# Auditor Industry Specialization and Evidence of Cost Efficiencies in Homogenous Industries

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## ABSTRACT

This study examines the audit pricing effects when auditors specialize in industries conducive to transferable audit processes. Our results indicate that industry specialists charge incrementally lower fees in industries with homogenous operations and particularly in industries with both homogenous operations and complex accounting practices. Moreover, we discover audit quality is no lower for clients audited by these specialists offering fee discounts, consistent with a conclusion that the reduction in fees indicates cost efficiencies rather than lower quality audits. Further analysis indicates the shared economies of scale only occur in a subsample of client firms with relatively high bargaining power. When considered in conjunction with prior research using a survivorship approach, our study provides evidence that certain industries lend themselves to specialization because auditors generate cost-based competitive advantages without compromising service quality.



**Keywords:** auditor industry specialization; audit fees; economies of scale; homogenous industries; complex industries


**Data Availability:** Data are publicly available from the sources identified in the paper.

# I. INTRODUCTION

Audit firms seek to specialize in certain industries for several reasons including enhancing the quality of audits and achieving lower average costs through transfers of knowledge about audit risks and processes across similar clients (Gramling and Stone 2001; Cairney and Young 2006; Reichelt and Wang 2010). A number of prior studies investigate the relation between industry specialization and audit pricing to draw conclusions about the effects of specialization (Ferguson, Francis, and Stokes 2003; Mayhew and Wilkins 2003; Francis, Reichelt, and Wang 2005; Numan and Willekens 2012). Most of these studies provide evidence of a specialist fee premium, which is attributed to the specialist's ability to provide a quality-differentiated service relative to non-specialist auditors. However, a few studies suggest the potential for fee discounts derived from specialist auditors' economies of scale (Cahan, Jeter, and Naiker 2011; Fung, Gul, and Krishnan 2012), or find that fee premiums occur only in certain settings or accrue to specialist auditors with certain levels of concentration (Mayhew and Wilkins 2003; Cahan et al. 2011; Hay and Jeter 2011). The purpose of our study is to examine whether industry specialists' pricing decisions vary based on homogeneity and accounting complexity, which represent key industry characteristics that allow for economies of scale through the transfer of audit processes across clients. Analyzing the pricing effects allows us to better understand auditors' behaviors when specializing in these industries.

Beginning with a series of studies by Eichenseher and Danos (1981) and Danos and Eichenseher (1982, 1986), prior research documents that industry homogeneity and complexity are significant determinants of auditor specialization and concentration. Early research focuses on regulated industries because these industries require specialized knowledge of regulatory accounting and reporting requirements. Hogan and Jeter (1999) find that while auditor specialization remained greater in regulated industries during their sample period, efforts toward specialization spread to non-regulated industries over time. The underlying argument suggests that scale economies exist in industries with greater homogeneity because auditors can apply learned audit procedures and reporting knowledge to clients in these industries. More recently, Cairney and Young (2006) and Cahan, Godfrey, Hamilton, and Jeter (2008) present evidence that auditors are more likely to specialize in industries with greater homogeneity among clients' operations and investment opportunity sets. Thus, the construct of homogeneity extends beyond regulatory reporting requirements to capture additional industry characteristics.

We identify operational homogeneity as a key characteristic that allows auditors to benefit from knowledge spillovers by specializing in the industry. Cairney and Young (2006) provide a broad definition of operational homogeneity by measuring the average correlation of operating cost structures for firms in the same industry. Less variation in operating expense growth reflects more homogeneous reporting of economic changes related to demand, prices, technologies, and other factors for firms in the same industry. As discussed in greater detail in Section II, these factors suggest homogeneity should facilitate the transfer of industry-specific knowledge across audit clients, enabling specialists to more efficiently achieve desired levels of planned detection risk, and spread the costs of acquiring industry expertise across the specialists' client base.

Nonetheless, it is unclear whether specialization in industries with greater operational homogeneity leads to a fee premium due to differentiation or a fee discount due to the sharing of efficiencies with client firms. On the one hand, specialization creates barriers to entry as specialists offer differentiated services or become low-cost producers (Cahan et al. 2008). If specialization results in greater dominance in the industry, then the auditor may demand fee premiums to enhance total profit and recoup the costs of acquiring industry-specific knowledge. On the other hand, competition for clients may create incentives for auditors to seek cost-based advantages when performing audits (Cullinan 1998; Cairney and Young 2006). Greater homogeneity within an industry facilitates transfers of industry-specific knowledge across more firms, resulting in scale economies through lower average costs per client. Lower audit costs allow specialists to pass some of the cost savings to the client, resulting in potentially lower audit fees while maintaining acceptable profit levels. Whether or not the specialist audit firms choose to share cost savings with a client may be a function of such factors as client bargaining power, perceived threat of client loss, and extent of cost savings. Analyzing these competing predictions is one of the primary motives for our study.

Next, we consider a setting in which specialization in homogeneous industries is likely to have a more pronounced effect. Specifically, we consider the joint effect of the industry's accounting complexity *and* operational homogeneity. Complex accounting issues and procedures increase the risk of material misstatement, which requires additional audit effort, investments in technology, and/or more experienced personnel to respond to these additional risks. Therefore, average audit effort is generally higher for firms in complex industries (Francis and Seavey 2012). However, when firms in a complex industry also exhibit relatively homogenous operations, specialist auditors are likely to benefit from efficiency gains due to transfers of knowledge and technical investments across clients in that industry. Therefore, homogeneity may reduce the impact of complexity on the specialist auditor's cost function, resulting in significant fee reductions relative to clients in complex, non-homogenous industries. Alternatively, to the extent operational homogeneity increases the specialist's creation of barriers to entry through differentiation, complex accounting for firms in an industry could result in larger fee premiums.

We focus on the complexity of accounting standards and practices in an industry rather than operational complexity, such as the number of segments in Doyle, Ge, and McVay (2007), because specialists can transfer technical knowledge about complex accounting across clients in the same industry. In contrast, auditing a client in an industry that is operationally complex does not necessarily generate expertise that can be applied to audits of other clients in the industry. As a result, we identify industries characterized by accounting complexity based on the existence of specific AICPA audit and accounting guides (Francis and Seavey 2012).

To conduct our analyses, we develop an audit fee model to examine whether specialists in homogenous and complex industries charge significantly different audit fees after controlling for other factors affecting audit effort and audit risk. We measure auditor industry specialization using a market share approach based on joint expertise at the national and city-specific levels, consistent with the assumption that specialization results from providing services to several clients within an industry (Francis et al. 2005; Reichelt and Wang 2010). We use joint specialization in our model because it is most likely to capture the benefits, if any, to specialist auditors in our setting. Local audit markets are important to the extent that industry expertise resides with personnel in specific offices. However, knowledge-sharing practices and technology development to promote specialization are also important at the audit firm level.

Using a sample of 23,578 firm-year observations between 2004 and 2009, we find that joint national and city-specific industry specialists serving clients in homogeneous industries charge incrementally lower audit fees relative to specialists serving clients in non-homogenous industries. Our results also indicate a negative effect on audit fees when joint specialists serve clients in industries with both complex accounting and homogenous operations. Our primary findings are robust to several sensitivity checks, including alternative measures of auditor specialization, industry homogeneity, and industry complexity. Overall, these results are somewhat surprising given the fact that prior research primarily documents fee premiums charged by industry specialist auditors. However, the existence of lower fees in homogenous industries is consistent with the early research on economies of scale.

Because we are unable to observe auditor cost data, an underlying assumption in our model is that audit fee reductions represent the sharing of cost savings with client firms. However, the auditor's incentive to pass cost savings to the client likely depends on the relative bargaining power of the client firm (Casterella, Francis, Lewis, and Walker 2004; Fung et al. 2012). To examine this issue, we define bargaining power as the size of the client relative to the total size of the client's city-industry market. We perform subsample analyses based on client bargaining power and find that specialists exhibit significantly lower fees in homogenous as well as homogenous and complex industries *only* when the client's bargaining power is relatively high. These findings suggest specialists are "forced" to pass on scale economies when clients exhibit greater bargaining power or risk losing the client (Fung et al. 2012).

We also recognize that an industry specialist's strategy involves both a price component and a quality component. Therefore, the fee discounts identified in our tests could reflect lower quality instead of economies of scale. To address this concern, we perform additional procedures to determine whether audit quality differs for client firms with specialist auditors in industries with these characteristics of interest. Using common measures of audit quality in the literature, our results indicate the quality of services provided by joint national and city-specific industry specialists is not significantly different in the face of greater industry operational homogeneity, or both industry homogeneity and accounting complexity.

Our study contributes to the existing literature in several ways. First, whether specialist auditors charge fee premiums to their clients for superior quality services or allow for fee discounts due to efficiencies is largely an unresolved issue. While many recent studies suggest the former, we identify settings in which specialists apparently pass on some of their cost savings to more influential clients in the form of lower fees without sacrificing quality. This evidence extends the early research on economies of scale based on the survivorship approach (Danos and Eichenseher 1982; Yardley, Kauffman, Cairney, and Albrecht 1992) and indicates that certain industries lend themselves to specialization because auditors benefit from audit production efficiencies. Both auditors and client firms benefit in these settings because client firms receive a quality audit at a competitive price, while the auditor has a greater probability of retaining these clients and developing further expertise. These findings on the effects of scale economies on audit pricing may reduce concerns about large audit firm concentration during the post-SOX period.

Our study also contributes to existing audit fee research. Audit fees reflect a complex interdependence among the demand for audits, the structure of the audit market, the nature of the audit firm, and the actual cost of delivering an audit (Causholli, De Martinis, Hay, and Knechel 2010). Prior audit fee research often uses pooled samples across a variety of industries to conclude that industry specialists charge a fee premium on average. These studies interpret this finding as the client's willingness to pay more for an auditor's expertise, reflecting pricing effects of demand and audit firm strategic positioning. However, evidence from research in this area remains mixed, suggesting the need for additional investigation to identify instances where specialization results in a fee premium or discount (Causholli et al. 2010). By differentiating among industries based on their levels of homogeneity and complexity, we show that audit pricing differs based on these characteristics. Finally, we contribute to a growing body of research attempting to disentangle various effects of industry specialist auditors on audit pricing and quality (Casterella et al. 2004; Huang, Liu, Raghunandan, and Rama 2007; Cahan et al. 2008; Cahan et al. 2011; Fung et al. 2012).

## II. BACKGROUND AND RESEARCH QUESTIONS

The U.S. audit market can be characterized as a differentiated oligopoly in which auditors use industry specialization to distinguish their audit services. In this market, competing firms with industry expertise may be able to maintain prices above marginal cost in equilibrium without losing market share (Numan and Willekens 2012). Prior studies support this service-differentiation strategy because they provide evidence that industry specialist auditors charge a fee premium to their clients (Craswell, Francis, and Taylor 1995; Ferguson et al. 2003; Francis et al. 2005; Mayhew and Wilkins 2003; Numan and Willekens 2012). Assuming that markets are perfectly competitive, these studies generally interpret a positive relation between specialization and audit fees as indirect evidence of a client's willingness to pay for the auditor's expertise and reputation.

However, the relation between fees and auditor specialization is not straightforward because auditors focusing their efforts in certain industries may benefit from cost-based competitive advantages. O'Keefe, King, and Gaver (1994) suggest that providing audit services to a client firm requires investments in general knowledge, industry-specific knowledge, and client-specific knowledge. Industry-specific knowledge is the only component that requires significant investments in audit technology and human capital development that can also be transferred to other clients in a given industry. Once these investments are in place, additional clients can be serviced at a lower marginal cost than the cost of servicing the first few clients (Fung et al. 2012). Therefore, technical economies of scale arise from genuine increases in efficiencies as a result of specialization when auditors can share costs across several clients (Yardley et al. 1992).[1] The purpose of our study is to better understand whether specialists' pricing decisions differ in certain industries that lend themselves to audit production economies.

## Research Questions

### *Industry Characteristics Affecting Audit Production Economies*

The extent of efficiency gains may differ across industries because learned and developed audit processes are more easily transferred in certain industries (Cairney and Young 2006). Since cost data for audit firms are not publicly available to analyze efficiency in an archival setting,

[1] For example, Low (2004) finds that specialist auditors make more efficient planning decisions by transferring expertise across clients in the same industry when evaluating and suggesting audit procedures for hypothetical clients.

several prior studies investigate possible scale economies in the U.S. audit market by employing the survivorship approach.[2] Studies using the survivorship approach provide evidence that, in certain industries, high concentration allows audit market leaders to develop expertise-related economies of scale that permit them to gain market share over time (Eichenseher and Danos 1981; Danos and Eichenseher 1982, 1986; Hogan and Jeter 1999). These early studies focus on regulated industries, which require specialized knowledge of regulatory accounting and reporting requirements. Overall, empirical findings from the survivorship approach are consistent with the model in Doogar and Easley (1998) that predicts auditors with smaller market shares will find it difficult to compete with the large market share auditors due to production constraints.

Cahan et al. (2008) extend this research stream to a setting with heightened audit risk by analyzing the industry's investment opportunity set (IOS). IOS represents a firm's growth options, which are difficult to observe, require managerial discretion in determining their value, and relate to future operational expectations. Because high growth firms are often characterized by rapid change, typical audit practices (such as comparisons of ratios to prior years or to industry averages) become less relevant, and new audit procedures must be implemented (Cahan, Godfrey, Hamilton, and Jeter 2014). Therefore, Cahan et al. (2008) argue that high IOS requires costly investments in industry-specific knowledge and allows specialists to offer a differentiated service. Consistent with this argument, their study reports a positive relation between industry IOS and auditor industry specialization.

Cairney and Young (2006) also extend prior research by developing a broader definition of industry homogeneity based on the operational cost structures of client firms within an industry. They discuss how the rates of change in the operating expenses of homogenous firms reflect the

[2] One unique study with access to proprietary data in a Belgian setting provides evidence that industry specialization is associated with efficiency gains, as evidenced by a negative association between specialization and audit hours (Dekeyser and Willekens 2012).

underlying similarity of operations because concurrent economic conditions result in a similar reported financial impact on these companies. Moreover, their findings provide indirect evidence of cost-based competitive advantages from specialization in homogenous industries by reporting a positive relation between industry homogeneity and auditor specialization.

External auditors gain an understanding of the client's industry and external environment to assess risk and develop the audit plan (PCAOB 2010). This plan, and the auditor's ability to implement the plan, can have a significant effect on audit production costs in terms of total labor hours and the mix of hours between experienced and inexperienced staff. Greater commonality across client firms creates a potential for knowledge overlap so that similar tasks can be completed in less time or by lower-level personnel, allows for more efficient planning and oversight, and generates efficiencies from shared technology (Brown 2012).

Specifically, similar risk characteristics and the related audit procedures to address those risks may apply to many client firms within an operationally homogeneous industry. As a result, industry specialist auditors can apply similar substantive testing across clients in operationally homogenous industries to achieve an acceptable level of planned detection risk more efficiently than specialists in non-homogenous industries. For example, auditors often use substantive analytical procedures to obtain evidential matter about particular assertions related to classes of transactions or account balances. Analytical procedures can be more effective or efficient than tests of details for achieving particular substantive testing objectives (AU 329, paragraphs 2 and 4). Therefore, auditors with significant industry expertise serving clients with homogeneous operations may be more likely to identify predictable relationships and to use analytical procedures to reduce or eliminate additional tests of details. However, industries with heterogeneous operations will likely include client firms with unique risk characteristics that require substantially different audit procedures, significantly diminishing potential cost efficiencies of specialization in such industries.

In addition to homogeneity, prior research indicates that complexity of accounting practices in an industry will also affect the auditor's production function. Eichenseher and Danos (1981) propose that the benefit in terms of cost reduction from industry specialization is greater in industries that have industry specific rules and required expertise. Specialist auditors have the opportunity to realize cost savings in complex industries when the client firms also have more homogenous operations because the auditor can capitalize on its investments in specialized audit technologies to address these accounting risks. This benefit may be limited in non-homogenous industries because knowledge obtained from serving one client is not readily transferable to another industry client in a given year if the two client firms experience different operational shocks over time. In other words, the benefits arising from economies of scale depend on the ability to transfer knowledge and use similar types of audit procedures related to these complex accounting issues across the industry specialist's client base.

***Industry Examples***

To illustrate the industry constructs of homogeneity and complexity, we highlight two industries with different classifications in our sample. First, we consider the oil and gas exploration and production (E&P) industry (SIC code 13), which is classified in our sample as an industry with complex accounting but not homogeneous operations. Firms in the oil and gas E&P industry face several complex accounting issues applicable only to this industry, including the choice between successful efforts ("SE") or full cost ("FC") accounting methods, the use of joint-interest operating arrangements, the process of estimating oil and gas assets such as proved reserves, the assessment of impairments for these oil and gas assets, and the frequent use of derivative contracts. Understanding and assessing these complex accounting issues creates risk for the external auditor and requires significant investment in human capital as well as industry-specific resources.

However, two specific factors in this industry create heterogeneity in operating results, which can limit the specialist auditor's ability to transfer knowledge between clients within this industry. First, the difference between SE and FC methods creates heterogeneity in operating expenses and substantially reduces comparability across audit clients.[3] Second, oil and gas companies participate in different types of exploration and extraction. Conventional methods involve drilling with a standard vertical well into a formation through which oil or gas flow naturally, while unconventional methods require various techniques to extract from alternative sources such as oil shale, tar sands, and coalbed methane.[4] Each unconventional technique is unique in its operating method and cost structure, which affects audit risk and the procedures necessary to test the relevant management assertions. Further, distinct unconventional methods result in significantly different expected future cash flows, which in turn affect the accounting for capitalized costs and reserves disclosures along with the necessary procedures to audit this financial information. Overall, we expect these differences to limit the transfer of auditor expertise and resources across client firms in this industry relative to the more homogeneous air transportation industry, as illustrated next.

The air transportation industry (SIC code 45) is classified as a complex *and* homogenous industry in our sample. Auditing this industry requires expertise in several complex accounting areas, including revenue recognition and frequent flyer accounting, derivative contracts, leased assets, and maintenance accounting. This level of complexity also requires significant industry resources to respond to the additional risks including in-house consulting groups and specialized audit programs or technologies. However, this industry also exhibits relatively homogenous

[3] According to Brady, Chang, Jennings, and Shappard (2011, 42), 46 of the 80 largest oil and gas producers use the SE method; therefore, wide variation in approaches exists in practice.

[4] Unconventional methods have experienced a boom in recent years and require significant investment in new production technologies (England and Mittal 2014). The success of these alternative exploration techniques will vary over time with the firm's investment in technologies as well as supply and demand, which ultimately creates different economic shocks to operating results.

operations. Changes in fuel prices and demand for air travel related to capacity issues represent economic forces that significantly affect the operations of companies in this industry.[5] These economic forces create similar shocks to operating expenses, including fuel costs, salaries and benefits, and landing fees, and also affect planning and risk assessments of the external auditor. Because these economic events have a similar effect on operations, industry specialists can apply their expertise to choose audit procedures similar to those employed for other airline clients, resulting in more efficient audits relative to specialist auditors in non-homogenous industries.

***Effect of Specialization on Audit Fees in Homogenous and Complex Industries***

Audit fees result from complex interdependencies among the demand for audits, the structure of the audit market, the audit firm's marketing and strategic positioning, and the actual cost of delivering an audit (Causholli et al. 2010). Prior research generally provides evidence of a specialist fee premium; however, this premium may only reflect certain influences on auditors' pricing decisions such as the effects of demand and the audit firm's strategic positioning. While auditors choose to specialize in certain industries, the related pricing effects are not always clear (Craswell et al. 1995). Therefore, we are interested in how potential audit efficiencies in industries with homogenous operations as discussed above manifest themselves in fees charged by the specialist auditor. Analyzing the pricing effects allows us to better understand auditors' behaviors when specializing in these industries.

Whether specialization in industries with greater operational homogeneity leads to a fee premium, attributable to differentiation, or a fee discount resulting from the sharing of efficiencies with client firms is an open question. On the one hand, specialization creates barriers to entry by allowing audit firms to offer a differentiated service (Cahan et al. 2008). If specialization adds

[5] To further illustrate how operating expenses are affected by these economic forces, we identified the following excerpt from Southwest Airlines' 2009 10-K filing: "Historically, except for changes in the price of fuel, changes in operating expenses for airlines are largely driven by changes in capacity."

value to clients and increases the auditor's market share in these homogenous industries, specialists have greater pricing power and may charge greater fees to increase their total profit. Cahan et al. (2008) observe this positive association when they analyze the association between IOS homogeneity and audit fees. However, as noted above, IOS relates to growth options and future operational expectations rather than the homogeneity of a client firm's current operations.

On the other hand, production efficiencies resulting from operational homogeneity of an industry could reasonably lead to audit fee reductions when a specialist transfers audit processes across client firms in the industry. In competitive markets, specialists may have an incentive to pass some of the costs savings to the client resulting in lower audit fees while still achieving a similar amount of total profit relative to clients in non-homogenous industries. Specifically, Cullinan (1998) suggests that auditors seek production efficiencies because competition for clients may be cost-based as well as fee-based.

Next, we consider settings with complex accounting practices where the effect of specialization in homogeneous industries may have a more pronounced effect. In general, complex accounting practices increase the risk of material misstatement for an audit and increase the number of audit hours, investments in audit technologies, or work performed by more experienced employees with higher billable rates needed to complete an audit effectively. Therefore, complexity indicates a need for additional audit effort and expertise, which could increase auditors' incentives to gain specialized knowledge and skills to serve these clients. These supply incentives may be especially strong in homogenous industries where industry knowledge is more readily transferable across clients. Therefore, specialization in homogenous *and* complex industries may give an audit firm a greater ability to differentiate from competitors and, thus to charge higher audit fees.

Alternatively, the cost benefits of homogeneity may be heightened for client firms in industries with accounting complexities because knowledge transfers related to auditing complex accounting treatments could save considerable audit effort. Therefore, specialization in operationally homogeneous industries that are also complex may result in significant cost savings relative to industries that are complex but not homogenous. These competing theories lead to our first research question.

> ***RQ1:*** Does the specialist auditor's pricing behavior vary based on key characteristics of the industry, in particular those industries with homogenous operations and complex accounting requirements?

Because we are unable to observe auditor cost data, an underlying assumption in our tests is that audit fee reductions represent the auditor sharing cost savings with client firms. We expect specialists' incentives to pass cost savings to the client likely depend on the relative bargaining power of the client firm. Specifically, Casterella et al. (2004) and Fung et al. (2012) argue and find that client bargaining power can significantly influence audit pricing. Client bargaining power is often defined in terms of the client's importance to the auditor, as measured, for example, by absolute client size relative to its market or client size relative to the auditor's portfolio. Thus, if auditors achieve economies of scale in certain industries, we expect greater client bargaining power will increase the likelihood that cost savings from audit efficiencies will be shared with the client through lower fees. This discussion leads to our second research question.

> ***RQ2:*** Do the pricing decisions by the specialist auditor in these industries depend on client bargaining power?

## III. RESEARCH DESIGN

### Auditor Industry Specialization

Our calculation of auditor industry expertise assumes that industry expertise increases with the size of the auditor's industry market share (Hogan and Jeter 1999; Ferguson et al. 2003). Using the definition in Reichelt and Wang (2010), we classify auditors as national (city) industry specialists if the auditor possesses a market share of audit fees in an industry-year (industry-city-year) greater than 30 percent (50 percent).[6] Our primary test variable, *SPEC*, is coded one when the auditor is an industry expert at both the national and city level. Francis et al. (2005) indicate that national and city-specific reputations are jointly relevant in the pricing of audit fees. Moreover, Reichelt and Wang (2010) provide evidence that audit quality is higher when the auditor is both a national and city-specific industry specialist. Local audit markets are important to the extent that industry expertise resides with personnel in specific offices. However, knowledge-sharing practices and technology development to promote specialization are also very important at the audit firm level. Because some aspects of specialized knowledge and expertise are fairly easily transferred across multiple offices of the same audit firm while others are unique to the local office, we believe this measure best captures specialization for purposes of our research questions.

**Homogenous and Complex Industries**

Our hypotheses require proxies for two industry classifications: 1) industry homogeneity, and 2) industry accounting complexity. Cairney and Young (2006) develop a measure of industry homogeneity based on client firms' operating cost structures. This proxy differs from prior research because it provides a measure of industry members' operational homogeneity rather than classifying attributes of the industry environment, such as the presence of significant regulation. Specifically, they measure homogeneity using the correlation of industry member first-differences in year-to-year operating expenses. This measure reflects the underlying similarity of operations for companies within an industry because concurrent economic conditions result in a relatively homogeneous reported financial impact across companies in the industry.

For our study, we develop a measure of industry homogeneity using the method in Cairney

[6] We use the yearly population of companies with audit fee and auditor city data in Audit Analytics to compute these specialization measures and classify cities based on Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. Further, we require at least two observations for each MSA-industry-year combination.

and Young (2006) based on the correlation of operating expense changes. Specifically, we define operating expenses as sales less operating income plus depreciation using data from Compustat. Then we calculate the percentage change in operating expenses [($OPEX_{i,t} - OPEX_{i,t-1}$) / $OPEX_{i,t-1}$] for each firm *i* in year *t* (2004 to 2009). *HGEN_C* equals the mean value for the Pearson correlation coefficients of the percentage change in operating expenses for all companies in a three-digit SIC code over the six-year sample period.[7] In our primary tests, we create an indicator variable, *HGEN*, equal to one if *HGEN_C* is greater than or equal to its third quartile value. This indicator variable classifies industries as more or less homogenous and simplifies the interpretation of the interaction coefficients in our model.

To measure industry complexity, we follow the classification in Francis and Seavey (2012). The AICPA periodically issues specific audit and accounting guides to deliver guidance for handling complex audit and accounting issues across a variety of industries.[8] These guides reflect the accounting profession's assessment of those industries and topics that give rise to accounting complexities in financial reporting as well as the need for guidance to supplement existing accounting standards (Francis and Seavey 2012). Therefore, the variable *COMPLEX* is equal to one for two-digit SIC codes with specific AICPA audit and accounting guides.[9] Using a measure based on accounting complexity allows us to capture industries in which specialist auditors can benefit from shared knowledge when addressing more complex accounting and reporting

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[7] As an additional analysis, we measure homogeneity at the two-digit SIC level and find similar results.

[8] To better understand the AICPA's process, we spoke with a technical manager in the AICPA's New York office. This manager indicated that, to his knowledge, there was not a formal approach for determining industries included in the AICPA guides. However, he stated the AICPA sought input from various practice groups, including the FASB, the SEC, the major CPA firms, and the Accounting Standards Executive Committee of the AICPA (subsequently renamed the Financial Reporting Executive Committee) when creating these guides.

[9] We classify the following two-digit industries as complex (excluding financial service industries because we remove them from our sample) following Francis and Seavey (2012): 01, 02, 07 (agricultural production and services); 13 (oil and gas extraction); 15, 16, 17 (construction); 37, 45 (air parts and transportation); 73 (business services); 79 (gaming); 80 (health services); and 87 (engineering and management services).

requirements.[10]

**Regression Models**

To test whether industry specialist auditors charge significantly different fees in homogenous, or in homogenous and complex, industries relative to specialists in industries without those characteristics, we estimate the following two models:

$$LAFEES_{i,t} = \beta_0 + \beta_1 SPEC_{i,t} + \beta_2 HGEN_{,t} + \beta_3 SPEC*HGEN_{i,t} + \beta_4 LTA_{i,t} + \beta_5 BIG4_{i,t} + \beta_6 BUSSEG_{i,t} + \beta_7 GEOSEG_{i,t} + \beta_8 CATA_{i,t} + \beta_9 QUICK_{i,t} + \beta_{10} DE_{i,t} + \beta_{11} ROI_{i,t} + \beta_{12} LOSS_{i,t} + \beta_{13} DECYE_{i,t} + \beta_{14} GC_{i,t} + \beta_{15} FIRSTYR_{i,t} + \beta_{16} HERF_{i,t} + \beta_{17} DISTANCE_{i,t} + \beta_{18} OFFICE_{i,t} + \beta_{19} MW_{i,t} + \beta_{20} IIOS_{i,t} + \beta_{21} HIOS_{i,t} + \beta_{22} REG_{i,t} + Year\ Fixed\ Effects + \varepsilon_{i,t} \quad (1)$$

$$LAFEES_{i,t} = \beta_0 + \beta_1 SPEC_{i,t} + \beta_2 HGEN_{i,t} + \beta_3 SPEC*HGEN_{i,t} + \beta_4 COMPLEX_{i,t} + \beta_5 SPEC*COMPLEX_{i,t} + \beta_6 HGEN*COMPLEX_{i,t} + \beta_7 SPEC*HGEN*COMPLEX_{i,t} + \beta_8 LTA_{i,t} + \beta_9 BIG4_{,t} + \beta_{10} BUSSEG_{i,t} + \beta_{11} GEOSEG_{i,t} + \beta_{12} CATA_{i,t} + \beta_{13} QUICK_{i,t} + \beta_{14} DE_{i,t} + \beta_{15} ROI_{i,t} + \beta_{16} LOSS_{i,t} + \beta_{17} DECYE_{i,t} + \beta_{18} GC_{i,t} + \beta_{19} FIRSTYR_{i,t} + \beta_{20} HERF_{i,t} + \beta_{21} DISTANCE_{i,t} + \beta_{22} OFFICE_{i,t} + \beta_{23} MW_{i,t} + \beta_{24} IIOS_{i,t} + \beta_{25} HIOS_{i,t} + \beta_{26} REG_{i,t} + Year\ Fixed\ Effects + \varepsilon_{i,t} \quad (2)$$

where *LAFEES* equals the natural log of total audit fees. The interaction between auditor specialization (*SPEC*) and industry homogeneity (*HGEN*) is our variable of interest in equation (1), whereas the three-way interaction between auditor specialization (*SPEC*), homogenous industries (*HGEN*), and complex industries (*COMPLEX*) is our variable of interest in equation (2). We orthogonalize the variables included in the interaction terms as in Draper and Smith (1981) to reduce multicollinearity.

A negative coefficient for $\beta_3$ ($\beta_7$) suggests that industry specialists achieve (and pass along) additional cost efficiencies when serving client firms in industries with homogenous operations (both homogenous operations and complex accounting). However, if specialists do not benefit from or do not pass along additional economies of scale to clients in these industries, then $\beta_3$ ($\beta_7$)

[10] This measure captures a different dimension of complexity from the regulated versus non-regulated dichotomy in many prior studies. We compare the SIC codes classified as complex in Francis and Seavey (2012) to the regulated industries in Hogan and Jeter (1999), and find that only SIC code 45 is included in both classifications.

will be positive or insignificant for clients in homogenous (homogenous and complex) industries.[11]

We base the control variables in equations (1) and (2) on Francis et al. (2005), Hay, Knechel, and Wong (2006), and Numan and Willekens (2012). These variables capture the audit fee impact of client size (*LTA*), audit firm size (*BIG4*), audit office size (*OFFICE*), client firm complexity (*BUSSEG* and *GEOSEG*), and client firm risk (*CATA*, *QUICK*, *DE*, *ROI*, *LOSS*, *GC*, and *MW*). We also include indicator variables for audits with December year-ends (*DECYE*) and first-year audit engagements (*FIRSTYR*). The model controls for potential market power effects due to auditor concentration (*HERF*) as well as the incumbent auditor's market power vis-à-vis its closest competitor (*DISTANCE*). Based on prior findings in Hogan and Jeter (1999) and Cahan et al. (2008), we incorporate characteristics of regulated industries (*REG*) and industry investment opportunity set (*IIOS* and *HIOS*) to distinguish our industry measures from these alternative industry characteristics. Finally, we include year fixed effects to capture variations in audit fees over time.[12] We winsorize all continuous variables at one percent and 99 percent to mitigate the influence of outliers. Table 1 provides detailed definitions for these variables.

(Insert Table 1 here)

## IV. SAMPLE AND DATA

Our sample consists of 23,578 firm-year observations between fiscal years 2004 and 2009. Because the Sarbanes-Oxley Act requires auditors to attest to a company's internal controls beginning in 2004, we start our sample in 2004 to maintain a consistent regulatory environment.

[11] We also present the results of an alternative approach in Table 5, in which we examine the effect of homogeneity on specialist fees in separate complex and non-complex subsamples.

[12] We do not include industry fixed effects in our primary models because the industry specialist variables are created *within* industries and because our test variables partition the industries based on common characteristics. Also, the industry fixed effects exhibit significant multicollinearity with the variables representing industry characteristics (*HGEN* and *COMPLEX*). Variation inflation factors (VIFs) greater than 10 may cause a concern about multicollinearity (Kennedy 2008). With industry fixed effects included in equation (2), the VIF on *HGEN*, *COMPLEX*, *HGEN*COMPLEX*, and *REG* are 561, 435, 217, and 648, respectively. Without the inclusion of industry fixed effects, the largest VIF is 4.57 on *BIG4*. If we estimate the model using ridge regression, a potential solution for multicollinearity, our results are similar to those in our primary test except that the three-way interaction is significant at p-value < 0.10 (two-sided); however, the VIF on *COMPLEX* is 12.44 in this alternative specification.

Table 2 summarizes the sample selection procedures. Our sample selection process begins with all firm-year observations between fiscal years 2004 and 2009 that have data available in Audit Analytics and Compustat.[13] Next, we identify an additional 3,355 firm-year observations in the Audit Analytics database with missing auditor city information for which we are able to collect the missing data. Consistent with prior audit fee research, we exclude firms in financial industries (SIC codes 6000-6999). We also exclude observations in audit markets with only one company or only one audit firm (Reichelt and Wang 2010; Numan and Willekens 2012). Finally, we remove observations with absolute studentized residuals greater than three.[14]

(Insert Table 2 here)

Table 3, Panel A presents descriptive statistics for the dependent variable, test variables, and control variables. The mean (median) value of our dependent variable, *LAFEES*, is 13.131 (13.255). These values translate into average audit fees of approximately \$0.504 million (\$0.571 million). The mean value for *SPEC* indicates that 8.4 percent of the firm-year observations in our sample engage an auditor with joint national and city-specific industry specialization. Approximately 23.7 percent of our sample includes client firms in homogenous industries, while 30.6 percent of our sample includes client firms in complex industries. The distribution of the continuous homogeneity variable, *HGEN_C*, is similar to that reported in Cairney and Young (2006). Moreover, we classify a similar percentage of firms in complex industries as the 26.1 percent reported in Francis and Seavey (2012). The remaining control variables are consistent with our expectations based on prior audit fee research.

(Insert Table 3 here)

[13] A possible concern is that the sample includes years affected by the financial crisis, which may have affected both the pricing of audits and the correlation of changes in operating expenses. In a robustness test, we include only years 2004 to 2007. Our results using this restricted sample period are similar to those shown. Specifically, the coefficient on *SPEC* remains positive and significant at p-value < 0.05 while the coefficients on *SPEC*HGEN* and *SPEC*HGEN*COMPLEX* remain negative and significant at p-value < 0.05.
[14] Inclusion of these observations does not affect our results.

Panel B of Table 3 presents the mean and standard deviation of our variables by industry classification. Consistent with Cairney and Young (2006), we find that a larger percentage of client firms engage a specialist auditor in industries with homogenous operations relative to industries with non-homogenous operations. Average audit fees for client firms of both specialists and non-specialists appear to be higher in homogenous industries. However, homogenous industries also include larger, more profitable firms so it is important to control for these factors in our multivariate analysis.

## V. RESULTS

### Audit Fee Tests

Panel A of Table 4 reports the multivariate regression results for our audit fee models. The first and fourth columns present the results from estimating equations (1) and (2), respectively. We include the second and third columns for completeness to show the effects of industry complexity alone, as well as both industry homogeneity and industry complexity, prior to the inclusion of the three-way interaction term. Finally, the fifth column reports the sensitivity of the regression results to a subsample of firms with Big 4 auditors. All regression models use t-statistics based on robust standard errors clustered at the client-firm level (Peterson 2009), report two-tailed p-values, include year fixed effects, and are significant at p-value < 0.001.

Consistent with prior audit fee research using pooled samples, we find a positive and statistically significant coefficient for *SPEC* ($\beta_1$). This positive relation indicates that industry specialists serving client firms in non-homogenous industries charge a fee premium. More importantly, we find evidence of a negative and statistically significant coefficient (p-value < 0.05) for the interaction of *SPEC*HGEN* ($\beta_3$). This negative relation shows that audit fees are incrementally lower for client firms in homogenous industries that engage an industry specialist relative to client firms in non-homogenous industries that engage an industry specialist. Therefore, we interpret this finding as evidence that, on average, specialist auditors in homogenous industries achieve cost efficiencies that they pass along to those client firms. The size of the coefficient $\beta_3$ suggests that the incremental effect on audit fees reduces the specialist premium to approximately zero as evidenced by the insignificant F-statistic at the bottom of Table 4.

(Insert Table 4 here)

In the second and third columns, we continue to find a positive and statistically significant coefficient for *SPEC*, which represents a fee premium for specialists in non-complex industries as well as industries that are neither homogenous nor complex. We note that the coefficient on the homogeneity measure, *HGEN*, is significantly negative and the coefficient on *COMPLEX* significantly positive, consistent with these proxies capturing the industry's homogeneity of operations and accounting complexity. These findings suggest non-specialist auditors can also realize some cost savings in homogenous industries, but charge higher fees to client firms in complex industries consistent with these accounting complexities requiring additional audit effort. We also note the two-way interaction *SPEC*COMPLEX* is insignificant in the second and third columns. Moreover, we test the overall effect on audit fees charged by specialists in complex industries as the joint significance of *SPEC* + *COMPLEX* + *SPEC* COMPLEX* and find a positive and statistically significant effect at p-value < 0.05 based on an untabulated F-statistic of 3.97 using column (2) results. Therefore, both specialist and non-specialist auditors in complex industries appear to charge fee premiums prior to consideration of industry homogeneity.

The fourth column introduces the three-way interaction between specialization, industry homogeneity, and industry complexity. We find that the coefficient on this interaction term ($\beta_7$) is significantly negative (p-value < 0.01). Therefore, industry specialists appear to charge incrementally lower fees in complex industries with homogenous operations. When we allow for these differential effects of auditor specialization in homogenous and complex industries, we find the overall effect of industry specialization on audit fees to be significantly negative, as indicated by the F-statistic (see bottom of Table 4). Column (5) reveals similar results for a subsample of client firms engaging Big 4 auditors.[15]

As an alternative approach to avoid the three-way interaction, we estimate our audit fee model including *SPEC* and *SPEC*HGEN* in separate complex and non-complex industry subsamples. The results of this alternative specification are included in Table 5. Consistent with Table 4, we find that the coefficient on *SPEC* is positive and significant in both subsamples, while the coefficient on *SPEC*HGEN* is significantly negative only in the complex industry subsample. Using a z-test (Paternoster, Brame, Mazerolle, and Piquero 1998), we also find that the difference in $\beta_3$ coefficients between complex and non-complex subsamples is statistically significant at p-value < 0.05 (untabulated). Therefore, specialist auditors charge a fee premium relative to non-specialists in complex industries; however, specialists are more likely to accrue economies of scale in complex industries (and pass those savings on to the client) when client firms in the industry also have homogenous operations.[16]

(Insert Table 5 here)

**Client Bargaining Power**

[15] While our findings are based on joint national and city-specific specialization, we recognize that national-only and city-only specialists are grouped with non-specialists in our benchmark group. Therefore, we perform an additional test whereby we eliminate client firms with national-only and city-only specialists to more directly analyze the difference between joint specialists and non-specialists. Our findings (untabulated) are robust to this alternative specification. Additionally, we measure specialization based *separately* on national or city market shares. When performing these separate regressions, we observe qualitatively similar findings to our primary results using national-level specialization. Our results are less robust for the separate city-level specification, perhaps because as technology improves, the sharing of knowledge across different cities is facilitated more easily, making national specialization even more important than industry expertise residing with personnel in local offices. Finally, we include controls for national-only and city-only specialists in our primary regression, along with their respective two-way and three-way interactions with homogeneity and complexity and find that our primary results for joint specialization are unchanged.

[16] We estimate economic significance using the methodology from Craswell et al. (1995) by calculating $e^z - 1$ where z is the mean parameter for the intercept variable tested. For the complex subsample, we find that industry specialists in non-homogenous industries ($\beta_1$) charge a fee premium on average of approximately 13.8 percent. In contrast, fees charged by specialists in homogenous industries ($\beta_1 + \beta_3$) show an overall significant reduction in audit fees. In the non-complex subsample, the fee premium of nearly ten percent in non-homogenous industries is reduced to approximately zero for specialists in homogenous industries.

Evidence from prior studies on the effect of client size, a common proxy for bargaining power, on specialist fee premiums is mixed. A number of studies find evidence of specialist premiums only for larger clients in Australia and New Zealand (Craswell et al. 1995; Ferguson and Stokes 2002; Ferguson et al. 2003; Carson and Fargher 2007; Hay and Jeter 2011). Using U.S. data, Francis et al. (2005) presents evidence of larger premiums for large clients, while Casterella et al. (2004) and Huang et al. (2007) report the opposite. Moreover, Palmrose (1986) finds no specialist premiums for firms in her sample.

In Table 6, we present the results for our examination of the effect of client bargaining power on specialist fees in homogenous and complex industries. We construct a measure of client bargaining power based on the ratio of the size of the client (natural log of total sales for the company) to the total size of the client's city-industry market (natural log of total sales for all companies in the same two-digit industry and MSA).[17] We provide descriptive statistics for this *POWER* measure in Panel A. We then split our sample based on the median value to conduct the subsample analysis presented in Panel B.

The results show the coefficients for *SPEC*HGEN* and *SPEC*HGEN* COMPLEX* to be significantly negative only in the subsample of client firms with relatively high bargaining power.[18] Because our bargaining power measure may vary significantly between clients of non-Big 4 and Big 4 auditors, we also perform our subsample analysis on the set of firms engaging Big 4 auditors (see the last two columns of Panel B). Our findings remain the same in this alternative sample. The coefficients on *SPEC*, *SPEC*HGEN* and *SPEC*HGEN*COMPLEX* are generally

[17] Alternatively, we define client bargaining power based on the size of the client relative to the total size of the auditor's office and find similar (untabulated) results using this specification.

[18] We further test differences in coefficients across the low and high power subsamples using three approaches: z-test (Paternoster et al. 1998), seemingly unrelated regression (SUEST in Stata), and stacked regression with an F-test. In each case, we find that the coefficient on the three-way interaction (*SPEC*HGEN*COMPLEX*) is at least marginally different across subsamples (p-value $< 0.05$ or p-value $< 0.10$ depending on the test) while the difference between coefficients for the two-way interaction (*SPEC*HGEN*) is not significantly different.

insignificant for the low power sample, consistent with prior studies finding specialist premiums only for larger, higher powered clients (Ferguson et al. 2003; Carson and Fargher 2007; among others). One exception is the positive coefficient on *SPEC* for the low power Big 4 sample, which is marginally significant at p-value < 0.10.

(Insert Table 6 here)

**Audit Quality Tests**

Because prior studies interpret the fee premium charged by industry specialists as evidence of higher audit quality (Francis et al. 2005), we recognize that our findings may indicate lower audit quality rather than economies of scale for specialists in these homogenous and complex industries. To address this concern, we perform additional tests to determine whether audit quality differs for client firms with specialist auditors in these specific industries. We use three output measures in our tests: discretionary accruals (financial reporting quality), the likelihood of issuing a going concern opinion (auditor communications), and the probability of a restatement (material misstatements).[19] We develop our first audit quality test based on the model in Reichelt and Wang (2010) using a sample consisting of 14,664 firm-year observations between 2004 and 2009 with available data for all variables in the model. Consistent with Reichelt and Wang (2010), the first column of Table 7 shows a significantly negative relation between *SPEC* and the absolute value of performance-matched discretionary accruals (|*DACC*|). When we include the variables *HGEN* and *COMPLEX* in the second column and their interactions with *SPEC*, the coefficients on these interactions are insignificant. The coefficients on the two-way and three-way interaction terms of interest should reflect the difference in discretionary accruals, if any, of clients audited by specialists in industries that are homogeneous, or both homogeneous and complex, relative to those

[19] DeFond and Zhang (2014) recommend that researchers select proxies for audit quality from different categories to take advantages of the strengths and attenuate the weaknesses of each group. The only group not applicable to our setting is perception-based measures of audit quality (e.g., cost of capital, market returns, etc.).

of specialists in other industries.

(Insert Table 7 here)

In our second and third audit quality tests, we estimate the likelihood of an auditor issuing a going-concern audit opinion based on the model from Reichelt and Wang (2010) and the likelihood of subsequently restating the current period financial statements based on models from Romanus, Maher, and Fleming (2008) and Blankley, Hurtt, and MacGregor (2014). Our sample for the going concern analysis consists of 5,534 firm-year observations between 2004 and 2009 that have available data and are considered to be financially distressed.[20] Alternatively, our sample for the restatement analysis consists of 11,532 firm-year observations between 2004 and 2009 with available data. The results of these logistic regression analyses are also included in Table 7.

Consistent with Reichelt and Wang (2010), we find a positive and significant coefficient for *SPEC* in the going concern model without our industry variables of interest. When we include the variables for homogenous and complex industries, we find that the two-way interaction and three-way interactions of interest are insignificant, suggesting that the likelihood of issuing a going concern opinion does not differ for auditors specializing in homogenous or homogenous and complex industries relative to specialists in other industries. In contrast with the other two audit quality measures, the restatement results show an insignificant coefficient on *SPEC* in the model excluding the industry interaction terms. The absence of a negative and significant coefficient for industry specialists is consistent with recent papers including Cao, Myers, and Omer (2012) and Blankley et al. (2014). When we include the interaction terms, we find insignificant coefficients for the two-way and three-way interactions of interest. Therefore, the likelihood of experiencing a subsequent restatement is no different for clients of specialists in homogenous, or homogenous

[20] We restrict our going-concern opinion analysis to financially distressed firms, following prior literature such as Lim and Tan (2008) and Reichelt and Wang (2010). A firm is defined as a financially distressed firm if it reports negative operating cash flow (OANCF-XIDOC).

and complex, industries, compared to other auditees.

Overall, these findings suggest the quality of services provided by industry specialist auditors in these industries is not significantly different in the face of either greater industry operational homogeneity or greater industry homogeneity and accounting complexity. Therefore, we conclude that the results observed in Table 4 are consistent with specialists generating production efficiencies without sacrificing audit quality.

**Sensitivity Tests**

***Alternative Measures***

In Table 8, we report sensitivity tests of our primary results using alternative measures of operational homogeneity and auditor industry specialization. The first column shows regression results from equation (2) using the continuous variable, *HGEN_C*, to proxy for homogenous industries. We continue to find a negative and significant coefficient $\beta_3$, but $\beta_7$ is not significant.[21] The second column presents our findings using an alternative measure of industry homogeneity based on changes in both operating expenses and total assets (*HGENAT*). This definition captures homogeneity in both operating cost structures and growth, and the results using this measure are similar to our primary findings.

(Insert Table 8 here)

The third column of Table 8 reports regression results when we use an alternative measure of industry specialization. Consistent with Reichelt and Wang (2010), this measure classifies auditors as national (city) industry specialists if the auditor possesses the largest market share of audit fees in an industry-year (industry-city-year) and the auditor's market share is at least ten percentage points greater than its closest competitor in a national (city) market. Therefore, the

[21] In untabulated results, we create an indicator variable for homogeneity based on the sixth and eight decile values of *HGEN_C*. We find significantly negative coefficients for $\beta_3$ and $\beta_7$ using both of these specifications. Thus, the effect of homogeneity does not appear to be monotonic, but instead emerges at a higher level.

indicator variable *DOMINANT* equals one if the auditor is both the national and city-specific specialist in a given year, and zero otherwise. Again, we find negative and significant coefficients for both $\beta_3$ and $\beta_7$ using this alternative definition.

Various classifications have been used to define industries in prior research. In this study, we identify homogeneity of operations at the three-digit SIC code level consistent with Cairney and Young (2006), while we classify industry specialization at the two-digit SIC code level based on prior specialization research. As an additional test, we measure both variables, *HGENFF* and *SPECFF*, using Fama and French's (1997) 48 industries. Results included in the fourth column of Table 8 using this alternative industry definition are consistent with our primary findings.

We also analyze different measures of industry homogeneity and accounting complexity. For homogeneity, we use an approach similar to Parrino (1997), Bhojraj, Lee, and Oler (2003), and Chen, Huang, and Wei (2013). This measure uses information in returns as described in Parrino (1997, 187):

> If the firms in an industry employ similar production technologies and compete in similar product markets, news concerning changes in factors, such as economic conditions or technological innovations, will tend to affect their cash flows, and therefore their stock prices, in a similar manner.

We expect that much of the effect on cash flows noted above will also be reflected in the operating results of the client firm, plus adjustments for timing differences incorporated through accounting accruals. Therefore, this measure provides an alternative proxy for the comparability of operations across client firms in an industry.

To create this measure, we estimate the adjusted r-squared from the regression of firm returns on industry returns from the past 36 monthly returns, with a minimum of 20 monthly returns, until the end of the current fiscal year for each firm-year observation. Industry returns are the mean monthly returns of all firms in the same industry as defined by three-digit SIC codes.

Then we compute the industry homogeneity measure as the mean adjusted r-squared of all firms in the industry for our sample period. Similar to our primary measure, we create an indicator variable (*HOMOG*) equal to one if the industry homogeneity measure is greater than the third quartile for our sample, and zero otherwise.

For accounting complexity, we create an alternative measure based on the industries listed in the 900 section of the FASB codification. This "Industries" FASB ASC topic (900s) contains industry specific guidance, including related financial statement presentation and disclosure requirements, for situations where specialized accounting and reporting applies. Therefore, authoritative guidance for specific industries is included in the related industry FASB ASC topic. Based on this classification, we create an indicator variable (*COMPLEX2*) equal to one if the industry is listed in the 900s section of the FASB codification, and zero otherwise.[22]

Our findings using these two alternative measures are included in the last three columns of Table 8. When using *COMPLEX2* and *HGEN* or *COMPLEX2* and *HOMOG*, we find that the results are similar to our primary findings with negative and significant coefficients for $\beta_3$ and $\beta_7$. However, only the coefficient for $\beta_3$ (but not $\beta_7$) is negative and significant when using *COMPLEX* and *HOMOG*. However, when we use our alternative measure of homogeneity (*HOMOG*) and our alternative measure of complexity (*COMPLEX2*), the three-way interaction remains negative and significant.[23] Overall, the results in Table 8 suggest that our findings are robust to most, although not all, alternative measures and specifications (i.e., all signs are consistent, 7 of 7 alternative

[22] Using this definition, the industries classified as complex are those with the following two-digit SIC codes: 01, 02, 07, 10, 12, 13, 14, 15, 16, 17, 20, 29, 36, 40, 41, 44, 45, 46, 48, 49, 70, 73, 78, 80, and 83. Since the FASB codification was developed based on several sources of authoritative literature (including the AICPA's audit and accounting guides), the increase in breadth of industries covered in this alternative measure is consistent with our expectations. We find that the correlation between this measure of complexity and our primary measure of complexity is 0.41.

[23] We performed two additional tests using: 1) the continuous measure of homogeneity based on Parrino and our primary measure of industry specialists (*SPEC*); and 2) *HOMOG* and the dominant industry specialist measure (*DOMINANT*). Both of these models include the original measure of complexity (*COMPLEX*). We find that the three-way interactions in both tests are significant at p-value < 0.01 and p-value < 0.10, respectively.

specifications are statistically significant for $\beta_3$, and 5 of 7 are statistically significant for $\beta_7$).

***Client Firm Size***

While we control for client size in our models, we also perform a matched sample analysis to determine whether client firm size drives the associations identified in this study as clients of industry specialist auditors are generally larger than those of non-specialists (Minutti-Meza 2013). We match firm-year observations from homogeneous industries with firm-year observations from non-homogeneous industries based on size (*LTA*) without replacement. We estimate equation (2) on this sample of 11,046 matched observations and report these results in Table 9. We continue to find negative and significant coefficients for $\beta_3$ and $\beta_7$, suggesting that our findings are not driven by differences in client firm size.

(Insert Table 9 here)

## VI. CONCLUSIONS

Previous studies document an association between auditor specialization and industry characteristics using the survivorship approach in which only cost-effective auditors are assumed to gain market share over time (Eichenseher and Danos 1981; Hogan and Jeter 1999; Cairney and Young 2006). These studies interpret higher auditor concentration in regulated and homogenous industries as evidence that specialist auditors benefit from economies of scale related to the transfer of industry-specific knowledge and expertise across client firms in these industries. Our study extends this research by evaluating audit fees more directly to ascertain whether industry specialist auditors achieve lower average costs related to the transfer of knowledge across similar clients in certain industries and pass savings, at least in part, to these clients in the form of lower audit fees. We focus on industries with homogenous operations and complex accounting practices as specific instances where potential efficiencies exist with respect to learned and developed audit processes.

Our results suggest that while joint national and city-specific industry specialists earn a fee premium when serving clients in non-homogenous industries, these specialists charge incrementally *lower* fees to clients in industries with homogenous operations, and to clients in industries with both homogenous operations and complex accounting requirements. Moreover, we observe this effect only when the client firm exhibits a relatively high degree of bargaining power, where bargaining power is defined based on the relative size of client sales within a city-industry market. In additional tests, we find no significant difference in service quality for specialists in those industries where economies of scale are reflected in lower fees. While prior research has identified industries in which specialists charge fee premiums for higher quality audits *or* fee discounts for lower quality audits (Cahan et al. 2011), our study suggests a setting where specialists pass on cost savings related to economies of scale to clients *without* sacrificing audit quality. Therefore, allowing for differential effects in homogenous and complex industries appears to be an important factor when examining the association between audit fees and industry specialization.

The findings in this study are subject to the following limitations. First, auditor specialization is an unobservable construct, so our measures may not fully capture the extent of knowledge-building and expertise of the external auditor. These measures also exclude private companies, which could misrepresent the level of specialization if audit firms and audit offices serve several private firms within a homogenous or complex industry. We focus on joint national and city-specific industry specialization, so our results should be interpreted with this caveat in mind. Second, audit firm cost data are not publicly available. Therefore, we use an audit fee model that controls for several factors affecting audit effort and audit costs, such as client size, risk factors, etc., to make inferences about cost efficiencies achieved by industry specialists (Yardley et al. 1992). Third, we measure industry homogeneity based on proxies from Cairney and Young (2006) and Parrino (1997). While these proxies encompass a broad definition of operational similarity within an industry, other measures may also capture the underlying construct of homogeneity. Finally, our evidence of unimpaired audit quality for specialists in homogenous and homogenous-complex industries relative to specialists in industries without those characteristics is based on insignificant coefficients for these variables in our audit quality models. Although robust across several audit quality proxies, the lack of significance may be due to the power of the tests. Larger samples in future studies could yield different inferences.

Overall, our findings provide evidence that certain industries lend themselves to specialization because auditors benefit from lower costs and can pass some of these savings on to the client. Both auditors and client firms benefit in these settings because client firms receive a quality audit at a competitive price, while the auditor can benefit from an increased likelihood of retaining these clients and developing further expertise. As regulators continue to express concerns about concentration in the audit market (GAO 2008; U.S. Treasury 2008), our findings contribute to the debate by showing that auditors can achieve economies of scale without sacrificing quality by specializing in homogenous and complex industries. Anti-competitive behavior would suggest that specialists might be expected to exploit their competitive advantage by charging higher fees in these industries. Instead, our findings indicate that specialist auditors pass at least some of their cost savings on to their clients.

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**Table 1**
Variable Definitions

| | |
|---|---|
| ***Dependent Variable*** | |
| *LAFEES* | the natural logarithm of total audit fees paid by company *i* to the external auditor. |
| ***Variables of Interest*** | |
| *SPEC* | 1 if company *i* is audited by an audit firm that is an industry specialist at both the city level and the national level. We classify cities based on the Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. Auditors are defined as being a city (national) industry specialist if they have greater than 50 (30) percent annual market share in a two-digit SIC code at the city (national) level. |
| *SPECFF* | 1 if company *i* is audited by an audit firm that is an industry specialist at both the city level and the national level. We classify cities based on the Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. Auditors are defined as being a city (national) industry specialist if they have greater than 50 (30) percent annual market share in one of the Fama-French's (1997) 48 industries at the city (national) level. |
| *DOMINANT* | 1 if company *i* is audited by an audit firm that is a dominant industry leader at both the city level and the national level. We classify cities based on the Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. Auditors are defined as a dominant city (national) industry leader if they have the largest annual market share in a two-digit SIC code and if their annual market shares are at least 10 percentage points greater than their closest competitor in the same city (national) audit market. |
| *COMPLEX* | 1 if company *i* is in an industry with a specific AICPA Audit & Accounting Guide as in Francis and Seavey (2012) (01, 02, 07, 13, 15, 16, 17, 37, 45, 73, 79, 80, and 87), and 0 otherwise. |
| *COMPLEX2* | 1 if company *i* is in an industry listed in the 900 section of the FASB codification (01, 02, 07, 10, 12, 13, 14, 15, 16, 17, 20, 29, 36, 40, 41, 44, 45, 46, 48, 49, 70, 73, 78, 80, and 83), and 0 otherwise. This "Industries" FASB ASC topic (900s) includes industry specific guidance, including related financial statement presentation and disclosure requirements, for situations where specialized accounting and reporting applies. Authoritative guidance that specifically relates to an industry will be included in that industry FASB ASC topic. |
| *HGEN_C* | the mean value of the Pearson correlation coefficients of the annual percentage change in operating expenses for all companies in a three-digit SIC code over the six years from 2004 to 2009. We use all companies with available data in the merged Audit Analytics and Compustat dataset to construct this measure. |
| *HGEN* | 1 if *HGEN_C* is greater than or equal to its third quartile value, and 0 otherwise. |
| *HGENFF* | 1 if *HGENFF_C* is greater than or equal to its third quartile value, and 0 otherwise. *HGENFF_C* is calculated similar to *HGEN_C* except that the calculation is based on Fama and French's (1997) 48 industries. |
| *HGENAT* | 1 if the mean Pearson correlation coefficient of the annual percentage change in both operating expenses *and* assets for all companies in a three-digit SIC code over the six years from 2004 to 2009 are greater than or equal to its third quartile value, and 0 otherwise. |
| *HOMOG* | 1 if the alternative homogeneity measure is greater than or equal to its third quartile value, and 0 otherwise. We calculate this alternative homogeneity measure using an approach similar to Parrino (1997), Bhojraj et al. (2003), and Chen et al. (2013). Specifically, for each firm-year observation, we estimate the adjusted r-squared from the regression of firm returns on industry returns from the past 36 (with a minimum of 20) monthly returns until the end of the current fiscal year. Industry returns are the mean monthly returns of all firms in the same industry defined by three-digit SIC codes. Then, we compute the industry homogeneity measure as the mean adjusted r-squared of all firms in the industry for our sample period (2004 to 2009). |
| ***Control Variables*** | |
| *BIG4* | 1 if company *i* engages a Big 4 auditor, and 0 otherwise. |
| *BUSSEG* | the natural logarithm of the number of business segments that company *i* operates in plus one. |
| *CATA* | the ratio of current assets to total assets for company *i*. |
| *DE* | the ratio of long-term debt to total assets company *i*. |
| *DECYE* | 1 if company *i* has a December year end, and 0 otherwise. |

| | |
|---|---|
| *DISTANCE* | the smallest absolute industry market share difference between company *i*'s auditor and its closest audit firm competitor in a city market. We classify cities based on the Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. |
| *FIRSTYR* | 1 if a first-year audit engagement, and 0 otherwise. |
| *GC* | 1 if company *i* received a going concern opinion in the current year, and 0 otherwise. |
| *GEOSEG* | the natural logarithm of the number of geographic segments that company *i* operates in plus one. |
| *HERF* | the industry Herfindahl index calculated as the sum of squared industry market shares (in audit fees) of all local audit offices in a city-year. We classify cities based on the Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. |
| *HIOS* | the within industry standard deviation of the firm-level IOS factor scores multiplied by -1. We follow the same method for computing IOS factor scores as Cahan et al. (2008). Industry is defined based on three-digit SIC codes. |
| *IIOS* | the median of the firm-level IOS factor scores in a given industry. We follow the same method for computing IOS factor scores as Cahan et al. (2008). Industry is defined based on three-digit SIC codes. |
| *LOSS* | 1 if company *i*'s income before extraordinary items is less than zero, and 0 otherwise. |
| *LTA* | the natural logarithm of company *i*'s year-end total assets (*in millions*). |
| *MW* | 1 if company *i* received an adverse opinion on internal controls (i.e., material weakness) in the current year, and 0 otherwise. |
| *OFFICE* | the natural logarithm of total audit fees for each audit office in the current year. |
| *QUICK* | the ratio of current assets less inventory to current liabilities for company *i*. |
| *REG* | 1 if company *i* operates in a regulated industry as classified in Hogan and Jeter (1999), and 0 otherwise. |
| *ROI* | the ratio of earnings before interest and tax to total assets for company *i*. |

***Additional Audit Quality Variables***

| | |
|---|---|
| *\|DACC\|* | absolute value of performance-adjusted discretionary accruals as defined in Reichelt and Wang (2010). |
| *Prob (GC = 1)* | 1 if company *i* received a going concern opinion in the current year, and 0 otherwise. |
| *Prob (Restate = 1)* | 1 if company *i*'s financial statements in year *t* were subsequently restated, and 0 otherwise. |
| | |
| *ACCR* | total accruals from continuing operations scaled by total assets for company *i* at the end of $t-1$. |
| *AGE* | the natural logarithm of the number of years company *i* exists in the Compustat database. |
| *ALTMANZ* | Altman's [1983] z-scores for company *i*. |
| *CFO* | operating cash flow scaled by lagged total assets for company *i*. |
| *EPR* | income from continuing operations scaled by market capitalization for company *i*. |
| *EPSGROW* | 1 if company *i* had positive EPS change for four consecutive quarters, and 0 otherwise. |
| *FIN* | the sum of cash raised from the issuance of long-term debt, common stock, and preferred stock for company *i*, deflated by total assets |
| *FOREIGN* | 1 if company *i* generated any sales in foreign countries, and 0 otherwise. |
| *FREEC* | the sum of cash from operations less average capital expenditures for company *i*, deflated by lagged total assets. |
| *LEV* | total long-term debt scaled by total assets for company *i*. |
| *LIT* | 1 if company *i* operates in a high litigation industry (SIC codes of 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370–7370), and 0 otherwise. |
| *LMVE* | the natural logarithm of market value of common equity for company *i*. |
| *LTASQ* | the squared value of *LTA* for company *i*. |
| *MKTBK* | the market value of equity divided by book value of equity for company *i*. |
| *NARATIO* | the ratio of non-audit to total fees paid by company *i* to the external auditor. |
| *SDCFO* | the standard deviation of *CFO* in the past four years ($t-4$ to $t-1$) for company *i*. |
| *SDIB* | the standard deviation of income before extraordinary items (scaled by total at the end of $t-1$) in the past four years ($t-4$ to $t-1$) for company *i*. |
| *\|TOTACCR\|* | absolute value of total accruals from continuing operations in year $t-1$ scaled by total assets at the end of $t-1$. |

**Table 2**

Sample Selection

| | Number of Observations |
|---|---|
| Audit Analytics data (2004 to 2009) where Compustat data are available | 32,809 |
| Plus: Auditor city data where data is missing in Audit Analytics | 3,355 |
| Less: Observations in financial industries | (7,724) |
| Less: Observations in market (MSA-industry-year) with only one audit firm or only one company | (4,763) |
| Less: Observations with an absolute studentized residual greater than 3 | (99) |
| **Final Sample** | **23,578** |

**Table 3**
Descriptive Statistics for Audit Fee Models

**Panel A: Full Sample (N=23,578)**

| Variable | Mean | Std. Dev. | 25th Perc. | Median | 75th Perc. |
|---|---|---|---|---|---|
| *LAFEES* | 13.131 | 1.530 | 12.044 | 13.255 | 14.207 |
| *SPEC* | 0.084 | 0.278 | 0.000 | 0.000 | 0.000 |
| *HGEN* | 0.237 | 0.426 | 0.000 | 0.000 | 0.000 |
| *HGEN_C* | 0.173 | 0.152 | 0.096 | 0.129 | 0.199 |
| *COMPLEX* | 0.306 | 0.461 | 0.000 | 0.000 | 1.000 |
| *LTA* | 5.020 | 2.693 | 3.341 | 5.171 | 6.912 |
| *BIG4* | 0.604 | 0.489 | 0.000 | 1.000 | 1.000 |
| *BUSSEG* | 0.441 | 0.624 | 0.000 | 0.000 | 1.099 |
| *GEOSEG* | 0.549 | 0.704 | 0.000 | 0.000 | 1.099 |
| *CATA* | 0.521 | 0.275 | 0.294 | 0.524 | 0.750 |
| *QUICK* | 2.405 | 3.207 | 0.811 | 1.394 | 2.599 |
| *DE* | 0.195 | 0.292 | 0.000 | 0.080 | 0.288 |
| *ROI* | -0.522 | 2.349 | -0.185 | 0.014 | 0.066 |
| *LOSS* | 0.450 | 0.497 | 0.000 | 0.000 | 1.000 |
| *DECYE* | 0.687 | 0.464 | 0.000 | 1.000 | 1.000 |
| *GC* | 0.136 | 0.343 | 0.000 | 0.000 | 0.000 |
| *FIRSTYR* | 0.084 | 0.278 | 0.000 | 0.000 | 0.000 |
| *HERF* | 0.453 | 0.206 | 0.292 | 0.408 | 0.568 |
| *DISTANCE* | 0.203 | 0.277 | 0.010 | 0.065 | 0.287 |
| *OFFICE* | 5.994 | 2.059 | 4.143 | 7.284 | 7.514 |
| *MW* | 0.081 | 0.273 | 0.000 | 0.000 | 0.000 |
| *IIOS* | 0.069 | 0.592 | -0.349 | 0.000 | 0.279 |
| *HIOS* | -0.570 | 0.498 | -0.784 | -0.422 | -0.221 |
| *REG* | 0.191 | 0.393 | 0.000 | 0.000 | 0.000 |

Table 1 provides variable definitions. All continuous variables are winsorized at 1 percent and 99 percent to mitigate the influence of outliers.

**Table 3 (*continued*)**

Descriptive Statistics for Audit Fee Models

**Panel B: Subsamples by Industry Classification**

| | *HGEN=1 & COMPLEX= 1 (N=1,365)* | | *HGEN=1 & COMPLEX= 0 (N=4,234)* | | *HGEN=0 & COMPLEX= 1 (N=5,861)* | | *HGEN=0 and COMPLEX= 0 (N=12,118)* | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
| *LAFEES* | 13.378 | 1.540 | 13.625 | 1.530 | 12.953 | 1.520 | 13.017 | 1.495 |
| *SPEC* | 0.085 | 0.279 | 0.168 | 0.374 | 0.037 | 0.188 | 0.078 | 0.268 |
| *HGEN* | 1.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| *HGEN_C* | 0.414 | 0.158 | 0.370 | 0.158 | 0.090 | 0.049 | 0.117 | 0.076 |
| *COMPLEX* | 1.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 |
| *LTA* | 5.717 | 2.638 | 6.258 | 2.612 | 4.589 | 2.650 | 4.717 | 2.603 |
| *BIG4* | 0.632 | 0.483 | 0.718 | 0.450 | 0.547 | 0.498 | 0.588 | 0.492 |
| *BUSSEG* | 0.515 | 0.655 | 0.623 | 0.684 | 0.396 | 0.600 | 0.391 | 0.597 |
| *GEOSEG* | 0.553 | 0.743 | 0.574 | 0.713 | 0.462 | 0.626 | 0.583 | 0.728 |
| *CATA* | 0.450 | 0.256 | 0.444 | 0.258 | 0.488 | 0.279 | 0.572 | 0.271 |
| *QUICK* | 1.771 | 2.241 | 1.655 | 2.317 | 2.222 | 2.913 | 2.826 | 3.609 |
| *DE* | 0.235 | 0.271 | 0.218 | 0.220 | 0.175 | 0.287 | 0.193 | 0.316 |
| *ROI* | -0.374 | 2.129 | -0.243 | 1.754 | -0.620 | 2.686 | -0.588 | 2.371 |
| *LOSS* | 0.403 | 0.491 | 0.284 | 0.451 | 0.459 | 0.498 | 0.508 | 0.500 |
| *DECYE* | 0.765 | 0.424 | 0.696 | 0.460 | 0.715 | 0.451 | 0.661 | 0.473 |
| *GC* | 0.129 | 0.335 | 0.087 | 0.282 | 0.140 | 0.347 | 0.153 | 0.360 |
| *FIRSTYR* | 0.082 | 0.275 | 0.069 | 0.253 | 0.093 | 0.291 | 0.086 | 0.280 |
| *HERF* | 0.479 | 0.228 | 0.544 | 0.204 | 0.383 | 0.186 | 0.452 | 0.200 |
| *DISTANCE* | 0.235 | 0.304 | 0.301 | 0.315 | 0.138 | 0.228 | 0.197 | 0.271 |
| *OFFICE* | 6.134 | 1.985 | 6.438 | 1.839 | 5.747 | 2.163 | 5.942 | 2.063 |
| *MW* | 0.075 | 0.264 | 0.078 | 0.268 | 0.085 | 0.280 | 0.081 | 0.273 |
| *IIOS* | -0.227 | 0.274 | -0.226 | 0.309 | 0.030 | 0.370 | 0.225 | 0.714 |
| *HIOS* | -0.279 | 0.214 | -0.281 | 0.255 | -0.515 | 0.337 | -0.731 | 0.578 |
| *REG* | 0.317 | 0.466 | 0.334 | 0.472 | 0.149 | 0.356 | 0.147 | 0.354 |

Table 1 provides variable definitions. All continuous variables are winsorized at 1 percent and 99 percent to mitigate the influence of outliers.

**Table 4**
Association between Audit Fees and Industry Specialization in
Homogenous and Homogenous-Complex Industries

| | | Dependent Variable: *LAFEES* | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Pred. Sign** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| *Intercept* | | 9.605 | 9.546 | 9.549 | 9.542 | 10.233 |
| | | *(216.51***)* | *(203.81***)* | *(204.65***)* | *(205.35***)* | *(24.63***)* |
| *SPEC (β1)* | + | 0.100 | 0.101 | 0.104 | 0.103 | 0.081 |
| | | *(4.23***)* | *(4.24***)* | *(4.41***)* | *(4.39***)* | *(3.42***)* |
| *HGEN* | - | -0.085 | | -0.080 | -0.080 | -0.101 |
| | | *(-4.79***)* | | *(-4.48***)* | *(-4.46***)* | *(-4.57***)* |
| *SPEC*HGEN (β3)* | - | -0.105 | | -0.112 | -0.118 | -0.141 |
| | | *(-2.21**)* | | *(-2.36**)* | *(-2.52**)* | *(-2.96***)* |
| *COMPLEX* | + | | 0.063 | 0.058 | 0.058 | 0.051 |
| | | | *(4.08***)* | *(3.74***)* | *(3.82***)* | *(2.56**)* |
| *SPEC*COMPLEX (β5)* | ? | | -0.084 | -0.094 | -0.087 | -0.069 |
| | | | *(-1.28)* | *(-1.51)* | *(-1.50)* | *(-1.16)* |
| *HGEN*COMPLEX* | ? | | | | -0.048 | -0.117 |
| | | | | | *(-1.25)* | *(-2.47**)* |
| *SPEC*HGEN*COMPLEX (β7)* | - | | | | -0.340 | -0.300 |
| | | | | | *(-2.65***)* | *(-2.24**)* |
| *LTA* | + | 0.459 | 0.457 | 0.460 | 0.460 | 0.485 |
| | | *(90.95***)* | *(90.62***)* | *(91.00***)* | *(91.37***)* | *(71.15***)* |
| *BIG4* | + | 0.123 | 0.125 | 0.122 | 0.121 | |
| | | *(4.49***)* | *(4.55***)* | *(4.46***)* | *(4.44***)* | |
| *BUSSEG* | + | 0.117 | 0.117 | 0.118 | 0.118 | 0.117 |
| | | *(10.28***)* | *(10.26***)* | *(10.38***)* | *(10.34***)* | *(8.78***)* |
| *GEOSEG* | + | 0.264 | 0.269 | 0.266 | 0.267 | 0.256 |
| | | *(24.47***)* | *(24.87***)* | *(24.67***)* | *(24.76***)* | *(20.12***)* |
| *CATA* | + | 0.403 | 0.408 | 0.418 | 0.423 | 0.599 |
| | | *(13.08***)* | *(13.00***)* | *(13.43***)* | *(13.71***)* | *(12.65***)* |
| *QUICK* | - | -0.036 | -0.035 | -0.036 | -0.036 | -0.040 |
| | | *(-16.22***)* | *(-16.00***)* | *(-16.18***)* | *(-16.21***)* | *(-11.15***)* |
| *DE* | + | 0.013 | 0.020 | 0.019 | 0.020 | -0.033 |
| | | *(0.59)* | *(0.88)* | *(0.83)* | *(0.90)* | *(-0.83)* |
| *ROI* | - | -0.051 | -0.051 | -0.051 | -0.051 | -0.256 |
| | | *(-18.44***)* | *(-18.17***)* | *(-18.36***)* | *(-18.33***)* | *(-7.33***)* |
| *LOSS* | + | 0.173 | 0.175 | 0.174 | 0.175 | 0.110 |
| | | *(13.91***)* | *(14.03***)* | *(14.02***)* | *(14.12***)* | *(6.51***)* |
| *DECYE* | + | 0.117 | 0.111 | 0.112 | 0.112 | 0.151 |
| | | *(7.90***)* | *(7.47***)* | *(7.61***)* | *(7.59***)* | *(8.10***)* |
| *GC* | + | 0.140 | 0.139 | 0.145 | 0.145 | 0.101 |
| | | *(6.54***)* | *(6.47***)* | *(6.75***)* | *(6.79***)* | *(2.82***)* |
| *FIRSTYR* | +/- | -0.095 | -0.094 | -0.095 | -0.095 | -0.058 |
| | | *(-5.96***)* | *(-5.95***)* | *(-5.96***)* | *(-5.97***)* | *(-1.91*)* |
| *HERF* | +/- | -0.413 | -0.406 | -0.382 | -0.381 | -0.520 |
| | | *(-9.21***)* | *(-8.98***)* | *(-8.43***)* | *(-8.39***)* | *(-7.89***)* |
| *DISTANCE* | + | 0.228 | 0.224 | 0.220 | 0.222 | 0.344 |
| | | *(6.73***)* | *(6.59***)* | *(6.50***)* | *(6.55***)* | *(7.53***)* |

*continued*

| | | | | | | |
|---|---|---|---|---|---|---|
| *OFFICE* | + | 0.101 | 0.102 | 0.101 | 0.101 | 0.004 |
| | | *(15.11***)* | *(15.16***)* | *(15.15***)* | *(15.14***)* | *(0.07)* |
| *MW* | + | 0.366 | 0.367 | 0.366 | 0.365 | 0.506 |
| | | *(19.14***)* | *(19.23***)* | *(19.21***)* | *(19.20***)* | *(21.60***)* |
| *IIOS* | + | 0.037 | 0.037 | 0.036 | 0.035 | 0.033 |
| | | *(2.87***)* | *(2.92***)* | *(2.85***)* | *(2.76***)* | *(2.19**)* |
| *HIOS* | + | 0.017 | -0.012 | 0.006 | 0.003 | 0.052 |
| | | *(-0.88)* | *(-0.61)* | *(0.29)* | *(0.17)* | *(2.11**)* |
| *REG* | - | -0.190 | -0.194 | -0.184 | -0.183 | -0.185 |
| | | *(-8.98***)* | *(-9.17***)* | *(-8.65***)* | *(-8.57***)* | *(-6.53***)* |
| Model F-value | | 5,238.36 | 5,230.28 | 4,889.02 | 4,579.00 | 1,397.63 |
| Adjusted R-squared | | 0.857 | 0.857 | 0.857 | 0.858 | 0.753 |
| N | | 23,578 | 23,578 | 23,578 | 23,578 | 14,233 |
| **F-Tests:** | | | | | | |
| $\beta 1 + \beta 3 = 0$ | | *2.17* | | *0.06* | *0.22* | *2.84*$^{+}$ |
| $\beta 1 + \beta 5 = 0$ | | | *0.20* | *0.07* | *0.16* | *0.12* |
| $\beta 1 + \beta 3 + \beta 5 + \beta 7 = 0$ | | | | | *23.86*$^{+++}$ | *23.84*$^{+++}$ |

This table presents the results of OLS regression models used to test the association between audit fees and industry specialization in homogenous and complex industries. Our primary models are as follows:

$$LAFEES_{i,t} = \beta_0 + \beta_1 SPEC_{i,t} + \beta_2 HGEN_{i,t} + \beta_3 SPEC*HGEN_{i,t} + \beta_4 LTA_{i,t} + \beta_5 BIG4_{i,t} + \beta_6 BUSSEG_{i,t} + \beta_7 GEOSEG_{i,t} + \beta_8 CATA_{i,t} + \beta_9 QUICK_{i,t} + \beta_{10} DE_{i,t} + \beta_{11} ROI_{i,t} + \beta_{12} LOSS_{i,t} + \beta_{13} DECYE_{i,t} + \beta_{14} GC_{i,t} + \beta_{15} FIRSTYR_{i,t} + \beta_{16} HERF_{i,t} + \beta_{17} DISTANCE_{i,t} + \beta_{18} OFFICE_{i,t} + \beta_{19} MW_{i,t} + \beta_{20} IIOS_{i,t} + \beta_{21} HIOS_{i,t} + \beta_{22} REG_{i,t} + Year\ Fixed\ Effects + \varepsilon_{i,t} \quad (1)$$

$$LAFEES_{i,t} = \beta_0 + \beta_1 SPEC_{i,t} + \beta_2 HGEN_{i,t} + \beta_3 SPEC*HGEN_{i,t} + \beta_4 COMPLEX_{i,t} + \beta_5 SPEC*COMPLEX_{i,t} + \beta_6 HGEN*COMPLEX_{i,t} + \beta_7 SPEC*HGEN*COMPLEX_{i,t} + \beta_8 LTA_{i,t} + \beta_9 BIG4_{i,t} + \beta_{10} BUSSEG_{i,t} + \beta_{11} GEOSEG_{i,t} + \beta_{12} CATA_{i,t} + \beta_{13} QUICK_{i,t} + \beta_{14} DE_{i,t} + \beta_{15} ROI_{i,t} + \beta_{16} LOSS_{i,t} + \beta_{17} DECYE_{i,t} + \beta_{18} GC_{i,t} + \beta_{19} FIRSTYR_{i,t} + \beta_{20} HERF_{i,t} + \beta_{21} DISTANCE_{i,t} + \beta_{22} OFFICE_{i,t} + \beta_{23} MW_{i,t} + \beta_{24} IIOS_{i,t} + \beta_{25} HIOS_{i,t} + \beta_{26} REG_{i,t} + Year\ Fixed\ Effects + \varepsilon_{i,t} \quad (2)$$

The symbols ***, **, and * denote two-tail significance at the .01, .05, and .10 level, respectively, and are derived from t-statistics based on robust standard errors clustered at the firm level. T-statistics are shown in parentheses below the corresponding coefficient. Year fixed effects are included in the model but not shown above for brevity. The symbols $^{+++}$, $^{++}$, and $^{+}$ denote significance at the .01, .05, and .10 level, respectively, for the F-tests of linear combinations of coefficients. Table 1 provides variable definitions.

**Table 5**
Effect of Homogenous Operations on Specialist Premiums
Subsamples based on Accounting Complexity

| | | Dependent Variable: *LAFEES* | |
|---|---|---|---|
| **Variables** | **Pred. Sign** | *COMPLEX = 1* | *COMPLEX = 0* |
| *Intercept* | | 9.855 | 9.446 |
| | | *(125.45***)* | *(173.79***)* |
| *SPEC (β1)* | + | 0.129 | 0.092 |
| | | *(2.37**)* | *(3.56***)* |
| *HGEN* | - | -0.017 | -0.093 |
| | | *(-0.48)* | *(-4.50***)* |
| *SPEC*HGEN (β3)* | - | -0.348 | -0.082 |
| | | *(-2.97***)* | *(-1.60)* |
| Control Variables | | Included | Included |
| Model F-value | | 1,632.05 | 3,705.12 |
| Adjusted R-squared | | 0.859 | 0.860 |
| N | | 7,226 | 16,352 |
| **F-Tests:** | | | |
| $\beta 1 + \beta 3 = 0$ | | $7.71^{+++}$ | *0.09* |

Table 1 provides variable definitions. This table presents the results of OLS regression models using alternative definitions of auditor industry specialization and industry homogeneity. Table 1 provides these alternative variable definitions. The symbols ***, **, and * denote two-tail significance at the .01, .05, and .10 level, respectively, and are derived from t-statistics based on robust standard errors clustered at the firm level. T-statistics are shown in parentheses below the corresponding coefficient. Control variables and year fixed effects are included in the model but not shown above for brevity. The symbols $^{+++}$, $^{++}$, and $^{+}$ denote significance at the .01, .05, and .10 level, respectively, for the F-tests of linear combinations of coefficients.

## Table 6
Subsample Analyses Based on Client Bargaining Power

### Panel A: Descriptive Statistics for Client Bargaining Power (*POWER*)

| Variable | Mean | Std. Dev. | 25th Perc. | Median | 75th Perc. |
|---|---|---|---|---|---|
| *POWER* | 0.556 | 0.371 | 0.371 | 0.592 | 0.804 |

We define client bargaining power (*POWER*) as the natural log of total sales for company *i* divided by the natural log of total sales for all companies in the same two-digit industry and MSA (city-industry market).

### Panel B: Regression Analysis by *POWER* subsamples

| | | Dependent Variable: *LAFEES* | | | |
|---|---|---|---|---|---|
| **Variables** | **Pred. Sign** | Low *POWER* | High *POWER* | Low *POWER* (Big4 Only) | High *POWER* (Big4 Only) |
| *Intercept* | | 9.694 | 9.234 | 10.205 | 10.169 |
| | | *(172.83***)* | *(96.82***)* | *(18.32***)* | *(17.14***)* |
| *SPEC (β1)* | + | 0.051 | 0.078 | 0.067 | 0.073 |
| | | *(1.09)* | *(2.90***)* | *(1.85*)* | *(2.51**)* |
| *HGEN* | - | -0.097 | -0.073 | -0.126 | -0.079 |
| | | *(-3.47***)* | *(-3.27***)* | *(-3.78***)* | *(-2.86***)* |
| *SPEC*HGEN (β3)* | - | -0.052 | -0.199 | -0.096 | -0.211 |
| | | *(-0.39)* | *(-3.86***)* | *(-1.18)* | *(-3.73***)* |
| *COMPLEX* | + | 0.065 | 0.036 | 0.075 | 0.006 |
| | | *(3.28***)* | *(1.57)* | *(2.99***)* | *(0.19)* |
| *SPEC*COMPLEX (β5)* | ? | 0.032 | -0.080 | -0.016 | -0.057 |
| | | *(0.31)* | *(-1.19)* | *(-0.19)* | *(-0.76)* |
| *HGEN*COMPLEX* | ? | -0.021 | -0.061 | -0.038 | -0.125 |
| | | *(-0.36)* | *(-1.20)* | *(-0.56)* | *(-1.89*)* |
| *SPEC*HGEN*COMPLEX (β7)* | - | 0.139 | -0.42 | -0.026 | -0.427 |
| | | *(0.47)* | *(-2.91***)* | *(-0.12)* | *(-2.65***)* |
| *BIG4* Control Variable | | Included | Included | Not Included | Not Included |
| All Other Control Variables | | Included | Included | Included | Included |
| Model F-value | | 1,435.64 | 1,408.22 | 424.54 | 688.64 |
| Adjusted R-squared | | 0.783 | 0.795 | 0.637 | 0.747 |
| N | | 12,348 | 11,230 | 7,230 | 7,003 |
| **F-Tests:** | | | | | |
| *β1 + β3 = 0* | | *0.00* | *12.73*$^{+++}$ | *0.22* | *13.93*$^{+++}$ |
| *β1 + β5 = 0* | | *0.54* | *0.00* | *0.51* | *0.13* |
| *β1 + β3 + β5 + β7= 0* | | *0.28* | *43.53*$^{+++}$ | *0.13* | *37.87*$^{+++}$ |

This table presents the results of OLS regression models using subsamples based on client bargaining power (*POWER*) as defined in Panel A. Table 1 provides variable definitions. The symbols ***, **, and * denote two-tail significance at the .01, .05, and .10 level, respectively, and are derived from t-statistics based on robust standard errors clustered at the firm level. T-statistics are shown in parentheses below the corresponding coefficient. Control variables and year fixed effects are included in the model but not shown above for brevity. The symbols $^{+++}$, $^{++}$, and $^{+}$ denote significance at the .01, .05, and .10 level, respectively, for the F-tests of linear combinations of coefficients.

**Table 7**
Tests of Audit Quality Differences in Homogenous and Homogenous-Complex Industries

| **Variables** | Dependent Variable: *\|DACC\|* | | | Dependent Variable: *Prob (GC = 1)* | | | Dependent Variable: *Prob (Restate = 1)* | |
|---|---|---|---|---|---|---|---|---|
| *Intercept* | 0.061 | 0.061 | *Intercept* | -0.866 | -0.746 | *Intercept* | -3.215 | -3.269 |
| | *(16.88***)* | *(16.78***)* | | *(19.91***)* | *(13.81***)* | | *(14.99***)* | *(15.35***)* |
| *SPEC* | -0.007 | -0.005 | *SPEC* | 0.399 | 0.302 | *SPEC* | 0.164 | 0.173 |
| | *(-3.84***)* | *(-2.80***)* | | *(3.15*)* | *(1.47)* | | *(1.76)* | *(1.92)* |
| *HGEN* | | -0.008 | *HGEN* | | 0.009 | *HGEN* | | 0.156 |
| | | *(-5.41***)* | | | *(0.01)* | | | *(2.36)* |
| *SPEC*HGEN* | | -0.004 | *SPEC*HGEN* | | -0.658 | *SPEC*HGEN* | | 0.188 |
| | | *(-1.06)* | | | *(1.10)* | | | *(0.58)* |
| *COMPLEX* | | 0.007 | *COMPLEX* | | -0.201 | *COMPLEX* | | 0.093 |
| | | *(4.21***)* | | | *(6.55**)* | | | *(1.15)* |
| *SPEC*COMPLEX* | | -0.009 | *SPEC*COMPLEX* | | -0.194 | *SPEC*COMPLEX* | | -0.225 |
| | | *(-1.61)* | | | *(0.13)* | | | *(0.55)* |
| *HGEN*COMPLEX* | | -0.006 | *HGEN*COMPLEX* | | 0.918 | *HGEN*COMPLEX* | | -0.212 |
| | | *(-1.63)* | | | *(16.10***)* | | | *(1.06)* |
| *SPEC*HGEN*COMPLEX* | | 0.000 | *SPEC*HGEN*COMPLEX* | | -1.243 | *SPEC*HGEN*COMPLEX* | | 0.008 |
| | | *(0.04)* | | | *(0.80)* | | | *(0.00)* |
| *LMVE* | -0.004 | -0.004 | *LMVE* | -0.494 | -0.497 | *LTA* | 0.548 | 0.543 |
| | *(-10.31***)* | *(-9.86***)* | | *(337.48***)* | *(336.80***)* | | *(18.60***)* | *(17.97***)* |
| *BIG4* | 0.053 | 0.051 | *BIG4* | -0.396 | -0.432 | *BIG4* | -0.220 | -0.213 |
| | *(5.22***)* | *(5.11***)* | | *(17.01***)* | *(19.55***)* | | *(3.95**)* | *(3.67*)* |
| *SDCFO* | -0.042 | -0.046 | *SDIB* | 0.024 | 0.025 | *ROA* | -0.163 | -0.170 |
| | *(-5.19***)* | *(-5.73***)* | | *(7.58***)* | *(7.98***)* | | *(3.81*)* | *(3.81*)* |
| *CFO* | 0.030 | 0.030 | *LEV* | 0.023 | 0.023 | *LOSS* | 0.018 | 0.033 |
| | *(10.17***)* | *(10.17***)* | | *(1.66)* | *(1.62)* | | *(0.02)* | *(0.09)* |
| *LEV* | 0.001 | 0.000 | *LOSS* | 1.274 | 1.262 | *MKTBK* | -0.001 | 0.001 |
| | *(0.35)* | *(-0.07)* | | *(65.54***)* | *(62.95***)* | | *(0.00)* | *(0.01)* |
| *LOSS* | 0.000 | 0.000 | *MKTBK* | 0.003 | 0.003 | *LEV* | 0.169 | 0.151 |
| | *(-0.41)* | *(-0.37)* | | *(1.95)* | *(1.90)* | | *(2.42)* | *(1.90)* |
| *MKTBK* | -0.001 | -0.001 | *LIT* | -0.277 | -0.176 | *BUSSEG* | 0.003 | -0.002 |
| | *(-8.74***)* | *(-8.33***)* | | *(6.64***)* | *(2.57)* | | *(0.00)* | *(0.00)* |
| *ALTMANZ* | 0.003 | 0.003 | *ALTMANZ* | -0.017 | -0.018 | *FOREIGN* | -0.036 | -0.036 |
| | *(1.17)* | *(1.19)* | | *(117.05***)* | *(121.14***)* | | *(0.16)* | *(0.16)* |

*continued*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *FIRSTYR* | 0.093 | 0.090 | *FIRSTYR* | 0.219 | 0.215 | *MW* | 1.642 | 1.641 |
| | *(13.67***)* | *(13.42***)* | | *(4.82**)* | *(4.58**)* | | *(325.32***)* | *(323.42***)* |
| *\|TOTACCR\|* | -0.002 | -0.002 | *ROI* | -0.332 | -0.317 | *FIRSTYR* | -0.388 | -0.389 |
| | *(-1.02)* | *(-0.91)* | | *(31.98***)* | *(29.76***)* | | *(6.64***)* | *(6.68***)* |
| | | | *ACCR* | 0.269 | 0.249 | *FIN* | -0.211 | -0.215 |
| | | | | *(12.67***)* | *(10.92***)* | | *(1.52)* | *(1.57)* |
| | | | | | | *EPR* | 0.096 | 0.092 |
| | | | | | | | *(0.19)* | *(0.17)* |
| | | | | | | *EPSGROW* | -0.188 | -0.194 |
| | | | | | | | *(3.32*)* | *(3.59*)* |
| | | | | | | *FREEC* | 0.002 | -0.007 |
| | | | | | | | *(0.00)* | *(0.00)* |
| | | | | | | *AGE* | -0.013 | -0.014 |
| | | | | | | | *(13.78***)* | *(14.43***)* |
| | | | | | | *LAFEES* | -0.045 | -0.042 |
| | | | | | | | *(0.40)* | *(0.35)* |
| | | | | | | *NARATIO* | 0.254 | 0.256 |
| | | | | | | | *(3.68*)* | *(3.73*)* |
| | | | | | | *LTASQ* | -0.039 | -0.039 |
| | | | | | | | *(16.78***)* | *(47.14***)* |
| Model F-value | 326.01 | 329.89 | Model Wald Chi-sq. | 2,392.12 | 2,420.10 | Model Wald Chi-sq. | 606.72 | 598.11 |
| Adjusted R-squared | 0.25 | 0.32 | Pseudo R-squared | 0.46 | 0.46 | Pseudo R-squared | 0.11 | 0.11 |
| N | 14,664 | 14,664 | N | 5,534 | 5,534 | N | 11,532 | 11,532 |

This table presents the results of OLS and logistic regression models used to test the association between audit quality and industry specialization in homogenous and complex industries. The results of the discretionary accruals test are from OLS regression model estimates based on the model from Reichelt and Wang (2010), the results of the going-concern opinion test are from logistic model based on the model from Reichelt and Wang (2010), and the results of the restatement test are from logistic model estimates based on the models from Romanus et al. (2008) and Blankley et al. (2014). The symbols ***, **, and * denote two-tail significance at the .01, .05, and .10 level, respectively, and are derived from t-statistics (Wald chi-squared statistics) based on robust standard errors clustered at the firm level. T-statistics (Wald chi-squared statistics) are shown in parentheses below the corresponding coefficient. Year fixed effects are included in the model but not shown above for brevity. Table 1 provides variable definitions.

**Table 8**
Sensitivity Tests
Alternative Measures of Industry Specialization, Homogeneity, and Complexity

| | | Dependent Variable: *LAFEES* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Pred. Sign** | *Homogenous = HGEN_C* | *Homogenous = HGENAT* | *Specialist = DOMINANT* | *Homogenous = HGENFF; Specialist = SPECFF* | *Complex = COMPLEX2* | *Homogeneous = HOMOG* | *Homogeneous = HOMOG Complex = COMPLEX2* |
| *Intercept* | | 9.551 | 9.525 | 9.530 | 9.462 | 9.534 | 9.543 | 9.547 |
| | | *(203.54***)* | *(194.96***)* | *(204.98***)* | *(202.42***)* | *(203.93***)* | *(207.29***)* | *(206.35***)* |
| *Specialist (β1)* | + | 0.100 | 0.113 | 0.069 | 0.097 | 0.105 | 0.103 | 0.109 |
| | | *(4.26***)* | *(4.82***)* | *(2.55**)* | *(4.45***)* | *(4.45***)* | *(4.45***)* | *(4.70***)* |
| *Homogeneous* | - | -0.189 | -0.074 | -0.081 | -0.027 | -0.069 | -0.166 | -0.159 |
| | | *(-4.09***)* | *(-4.55***)* | *(-4.53***)* | *(-1.35)* | *(-3.73***)* | *(-9.46***)* | *(-9.05***)* |
| *Specialist and Homogeneous (β3)* | - | -0.354 | -0.139 | -0.217 | -0.125 | -0.101 | -0.171 | -0.130 |
| | | *(-2.16**)* | *(-3.00***)* | *(-4.00***)* | *(-2.72***)* | *(-2.14**)* | *(-3.53***)* | *(-2.66***)* |
| *Complex* | + | 0.059 | 0.056 | 0.058 | 0.062 | 0.064 | 0.075 | 0.081 |
| | | *(3.84***)* | *(3.60***)* | *(3.79***)* | *(3.95***)* | *(3.86***)* | *(4.94***)* | *(5.18***)* |
| *Specialist and Complex (β5)* | - | -0.078 | -0.085 | -0.207 | -0.035 | -0.107 | -0.048 | -0.072 |
| | | *(-1.31)* | *(-1.44)* | *(-2.73***)* | *(-0.57)* | *(-2.26**)* | *(-0.81)* | *(-1.55)* |
| *Homogeneous and Complex* | ? | -0.310 | -0.043 | -0.048 | -0.140 | -0.083 | -0.166 | -0.118 |
| | | *(-3.03***)* | *(-1.14)* | *(-1.28)* | *(-2.54**)* | *(-2.30**)* | *(-4.58***)* | *(-3.36***)* |
| *Specialist, Homogeneous, and Complex (β7)* | - | -2.456 | -0.279 | -0.531 | -0.276 | -0.199 | -0.031 | -0.214 |
| | | *(-1.35)* | *(-2.18**)* | *(-3.32***)* | *(-1.93*)* | *(-2.06**)* | *(-0.25)* | *(-2.20**)* |
| Control Variables | | Included | Included | Included | Included | Included | Included | Included |
| Model F-value | | 4,576.83 | 4,293.15 | 4,580.87 | 4,535.53 | 4,587.42 | 4,635.75 | 4,512.83 |
| Adjusted R-squared | | 0.858 | 0.854 | 0.858 | 0.856 | 0.858 | 0.859 | 0.860 |
| N | | 23,578 | 23,578 | 23,578 | 23,578 | 23,578 | 23,578 | 23,578 |
| **F-Tests:** | | | | | | | | |
| *β1 + β3 = 0* | | *6.00⁺⁺* | *0.65* | *13.94⁺⁺⁺* | *1.22* | *0.02* | *4.23⁺⁺* | *0.21* |
| *β1 + β5 = 0* | | *0.32* | *0.49* | *7.14⁺⁺⁺* | *0.03* | *0.00* | *2.02* | *1.17* |
| *β1 + β3 + β5 + β7= 0* | | *4.56⁺⁺* | *17.81⁺⁺⁺* | *56.64⁺⁺⁺* | *29.90⁺⁺⁺* | *8.60⁺⁺⁺* | *2.74⁺* | *16.36⁺⁺⁺* |

This table presents the results of OLS regression models using alternative definitions of auditor industry specialization and industry homogeneity. Table 1 provides these alternative variable definitions. The symbols ***, **, and * denote two-tail significance at the .01, .05, and .10 level, respectively, and are derived from t-statistics based on robust standard errors clustered at the firm level. T-statistics are shown in parentheses below the corresponding coefficient. Control variables and year fixed effects are included in the model but not shown above for brevity. The symbols $^{+++}$, $^{++}$, and $^{+}$ denote significance at the .01, .05, and .10 level, respectively, for the F-tests of linear combinations of coefficients.

**Table 9**
Sensitivity Tests
Matched Sample Design

| Variables | Pred. Sign | Dependent Variable: *LAFEES* *Matched Sample* |
|---|---|---|
| *Constant* | | 9.462 |
| | | *(128.24***)* |
| *SPEC (β1)* | + | 0.098 |
| | | *(3.60***)* |
| *HGEN* | - | -0.091 |
| | | *(-4.70***)* |
| *SPEC*HGEN (β3)* | - | -0.145 |
| | | *(-2.87***)* |
| *COMPLEX* | + | 0.073 |
| | | *(3.37***)* |
| *SPEC*COMPLEX (β5)* | - | -0.109 |
| | | *(-1.53)* |
| *HGEN*COMPLEX* | ? | -0.042 |
| | | *(-1.01)* |
| *SPEC*HGEN*COMPLEX (β7)* | - | -0.296 |
| | | *(-2.04**)* |
| Control Variables | | Included |
| Model F-value | | 1,632.05 |
| Adjusted R-squared | | 0.859 |
| N | | 11,046 |
| **F-Tests:** | | |
| $\beta 1 + \beta 3 = 0$ | | *1.22* |
| $\beta 1 + \beta 5 = 0$ | | *0.03* |
| $\beta 1 + \beta 3 + \beta 5 + \beta 7 = 0$ | | *29.90*$^{+++}$ |

This table presents the results of OLS regression models a matched sample design in which we match firm-year observations from homogeneous industries with firm-year observations from non-homogeneous industries based on size (*LTA*) without replacement. The symbols ***, **, and * denote two-tail significance at the .01, .05, and .10 level, respectively, and are derived from t-statistics based on robust standard errors clustered at the firm level. T-statistics are shown in parentheses below the corresponding coefficient. Control variables and year fixed effects are included in the model but not shown above for brevity. The symbols $^{+++}$, $^{++}$, and $^{+}$ denote significance at the .01, .05, and .10 level, respectively, for the F-tests of linear combinations of coefficients. Table 1 provides variable definitions.