925	206
2009	6,585	14,262	676	1,657	4,542	202
2010	5,894	12,909	600	1,421	4,000	215
2011	5,633	12,603	554	1,419	3,925	222
2012	5,827	13,367	625	1,400	3,984	221
2013	5,879	13,744	616	1,234	4,000	222
2014	5,871	13,070	616	1,408	4,219	234
2015	6,070	13,522	735	1,658	4,650	249
2016	5,801	11,807	772	1,900	5,000	259

TABLE A2

Audit firm market shares in 2002-2016 based on audit fees in million SEK

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
PWC	330	373	436	476	667	567	631	614	573	579	621	686	661	769	712	8,696
	42 %	*45 %*	*48 %*	*48 %*	*52 %*	*44 %*	*47 %*	*46 %*	*45 %*	*46 %*	*48 %*	*53 %*	*48 %*	*51 %*	*47 %*	*48 %*
EY	117	82	93	106	126	142	142	155	165	133	139	164	165	201	286	2,215
	15 %	*10 %*	*10 %*	*11 %*	*10 %*	*11 %*	*11 %*	*12 %*	*13 %*	*11 %*	*11 %*	*13 %*	*12 %*	*13 %*	*19 %*	*12 %*
KPMG	239	262	264	295	366	407	424	434	359	371	367	319	348	327	279	5,061
	30 %	*32 %*	*29 %*	*29 %*	*28 %*	*32 %*	*32 %*	*33 %*	*28 %*	*30 %*	*29 %*	*24 %*	*25 %*	*22 %*	*19 %*	*28 %*
Deloitte	87	99	114	119	127	157	140	119	163	161	154	132	195	209	219	2,194
	11 %	*12 %*	*12 %*	*12 %*	*10 %*	*12 %*	*10 %*	*9 %*	*13 %*	*13 %*	*12 %*	*10 %*	*14 %*	*14 %*	*15 %*	*12 %*
Non-Big 4	13	9	7	6	5	3	6	8	7	7	7	4	5	5	6	97
	1,6 %	*1,1 %*	*0,8 %*	*0,6 %*	*0,4 %*	*0,3 %*	*0,5 %*	*0,6 %*	*0,5 %*	*0,5 %*	*0,5 %*	*0,3 %*	*0,3 %*	*0,3 %*	*0,4 %*	*0,5 %*
Total	786	825	914	1,001	1,291	1,276	1,341	1,330	1,267	1,251	1,288	1,305	1,374	1,511	1,502	18,264

TABLE A3

Audit firm market shares in 2002-2016 based on number of client firms

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
PWC	51	56	58	61	62	69	73	72	75	83	83	88	90	101	101	1,123
	28 %	*31 %*	*32 %*	*32 %*	*31 %*	*33 %*	*35 %*	*36 %*	*35 %*	*37 %*	*38 %*	*40 %*	*38 %*	*41 %*	*39 %*	*35 %*
EY	40	39	41	45	47	50	48	46	53	55	52	52	56	57	62	743
	22 %	*21 %*	*22 %*	*23 %*	*23 %*	*24 %*	*23 %*	*23 %*	*25 %*	*25 %*	*24 %*	*23 %*	*24 %*	*23 %*	*24 %*	*23 %*
KPMG	47	47	46	50	54	52	52	51	50	49	50	44	49	49	50	740
	26 %	*26 %*	*25 %*	*26 %*	*27 %*	*25 %*	*25 %*	*25 %*	*23 %*	*22 %*	*23 %*	*20 %*	*21 %*	*20 %*	*19 %*	*23 %*
Deloitte	26	24	23	25	27	27	23	23	26	26	26	28	30	33	37	404
	14 %	*13 %*	*13 %*	*13 %*	*13 %*	*13 %*	*11 %*	*11 %*	*12 %*	*12 %*	*12 %*	*13 %*	*13 %*	*13 %*	*14 %*	*13 %*
Non-Big 4	17	17	15	12	12	10	10	10	11	9	10	10	9	9	9	170
	9 %	*9 %*	*8 %*	*6 %*	*6 %*	*5 %*	*5 %*	*5 %*	*5 %*	*4 %*	*5 %*	*5 %*	*4 %*	*4 %*	*3 %*	*5 %*
Total	181	183	183	193	202	208	206	202	215	222	221	222	234	249	259	3,180

Descriptive data of client- audit firm pairings for variables included in V_{ij}

Firm	Bonding			Size	Risk		Audit Quality			Industry					
	Audit Fees	T	NAS	MC	ROE	MB	AP	IR		Consumer Discretionary	I.T.	Healthcare	Industrial	Real Estate	Fin. Services
PWC	7.7	12.1	4.5	17,420	10.4 %	2.8	7.8 %	23.3 %		144	246	104	344	25	76
EY	3.0	11.1	1.4	10,953	−0.1 %	2.5	8.5 %	23.5 %		123	123	123	150	57	58
KPMG	6.8	12.3	2.9	18,568	14.1 %	3.1	8.6 %	22.5 %		110	114	72	172	51	110
Deloitte	5.4	11.7	2.3	18,216	−2.6 %	3.1	7.0 %	18.3 %		27	90	66	81	74	25
Non-B4	0.6	11.1	0.2	1,024	−14.3 %	3.9	7.3 %	23.2 %		5	44	60	38	6	7
Median	5.4	11.7	2.3	17,420	-0.1%	3.1	7.8 %	23.2 %	$\sum$	409	617	425	785	213	276

The table presents the means of the variables included in the specification of V_{ij} for the different audit firm alternatives to illustrate if client firms tend to associate with certain audit firms contingent on their characteristics. Fees shows the mean audit fee in MSEK that client firms have paid each audit firm alternative during the period 2002-2016. T shows the tenure, the mean duration of client- audit firm relationships in 2016. NAS shows the mean amount in MSEK spent by client firms on non-audit services during 2002-2016. MC shows the mean market capitalization for the client firms during 2002-2016. ROE shows the mean return on equity 2002-2016 for the client firms. MB shows the mean market-to-book value of equity ratio of the client firms during 2002-2016. AP and IR show the mean accounts payables as well as inventories and accounts receivables as percentages of total assets respectively during 2002-2016 for the client firms.

The columns under the subsection "Industry" shows the number of client firms served by the audit firm alternatives during 2002-2016. Industries for which fewer than 200 firm years were recorded were dropped on account of too few observations to distinguish industry specialization. The bottom row of "Industry" shows the total number of client firms within a given industry classification.

TABLE A5

Coefficients of audit fee estimation variables from the Fixed Effects regression

Variables	Predicted sign (+/−)	PWC	EY	KPMG	Deloitte	Non-Big 4
XT_{ijt}	+	-0.0431	0.0331	0.117***	-0.0248	0.0336
NAS_{ijt}	+	0.0202	0.242***	-0.0815*	0.134**	-0.0700
A_{ijt}	+	0.00295***	0.000474	0.00403***	0.0131***	0.208
MC_{ijt}	+	0.0329***	-0.0415***	0.0131	0.00412	-0.0683
R_{ijt}	+	0.258***	0.230***	0.356***	0.327***	-0.305
IR_{ijt}	+/−	0.726	-0.504	-3.190**	-4.269**	-1.192
AP_{ijt}	+/−	-0.995	-4.387	-3.546	1.880	-1.153
ROE_{ijt}	−	-0.0412	-0.0134	-0.125	-0.0118	0.0755
MB_{ijt}	−	0.00381	0.0150	-0.00853	0.00541	-0.00276
Constant	+/−	2.731***	2.731***	2.731***	2.731***	2.731***

Observations: 3,180, R^2: 0.841, Groups: 325

The model shows the estimated coefficients from the Fixed Effects regression along with the predicted signs of the variables and their effect on audit fees, AF_{ijt}. Each variable was interacted with the different audit firm alternatives to illustrate their relative effects on the audit firms. The number of observations and R^2 thus apply to all audit firm alternatives. XT_{ijt} shows the effect from increased audit firm tenure. NAS_{ijt} shows the effect from increased NAS-fees. A_{ijt}, MC_{ijt} and R_{ijt} show the impact from client firm total assets, market capitalization and revenues respectively. IR_{ijt} and AP_{ijt} show the effect from increasing ratios of inventories and receivables relative to total assets and payables relative to total assets. Finally, ROE_{ijt} and MB_{ijt}, return on equity and market-to-book value of equity, show the impact of increasing business risk.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Average Audit Firm Tenure

Audit firm	2010	2011	2012	2013	2014	2015	2016
PWC	7.0	7.2	8.0	8.4	8.6	8.3	8.9
EY	6.2	6.5	7.0	7.1	7.2	7.4	7.1
KPMG	7.4	8.4	8.8	9.3	8.7	8.9	8.6
Deloitte	6.2	6.6	6.8	6.5	6.0	6.4	6.7
Non-Big 4	7.1	8.2	7.9	7.7	8.1	7.6	8.6
Median	7.0	7.2	7.9	7.7	8.1	7.6	8.6

The table shows the average tenures for each respective audit firm alternative. The leftmost column displays the different audit firm alternatives while the other columns display the average tenures in our sample if the sample period would commence in 2002 and end in the respective years displayed. The table illustrates that as the sample period is increased, the average tenures in the data tend to increase as well.