The Big Four Premium: Are Audit Fees a Matter of Size, Reputation, or Complexity?

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ABSTRACT

With an emphasis on the influence of Big Four auditors in the US between 2000 and 2024, this paper explores the factors that influence audit fees and associated non-audit fees. We examine trends in audit, tax-related, and miscellaneous fees using a dataset that includes 1,187 auditors and 13,822 distinct entities across 1,315 sectors. In order to determine if the Big Four auditors—Deloitte, PwC, EY, and KPMG—command a higher cost for their services, we examine how firm-specific factors like revenue, assets, book value, and earnings affect fee structures. This study looks at both linear and non-linear associations using advanced econometric methods, such as multiple regression analysis and non-parametric Wilcoxon rank-sum tests. It additionally incorporates interaction variables to account for differences between Big Four and non-Big Four auditors. The findings reveal that companies audited by Big Four auditors pay significantly more, which is symptomatic of their perceived market dominance and audit quality. While non-audit fees demonstrate clear trends impacted by auditor type, larger businesses with higher revenues and assets are also linked to higher rates.

KEYWORDS: Audit Fees, Big Four Auditors, Audit Quality, Corporate Governance, United States of America.

Jel Classifications: M42, G34, C12, L84

INTRODUCTION

In the field of accounting and finance, audit fees and their determinants have been the focus of a great deal of research, making it an important topic for both scholars and professionals. In exchange for completing statutory audits, guaranteeing the accuracy of financial statements, and fulfilling regulatory compliance obligations, corporations pay external auditors audit fees. Knowing the elements affecting audit costs has become crucial in a time of rising regulatory supervision, expanding financial complexity, and more scrutiny of corporate governance procedures. This study aims to add to the body of knowledge by examining audit fees and associated fees, with a focus on how the Big Four audit companies have influenced these expenses.

The main driving force for this study is the difference between audits carried out by smaller audit companies and those carried out by the Big Four accounting firms: Deloitte, PwC, EY, and KPMG. The global audit market is dominated by the Big Four auditors, who are renowned for their vast resources, global presence, and perceived superior audit quality. Using complex econometric demonstrating, this study explores the nature of these linkages and determines if the presence of a Big Four auditor is linked to increased fees. The study also investigates whether the size of audit and non-audit fees is influenced by a company's financial attributes, including sales, assets, and earnings. This study uses a comprehensive dataset that includes audit fees, tax-related costs, and other expenses paid by American businesses over a 24-year period, from 2000 to 2024. The dataset comprises the work of 1,187 different auditors and contains data on 13,822 separate organizations across 1,315 different industries. The study offers a complete understanding of the trends and factors influencing audit and non-audit fees in the US by concentrating on a large and longitudinal dataset.

This study's varied methodological framework makes use of both descriptive and inferential statistical investigations. In order throw light on the main trends and variances in audit fees, non-audit fees, and business characteristics, the study starts with a thorough analysis of summary statistics. Fundamental information on the size, earnings, revenue, and other important characteristics of the companies in the dataset is provided by the descriptive statistics. The associations between audit fees and independent variables including firm size, profitability, and the presence of a Big Four auditor are then investigated using correlation analysis. The basis of this study's methodology is the use of regression analysis. The determinants of audit fees, total non-audit fees, and total fees are examined using multiple regression models. As predictors, these models use factors including earnings, assets, revenue, and Big Four status. In order to account for non-linear correlations and determine whether the consequences of specific variables, such income and assets, differ according on the auditor's Big Four status, some models also incorporate interaction terms and squared terms.

Non-parametric statistical tests are performed in addition to regression analysis to confirm the findings' robustness. In particular, firms audited by Big Four and non-Big Four auditors had their fee distributions compared using the Two-Sample Wilcoxon Rank-Sum (Mann-Whitney) test. Without making any firm assumptions about the facts that underlie the distributions, this test is a useful tool for determining whether there are notable differences between the two groups. The study guarantees that its conclusions are both statistically sound and broadly applicable by integrating parametric and non-parametric approaches. One particularly novel feature of this study is the incorporation of interaction factors and non-linear variables. To investigate if the effect of firm size on audit fees varies between Big Four and non-Big Four auditors, interaction terms like Big4Revenue and Big4Assets are employed. To test for non-linear impacts, squared terms for revenue and assets are also added. This captures situations in which the relationship between company size and fees may plateau or accelerate at higher levels. These

methodological improvements provide the study a deeper comprehension of the dynamics at work and enable it to transcend straightforward linear connections.

The research additionally concentrates on the difference between audit and non-audit services. The study looks at tax-related costs, other miscellaneous fees, and overall non-audit expenses, even though audit fees are at the heart of the analysis. This detailed methodology makes it possible to evaluate the fee structures related to the various services that auditors offer in a complete manner. The study clarifies the wider economic link between companies and their auditors by examining these other fee categories, with possible ramifications for auditor independence and regulatory compliance. Given the continuous discussions over the audit profession's function in guaranteeing financial responsibility and transparency, this study is also pertinent and timely. The significance of strict auditing procedures and increased public scrutiny of auditor performance have been highlighted by recent corporate scandals and audit failures. This study adds to the larger conversation on audit quality and the variables influencing auditor choice by examining the fee structures related to Big Four and non-Big Four auditors.

LITERATURE REVIEW

The methodology for evaluating audit fees as a function of the auditor's expenses and risks was developed by Simunic (1980), one of the most important studies on audit pricing. The economic justification for audit pricing is highlighted by this study's findings that audit prices fluctuate according to customer size, complexity, and audit risk. Similar to this, Francis (1984) pointed out that bigger audit firms—like the Big Four—charge more because they are thought to be better and cover more risk. Several studies have since confirmed this finding (DeFond & Zhang, 2014). Research on audit fees has focused on the dominance of the Big Four audit firms: Deloitte, PwC, EY, and KPMG. Due to their substantial market dominance in the global audit industry, these businesses' pricing structures are the subject of in-depth analysis. DeAngelo (1981) proposed that larger businesses justify their premium prices by providing higher-quality audits since they can invest more in resources and training. A meta-analysis by Hay, Knechel, and Wong (2006) revealed that Big Four auditors routinely charge higher rates in many markets, highlighting the connection between auditor reputation and cost.

A significant factor influencing audit fees has been found to be the size of the client, as indicated by total assets or revenue. Research has repeatedly demonstrated that because larger organizations' audits are more extensive and sophisticated, they pay higher rates (Taylor & Baker, 1981; Francis, 1984). Additionally, audit fees are influenced by client-specific characteristics including earnings, leverage, and financial performance since auditors modify their work according to the client's financial risks (Carcello et al., 2002). Another important element affecting audit fees is audit complexity. Businesses with complicated financial structures, multinational subsidiaries, or varied operations need more thorough audit processes, which raises prices (Firth, 1985; Ferguson et al., 2003). In sectors like banking and finance, where regulatory requirements add even another level of complexity, this association has been especially noticeable (Ghosh & Pawlewicz, 2009).

Audit fees have also been found to be impacted by corporate governance practices, including ownership structure, board independence, and the existence of an audit committee. According to Carcello et al. (2002), companies with more robust governance frameworks typically pay more costs because they place a higher priority on financial transparency and audit quality. Conversely, inadequate governance frameworks might result in increased audit risks, requiring more audit work and higher costs (Zhang et al., 2007). The function of non-audit services, like consultancy and tax-related services, has garnered a

lot of attention in addition to audit fees. Concerns regarding possible conflicts of interest and their effect on auditor independence have been raised by the auditor's provision of non-audit services (Frankel et al., 2002). Instead of lowering audit quality, Whisenant, Sankaraguruswamy, and Raghunandan (2003) contended that non-audit fees are positively correlated with customer size and complexity, reflecting valid economic considerations. Changes in regulations, such the Sarbanes-Oxley Act (SOX)'s enactment in 2002, have had a big impact on audit fees and non-audit services. According to studies, SOX raised audit fees since it placed more of an emphasis on internal controls and added compliance requirements (Raghunandan & Rama, 2006). As firms aimed to improve auditor independence by restricting the range of non-audit services their auditors may give, this regulatory change also resulted in a decrease in non-audit fees (Ettredge, Li, & Scholz, 2007).

Audit fees are affected by cultural and geographic factors as well. According to Choi, Kim, and Zang (2010), organizations with strong uncertainty-avoidance cultures pay higher costs because they place a greater priority on risk mitigation, demonstrating how cultural differences affect the demand for audit services. The literature on audit fees has been further enhanced by interaction effects between client and auditor attributes. For example, Bandyopadhyay and Kao (2001) investigated the relationship between auditor reputation and client size and discovered that the Big Four premium is higher for larger companies. Additionally, Kim, Simunic, Stein, and Yi (2011) examined how auditor specialization in specific industries affects pricing, concluding that industry expertise commands higher fees due to the added value perceived by clients.

Due to their national and office-level market leadership, Big 4 companies are able to command higher fees, according to research conducted in the United Kingdom that implies a three-level hierarchy in audit fee structures (Ferguson et al., 2003). There are several factors that influence audit fees. One important consideration is the size of the company; larger businesses usually pay more for audits because their financial statements are more complicated and comprehensive (Naser & Nuseibeh, 2008). Furthermore, it has been discovered that audit fees strongly correspond with complexity metrics, such as the ratio of inventory and receivables to total assets (Rewczuk & Modzelewski, 2019).

Additionally, it has been discovered that non-Big 4 audit partners who have previously worked for Big 4 companies fetch a higher charge, suggesting that the market recognizes the value of Big 4 experience and training (Zimmerman et al., 2021). Audit price is influenced by market conditions and competition amongst audit firms. It has been demonstrated that the Big 4 auditors' fee competition affects audit quality; more competition may result in cheaper fees and worse audit quality (Asthana et al., 2019). On the other hand, since they allow auditors to devote more time and resources to the audit process, higher audit fees are frequently linked to better audit quality (El-Gammal, 2012). There is a complicated link between audit fees and audit quality. Higher fees may not automatically equate to better audit results, even though they can indicate more audit work and resources. Despite the fee differences, some studies have found no discernible difference in audit quality between Big 4 and non-Big 4 auditors (Campa, 2013). This implies that elements other than audit fees, such the independence of the auditor and ethical standards, are crucial in determining the quality of the audit.

Many research investigations have used non-parametric techniques, including the Wilcoxon rank-sum test, to examine fee distributions between groups, including Big Four auditors and non-Big Four auditors (Hay et al., 2006). By offering solid proof of charge differences without depending on rigid distributional assumptions, these techniques enhance regression studies. Emerging topics including the effects of data analytics and technology on audit procedures have also been incorporated into the literature on audit fees. Improvements in audit technology have the ability to change price structures by increasing efficiency and risk assessment, as noted by Brown-Liburd, Issa, and Lombardi (2015). Additionally, concerns have been expressed regarding the potential impact of these trends on audit and non-audit fees

due to the growing incorporation of environmental, social, and governance (ESG) elements into corporate reporting (Kölbel et al., 2017). In summary, a great deal of research has been done on the factors that affect audit fees, and the results consistently show that client size, complexity, governance, and auditor reputation are significant. The literature focuses on the Big Four auditors' premium, the impact of regulatory changes, and how price structures are shaped by non-audit services. Future studies should examine the effects of global legislative trends, ESG reporting, and technology developments on audit price as the auditing landscape continues to change.

DATA AND METHODOLOGY

The current research makes use of a large dataset from American businesses that spans the years 2000–2024. A wide variety of industries across 1,315 different sectors are represented by the 13,822 unique entities that make up the sample. With data from 1,187 unique auditors, the collection contains comprehensive financial and auditing information for these companies. With their headquarters located in the United States, the companies examined in this study offer a thorough depiction of the corporate environment in the nation. This dataset provides important insights into the factors influencing audit fees and other associated financial measures because the organizations in it vary greatly in terms of size, industry, and financial performance.

The difference between businesses audited by Big4 firms (Deloitte, EY, KPMG, and PwC) and those audited by smaller, non-Big4 audit firms is a major focus of this study. Since the Big Four dominate the worldwide audit market, it is essential to comprehend how they influence audit fees. With the help of a dummy variable (Big4), businesses audited by Big4 auditors are represented in the dataset as Big4 = 1, whereas businesses audited by non-Big4 auditors are given the value Big4 = 0. This categorization makes it possible to compare the audit fees of these two company groupings, providing information about how the choice of auditor influences the price of audit services. The dataset contains additional financial variables in addition to the Big4 variable, including total assets, book value, earnings, and corporate revenue. These variables serve as control factors in understanding the broader financial dynamics at play when determining audit fees.

Table 1. Variables' Definitions

Variable	Code Name	Description
Audit Fees	**auditfees**	The total audit fees paid by firms. This is the dependent variable in multiple regression models, where the relationship with independent variables like Big4 status, revenue, assets, and earnings is explored.
Tax-related Fees	**taxrelatedfees**	Fees associated with tax-related services. This variable is also included in some regression models to understand how non-audit services (such as tax-related services) correlate with the firm's characteristics.
Other Miscellaneous Fees	**othermiscfees**	A category of fees that are not related to the audit or tax services. This variable, too, is used in the regressions to assess the total non-audit fees firms incur.
Total Non-Audit Fees	**totalnonauditfees**	This is a broader category encompassing tax-related fees and other miscellaneous fees. It is included in regressions to examine the overall trend of non-audit fees in relation to the firm's characteristics.

Total Fees	**totalfees**	This variable represents the total of all fees paid by the firm, including audit, tax, and miscellaneous fees. By analyzing this variable, we aim to understand how overall fees are influenced by firm characteristics.
Revenue	**revenue**	This variable represents the total revenue of a firm and is an important independent variable in the regression models. It is expected that larger firms with higher revenue would incur higher audit and non-audit fees.
Earnings	**earnings**	Earnings, or profit, is another key independent variable in the analysis. It provides insight into the profitability of firms and is expected to correlate with the level of fees a firm pays.
Book Value	**bookvalue**	Book value represents the net value of a firm's assets, as reported in its financial statements. It is used to understand how the size and financial stability of a firm influence its fees.
Assets	**assets**	This variable represents the total value of a firm's assets and is often used as a proxy for firm size. Larger firms with more assets may have higher audit and non-audit fees.
Big 4	**Big4**	This dummy variable indicates whether a firm is audited by one of the Big Four accounting firms (1 if Big4, 0 otherwise). This is an important variable in assessing the differences in fees paid by firms audited by major firms compared to non-Big Four auditors.

Source: Provided by Authors

To comprehensively develop our research, we used an extended statistical and econometric analysis. More precisely, we calculated:

Mean (Average) which is a measure of central tendency that represents the central value of a dataset. It is calculated by summing all values in a dataset and then dividing by the number of values.
For a set of n values $X = \{x1, x2, \dots, xn\}$, the mean $\bar{X}$ is given by:

$$\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \qquad (1)$$

Standard Deviation (Std Dev) which is a measure of the spread or dispersion of a set of values around the mean. It provides insight into how much individual data points typically deviate from the average value. Standard deviation is especially useful because it is in the same units as the data, making it easier to interpret.

$$\sigma_x = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2} \qquad (2)$$

Variance which is a statistical measure that describes the spread or dispersion of a set of values around their mean. It tells us how far each value in the data is from the mean and, therefore, from each other. In essence, variance quantifies how much the values in a dataset vary from the average value.
For a set of n values $X = \{x1, x2, \dots, xn\}$, with a mean $\bar{X}$, the variance σ^2 is calculated as:

$$\sigma_x^2 = \frac{1}{N-1}\sum_{i=\perp}^{N}(x_i - \bar{x})^2 \qquad (3)$$

Skewness which is a measure of the **asymmetry** of the distribution of data around its mean. It helps describe the shape of a distribution and whether it leans more to one side than the other.
For a set of n values $X = \{x1, x2, \dots, xn\}$, with a mean $\bar{X}$, Swekness (γ) can be calculated as:

$$\gamma = \frac{\frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^3}{\left(\frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^2\right)^{3/2}} \qquad (4)$$

Kurtosis which is a statistical measure that describes the **"tailedness"** or **peak sharpness** of a distribution relative to a normal (bell curve) distribution. While skewness describes asymmetry, kurtosis focuses on the height and sharpness of the distribution's peak and the weight of its tails.
For a set of n values $X = \{x1, x2, \dots, xn\}$, with a mean $\bar{X}$, Kurtosis (κ) can be calculated as:

$$\kappa = \frac{\frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^4}{\left(\frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^2\right)^{2}} \qquad (5)$$

Correlation coefficients between variables are computed to detect multicollinearity, given by:

$$Corr(X,Y) = \frac{\sum_{t=1}^{T}(X_{it} - \bar{X})(Y_{it} - \bar{Y})}{\sqrt{\sum_{t=1}^{T}(X_{it} - \bar{X})^2} * \sqrt{\sum_{t=1}^{T}(Y_{it} - \bar{Y})^2}} \qquad (6)$$

Then we calculated independent t-test, which is a statistical method used to compare the means of two distinct groups to determine if there is a statistically significant difference between them. Below are the key mathematical formulas used in the test:

t-Test:

$$\boldsymbol{t} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad (7)$$

Where:

$\bar{x}_1$ and $\bar{x}_2$ are the sample means of the two groups

s_1^2 and s_2^2 are the variances of the two groups

$n1$ and $n2$ are the sample sizes of the two groups

the degrees of freedom,

$$\boldsymbol{df} = \frac{(\frac{s_1^2}{n1}+\frac{s_2^2}{n2})^2}{\frac{(s_1^2)^2}{n1-1}+\frac{(s_2^2)^2}{n2-1}} \qquad (8)$$

the pooled variance,

$$\boldsymbol{s_p^2} = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2} \qquad (9)$$

Final t-test's form:

$$\boldsymbol{t} = \frac{\bar{x}_1-\bar{x}_2}{\sqrt{s_p^2\left(\frac{1}{n_1}+\frac{1}{n2}\right)}} \qquad (10)$$

Basic Regression Models

The basic regression models for audit fees, total non-audit fees, and total fees:

$$\boldsymbol{AuditFees_i} = \beta 0 + \beta 1 \;\; Big4_i + \beta 2 \;\; Revenue_i + \beta 3 \;\; Assets_i + \beta 4 \;\; Earnings_i + \epsilon_i \quad (11)$$

$$\boldsymbol{TotalNonAuditFees}_i = \beta 0 + \beta 1 \;\; Big4_i + \beta 2 \;\; Revenue_i + \beta 3 \;\; Assets_i + \beta 4 \;\; Earnings_i + \epsilon_i \quad (12)$$

$$\boldsymbol{TotalFees_i} = \beta 0 + \beta 1 \;\; Big4_i + \beta 2 \;\; Revenue_i + \beta 3 \;\; Assets_i + \beta 4 \;\; Earnings_i + \epsilon_i \quad (13)$$

Where:

$\boldsymbol{\epsilon i}$ *is the Error term for firm*

$\boldsymbol{\beta 0}$ *are the coefficients to be estimated.*

$\boldsymbol{i}$ *is the company*

Regression Models (Interactions Effects)

$$\boldsymbol{AuditFees_i} = \beta 0 + \beta 1 \;\; Big4_i + \beta 2 \;\; Revenue_i + \beta 3 \;\; big4\_revenue\_interaction_i + \epsilon_i \quad (14)$$

$$\boldsymbol{AuditFees_i} = \beta 0 + \beta 1 \;\; Big4_i + \beta 2 \;\; Revenue_i + \beta 3 \;\; big4\_assets\_interaction_i + \epsilon_i \quad (15)$$

Where:

$$\boldsymbol{big4\_revenue\_interaction} = Big4 * revenue$$

$$\boldsymbol{big4\_assets\_interaction} = Big4 * assets$$

Regression Models (Non-Linearity with Squared Terms)

$$\boldsymbol{AuditFees_i} = \beta 0 + \beta 1 \ \ Big4_i + \beta 2 \ \ Revenue\_sq_i + \beta 3 \ \ Assets\_sq_i + \epsilon_i \quad (16)$$

$$\boldsymbol{AuditFees_i} = \beta 0 + \beta 1 \ \ Big4_i + \beta 2 \ \ Revenue\_sq_i + \beta 3 \ \ Assets\_sq_i + \beta 4 \ \ big4\_revenue\_interaction_i + \beta 5 \ \ big4\_assets\_interaction_i + \epsilon_i \quad (17)$$

Where:

$$\boldsymbol{Revenue\_sq_i} = Revenue\text{^}2$$

$$\boldsymbol{Assets\_sq_i} = Assets\text{^}2$$

Finaly, for robustness checks, we used the Wilcoxon Rank-Sum Test (Mann-Whitney U Test), which evaluates whether two independent samples come from the same distribution. Below are the key mathematical formulas used in the test:

Firstly, we combined the two samples (companies audited by a Big Four with the dummy variable Big4=1 and Big4=0 for those who didn't audit by a Big Four) and, rank them in ascending order, and assign ranks $\boldsymbol{Ri}$. If there were ties, we assigned each tied observation the average of their ranks.

The rank-sum for each group is calculated as:

$$\boldsymbol{W} = \sum_{i \in G_1} R_i \quad (18)$$

Where:

$\boldsymbol{G1}$ is the group of interest (e.g., Big4 = 1)

$\boldsymbol{Ri}$ are the ranks of observations in $G1$

The rank-sum W for $G2$ (Big4 = 0) is the complement:

$$\boldsymbol{W2} = T - W \quad (19)$$

where T is the total sum of ranks across all groups:

$$\boldsymbol{T} = \sum_{i=1}^{n_1+n_2} R_i \quad (20)$$

Under the null hypothesis ($H0$), the expected rank-sum for $G1$ is:

$$\boldsymbol{E(w)} = \frac{n_1(n1+n2+1)}{2} \quad (21)$$

Where, n1 and n2 are the sample sizes of G1 and G2, respectively.

The variance of W under H0 is:

$$\boldsymbol{Var(w)} = \frac{n_1 \ n_2 \ (n1+n2+1)}{12} \quad (22)$$

For tied ranks, the variance adjusted:

$$\mathbf{Var}(\boldsymbol{w}) = \frac{n_1 n_2}{12}\left[(n1+n2+1) - \sum_{j=1}^{k} \frac{t_j^3 - t_j}{(n1+n2)(n1+n2+1)}\right] \quad (23)$$

Then, we converted the rank-sum W to a standard normal Z-score:

$$\boldsymbol{z} = \frac{w - E(w)}{\sqrt{\mathrm{Var}(w)}} \quad (24)$$

Finaly, if $|\boldsymbol{z}| > \boldsymbol{z}_{\frac{a}{2}}$, (25) (critical value from the standard normal distribution for a given significance level a), we reject the null hypothesis. Then the p-value calculated as

$$\boldsymbol{p} = 2 \cdot \Phi(-|z|) \quad (26)$$

where Φ is the cumulative distribution function of the standard normal distribution.

RESULTS AND DISCUSSION

Table 2. Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
auditfees	48,364	3065945	6053972	0	1.62E+08
taxrelatedfees	48,364	433091.8	1845391	0	1.08E+08
othermiscfees	48,364	119983.5	1108278	0	7.31E+07
totalnonauditfees	48,364	941335.6	3401570	0	1.31E+08
totalfees	48,364	4007280	8591385	0	1.94E+08
revenue	47,769	5.64E+09	2.17E+10	-4.21E+09	6.48E+11
earnings	48,101	4.37E+08	2.57E+09	-9.93E+10	1.05E+11
bookvalue	44,424	1.42E+09	1.11E+10	-1.09E+11	4.51E+11
assets	48,183	1.62E+10	1.02E+11	0	3.88E+12

Source: Provided by Authors, Calculated in Stata 14.2

There is substantial variation in the data, as evidenced by the audit fees mean of 3,065,945 and the huge standard deviation of 6,053,972. The diversity of audit fees across the sample is demonstrated by the range of audit fees, which ranges from 0 to 162 million. With a mean of 433,091.8 and a standard deviation of 1,845,391, tax-related fees show a broad range of values, with the highest amount being

almost 108 million. With a mean of 119,983.5 and a significantly greater standard deviation of 1,108,278, other miscellaneous fees indicate significant variation across data. A considerable degree of variability is seen in the means of total non-audit fees and total fees, which are 941,335.6 and 4,007,280, respectively, with notable standard deviations. With the maximum standard deviation of 21.7 billion and a mean of 5.64 billion, revenue shows significant variations in revenue across the dataset's organizations. Similarly, earnings show significant differences in profitability between enterprises, with a mean of 437 million and a standard deviation of 2.57 billion. With a high standard deviation of 11.1 billion and a mean book value of 1.42 billion, the companies' book values show significant variety. Finally, the sample's firms' asset sizes vary significantly, with a mean of 16.2 billion and a standard deviation of 102 billion.

Table 3. Detailed Summary Statistics for Audit Fees and Total Fees

Audit Fees ($)					*Total Fees ($)*				
	Percentiles	**Smallest**				**Percentiles**	**Smallest**		
1%	14000	0	**Obs**	48,364	**1%**	30000	0	**Obs**	48,364
5%	96500	0	**Sum of Wgt.**	48,364	**5%**	137000	0	**Sum of Wgt.**	48,364
10%	189000	0	**Mean**	3065945	**10%**	258152	1000	**Mean**	4007280
25%	540300	0	**Std. Dev.**	6053972	**25%**	669977	1000	**Std. Dev.**	8591385
50%	1332277				**50%**	1614450			
		Largest					**Largest**		
75%	3074748	9.77E+07			**75%**	3826000	1.80E+08		
90%	6788000	1.08E+08	**Variance**	3.67E+13	**90%**	8892000	1.84E+08	**Variance**	7.38E+13
95%	1.13E+07	1.45E+08	**Skewness**	6.763759	**95%**	1.47E+07	1.93E+08	**Skewness**	7.332073
99%	2.89E+07	1.62E+08	**Kurtosis**	75.22358	**99%**	4.06E+07	1.94E+08	**Kurtosis**	83.94416

Source: Provided by Authors, Calculated in Stata 14.2

Table 4. Correlation Matrix

	auditfees	**taxrelatedfees**	**othermiscfees**	**totalnonauditfees**	**totalfees**	**revenue**	**earnings**	**bookvalue**	**assets**
auditfees	1								
taxrelatedfees	0.4767	1							
	0.000								
othermiscfees	0.1164	0.0917	1						
	0.000	0.000							
totalnonauditfees	0.6213	0.7957	0.4622	1					
	0.000	0.000	0.000						
totalfees	0.9507	0.6509	0.265	0.8338	1				
	0.000	0.000	0.000	0.000					
revenue	0.5536	0.2284	0.1069	0.3461	0.5272	1			
	0.000	0.000	0.000	0.000	0.000				
earnings	0.4553	0.1986	0.0672	0.3025	0.4406	0.632	1		
	0.000	0.000	0.000	0.000	0.000	0.000			
bookvalue	0.4089	0.123	0.0685	0.2344	0.3809	0.4335	0.556	1	
	0.000	0.000	0.000	0.000	0.000	0.000	0.000		

assets	0.6612	0.241	0.0914	0.4197	0.6321	0.3913	0.4498	0.6656	1
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Note:** Values Below Correlations indicate the Significance Level

Source: Provided by Authors, Calculated in Stata 14.2

Table 5. T-Test for Audit Fees (Big 4 vs Non-Big 4)

Group	N	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	10271	600811.8	8808.297	892685	583545.9	618077.8
1	38093	3730618	34077.98	6651144	3663824	3797411
combined	48364	3065945	27528.3	6053972	3011989	3119901
diff		-3129806	65787.8		-6259612	
diff = mean(0) - mean(1)					**t = -47.5743**	
Ho: diff = 0					**Degrees of Freedom = 48362**	
Ha: diff < 0		Ha: diff != 0			Ha: diff > 0	
Pr(T < t) = 0.0000		Pr(T > t) = 0.0000			Pr(T > t) = 1.0000	

Source: Provided by Authors, Calculated in Stata 14.2

The mean fees that Big 4 and non-Big 4 auditors charge differ significantly, according to the results of the t-test for audit fees. The average audit fee paid by companies audited by Big 4 firms is about $3.73 million, whereas the average audit fee paid by non-Big 4 firms is $600,811.8. The t-statistic of -47.57 and the p-value of 0.0000 show that the difference, which is approximately $3.13 million, is statistically significant. The null hypothesis, according to which the average audit fees for Big 4 and non-Big 4 auditors are equal, can thus be safely rejected. The conclusion that Big 4 auditors charge much higher audit fees than non-Big 4 auditors is supported by the incredibly low p-value. The significant difference in mean fees raises the possibility that the higher fees from Big 4 firms are due to variables other than the basic audit service, such as the size and reputation of the auditing firm. Furthermore, the Big 4 fees standard deviation is significantly higher, suggesting that the fees these corporations charge vary more. This may indicate that the Big 4 firms serve larger and more difficult clients, which may explain the higher costs, and it may also represent variations in the scope or complexity of audits carried out by these businesses.

Table 6. T-Test for Total Non-Audit Fees (Big4 vs Non-Big4)

Group	N	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	10271	154524.6	9102.887	922540.7	136681.2	172368.8
1	38093	1153483	19340.7	3774807	1115575.1	1191391.5
combined	48364	941335.6	15467.44	3401570	911019.3	971652.7
diff		-998958.6	37545.74		-1997917.5	
diff = mean(0) - mean(1)					**t = -26.6064**	
Ho: diff = 0					**Degrees of Freedom = 48362**	
Ha: diff < 0		Ha: diff != 0			Ha: diff > 0	
Pr(T < t) = 0.0000		Pr(T > t) = 0.0000			Pr(T > t) = 1.0000	

Source: Provided by Authors, Calculated in Stata 14.2

A similar pattern to the earlier audit fee study can be seen in the t-test results for total non-audit fees. The mean total non-audit fees for companies audited by Big 4 firms are substantially greater than those audited by non-Big 4 firms. In particular, non-audit costs for Big 4 companies average $1,153,483, while non-Big 4 firms pay $154,524.6, which is significantly less. With a t-statistic of -26.6064 and a p-value of 0.0000, the roughly $998,958.6 difference is extremely significant. This suggests that compared to non-Big 4 auditors, the mean non-audit fees for Big 4 auditors are statistically significantly higher. The null hypothesis that the average total non-audit fees are the same for both auditor groups may be reliably rejected due to the incredibly low p-value. While Big 4 auditors typically charge higher fees, non-Big 4 auditors may show more variability in the non-audit fees they charge, as indicated by the bigger standard deviation for non-Big 4 auditors ($3,774,807) compared to Big 4 auditors ($922,540.7). This finding is consistent with the theory that Big 4 auditors charge far higher non-audit fees, like those for tax services and other consultancy, in addition to higher audit fees.

The next section presents the results of the regression analysis examining the relationship between audit fees, non-audit fees, and total fees with respect to key firm-specific variables such as whether the firm is audited by Big4, revenue, assets, and earnings. The following tables display the estimated coefficients for each dependent variable along with their respective standard errors, statistical significance levels, and overall model fit.

Table 7. Regression Analysis (Main Models)

VARIABLES	auditfees	totalnonauditfees	totalfees
Big4	1.959e+06***	585,497***	2.544e+06***
	(46,035)	(34,360)	(68,995)
revenue	9.40e-05***	3.03e-05***	0.000124***
	(1.12e-06)	(8.37e-07)	(1.68e-06)
assets	3.11e-05***	1.10e-05***	4.21e-05***
	(2.06e-07)	(1.54e-07)	(3.09e-07)
earnings	-3.64e-06	3.76e-05***	3.39e-05**
	(9.68e-06)	(7.23e-06)	(1.45e-05)
Constant	511,218***	121,611***	632,828***
	(40,657)	(30,347)	(60,935)
Observations	47,718	47,718	47,718
R-squared	0.557	0.220	0.506

Standard errors in parentheses

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

Source: Provided by Authors, Calculated in Stata 14.2

The Big 4 variable has a positive and statistically significant coefficient of 1.959e+06 (roughly $1.96 million), according to the results of the first regression analysis. This means that, when revenue, assets, and earnings are held constant, companies audited by Big 4 firms pay $1.96 million more in audit fees than companies audited by non-Big 4 firms. With a p-value of less than 0.01, this result is highly significant and supports the t-test's earlier results that Big 4 auditors demand higher audit fees. Next, there is a positive and statistically significant correlation between audit fees and the revenue and asset variables. Specifically, for every additional dollar of revenue, audit fees increase by 9.4e-05 (roughly 0.000094 per dollar of revenue), and for every additional dollar of assets, audit fees increase by 3.11e-05 (roughly 0.000031 per dollar of assets). Both of these coefficients are highly significant with p-values less than 0.01, which suggests that larger firms, with higher revenue and assets, tend to pay higher audit fees. Nevertheless, there is no statistically significant correlation between audit fees and the earnings variable. Since the p-value is significantly higher than 0.1 and the earnings coefficient is -3.64e-06, we are unable to draw the conclusion that earnings significantly affect audit fees. About 55.7% of the variation in audit fees can be explained by the model, according to the R-squared value of 0.557. Although this is a good fit, it implies that the audit fees may still be impacted by additional, unobserved factors that the model does not account for.

The Big 4 variable has a positive and statistically significant coefficient of 585,497, according to the findings of the second regression analysis for the total amount of non-audit fees. This shows that, when sales, assets, and earnings are held constant, businesses audited by Big 4 firms typically pay $585,497 more in total non-audit costs than businesses audited by non-Big 4 firms. With a p-value less than 0.01, this result is highly significant and supports previous results that Big 4 auditors charge much higher non-audit costs in addition to higher audit fees. With a correlation of 3.03e-05, the revenue variable and non-audit fees have a positive and statistically significant association. This indicates that overall non-audit fees rise by about $0.0000303 for every dollar of revenue. Companies with more assets also typically pay higher non-audit fees, according to the assets variable, which has a positive and significant coefficient of 1.10e-05. Interestingly, with a positive value of 3.76e-05, the earnings variable is likewise statistically significant. This implies that higher-earning businesses also typically pay higher non-audit costs, which may be a reflection of the demand for more sophisticated or extra services, like tax planning or advice, that Big 4 firms may offer to bigger, more successful businesses. About 22% of the variation in total non-audit fees can be explained by the model, according to the R-squared value of 0.220. Though there may be other variables not included in the analysis that also influence non-audit fees, this is still a smaller R-squared than the audit fees R-squared of 55.7%, suggesting that the model captures some significant elements.

After adjusting for revenue, assets, and earnings, the final regression analysis that looked at the relationship between total fees and the different factors—including Big 4 auditors—showed that the coefficient for Big 4 was 2.544e+06. This means that, on average, companies audited by Big 4 firms pay $2.544 million more in total fees than those audited by non-Big 4 firms. At the 1% level, this finding is statistically significant, indicating a direct correlation between having a Big 4 audit and higher overall fees. With a positive coefficient of 0.000124 for the revenue variable, total fees rise by around $0.000124 for every dollar of revenue, which is statistically significant at the 1% level. Likewise, the assets variable has a coefficient of 4.21e-05, which is statistically significant at the 1% level and indicates that businesses with greater assets typically pay higher total fees. Additionally, the earnings variable shows

a positive and statistically significant coefficient of 3.39e-05, indicating that slightly greater total fees are often paid by more profitable businesses. With an R-squared value of 0.506, the model exhibits a moderate to good fit, explaining roughly 50.6% of the variation in total fees. This indicates that even if the model accounts for a number of significant factors impacting total fees, the regression may not have taken into account all the variables that affect total fees.

To examine more complex associations and learn more about the factors influencing audit fees, we expand on the fundamental regression models in this last part. We specifically investigated non-linear correlations, interaction effects, and a robustness check using the Wilcoxon rank-sum test.

Interaction Effects

First, we look at how the Big Four and the financial variables—revenue and assets—interact with one another. This enables us to determine whether a firm's audited status by Big4 auditors affects the relationship between audit fees and these financial KPIs. We can determine whether the impact of revenue or assets on audit fees is greater or less pronounced for Big4 firms as opposed to non-Big4 firms by using interaction terms. This is especially crucial because Big4 auditors may have different pricing practices, and the audit procedure and fee schedule may vary depending on the firm's size and complexity. Thus, testing interactions provides a more nuanced understanding of how Big4 audit companies differ from non-Big4 firms in their operations.

Calculation of Interaction Variabes: **big4_revenue_interaction** = Big4 * Revenue, **big4_assets_interaction** = Big4 * Assets

Table 8. Regression Analysis (Interaction Effects Revenue)

VARIABLES	(1) auditfees
Big4	2.189e+06***
	(58,712)
revenue	0.000206***
	(2.89e-05)
big4_revenue_interaction	-5.54e-05*
	(2.89e-05)
Constant	509,599***
	(52,291)
Observations	47,769
R-squared	0.327

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Provided by Authors, Calculated in Stata 14.2

According to the regression results, having a Big4 audit greatly raises audit fees; the coefficient suggests a premium of about $2.19 million. This illustrates Big4 auditors' significant pricing power, which is probably due to their resources, reputation, and perceived audit quality. Another important factor is revenue, since higher revenue is closely linked to higher audit fees. Given that larger businesses need more comprehensive auditing services, this is to be expected. Even while Big4 companies charge more overall, their incremental pricing for growing sales is marginally lower than that of non-Big4 companies, according to the interestingly negative and marginally significant interaction term between Big4 and revenue.

This implies that although Big4 firms retain high base rates regardless of customer size, non-Big4 firms might rely more on scaling fees with revenue. Although other factors not included in the model also play a role, the model explains a significant percentage of the variation in audit fees, as indicated by the R-squared value of 32.7%. All things considered, the findings show how Big4 firms and non-Big4 businesses structure their fees differently, especially when it comes to customer revenue.

Table 9. Regression Analysis (Interaction Effects Assets)

VARIABLES	(1) auditfees
Big4	2.444e+06***
	(52,597)
assets	5.03e-05***
	(9.41e-06)
big4_assets_interaction	-1.16e-05
	(9.41e-06)
Constant	513,973***
	(47,249)
Observations	48,183
R-squared	0.464

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Provided by Authors, Calculated in Stata 14.2

With a coefficient of around $2.44 million, the regression results show that Big4 auditors charge a much higher base audit price. This supports the idea of a Big4 premium by highlighting their standing and competence. As would be predicted given that businesses with greater asset bases usually have more intricate financial structures that require for more thorough audits, assets have a positive and significant correlation with audit fees. Despite being negative, the interaction term between Big4 and assets is not statistically significant.

This implies that the way Big4 and non-Big4 firms modify their fees in response to the size of the client's assets is not significantly different. Put otherwise, the fees for both kinds of auditors appear to scale in tandem with the size of the assets. The model's variables account for a significant amount of the variance in audit fees, according to the R-squared value of 46.4%, however other factors might possibly play a

role. While suggesting that the interaction impact may not differ substantially throughout auditor types, this result emphasizes the significance of both Big4 status and client asset size in influencing audit fees.

Non-Linearity with Squared Terms

Then, in order to check for non-linear correlations, we compute squared terms for assets and revenue. It is conceivable that the link between audit fees and revenue and assets may not be linear, notwithstanding the assumption made by earlier models. For instance, a significant rise in assets or revenue may not have the same impact as an increase in audit fees. We can determine whether such non-linear effects occur by incorporating squared terms into our models. This stage enables us to determine whether the influence of these factors on audit fees increases or decreases with increasing revenue or asset levels.

Table 10. Regression Analysis (Non-Linearity with Squared Terms)

VARIABLES	(1) auditfees
Big4	2.865e+06***
	(58,889)
revenue_sq	0***
	(0)
assets_sq	0***
	(0)
Constant	617,789***
	(52,363)
Observations	47,740
R-squared	0.264

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

Source: Provided by Authors, Calculated in Stata 14.2

Given that their coefficients are zero, the regression findings indicate that there is no nonlinear relationship between audit fees and the squared terms for revenue and assets (revenue_sq and assets_sq), indicating that they are statistically insignificant. Accordingly, the influence of assets and revenue on audit fees does not alter nonlinearly as these variables rise in this model. Companies audited by Big4 firms continue to pay substantially higher audit fees than those audited by non-Big4 firms, according to the coefficient for the Big4 dummy variable, which is still significant.

The notion that revenue, assets, and audit fees have a linear relationship in this situation is supported by the squared terms' lack of relevance. Although the included variables account for a moderate amount of the variance in audit fees, the R-squared value of 0.264 suggests that there may be more factors impacting audit fees in addition to income, assets, and the Big4 variable.

Table 11. Regression Analysis (Non-Linearity with Squared Terms)

VARIABLES	(1) auditfees
Big4	1.237e+06***
	(40,845)
revenue_sq	-0***
	(0)
assets_sq	-0***
	(0)
big4_revenue_interaction	0.000171***
	(1.62e-06)
big4_assets_interaction	5.41e-05***
	(4.09e-07)
Constant	620,167***
	(35,691)
Observations	47,740
R-squared	0.658

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Provided by Authors, Calculated in Stata 14.2

The impact of revenue and assets on audit fees varies for Big4 and non-Big4 auditors, according to the results of the regression with the interaction terms big4_revenue_interaction and big4_assets_interaction. The coefficients for these interaction terms are significant and positive. In particular, the interaction term between Big4 and revenue_sq has a positive coefficient and is statistically significant, indicating that for Big4 firms, the influence on audit fees gets somewhat stronger as revenue rises. The association between audit fees and assets is higher for Big4 firms as assets increase, as seen by the positive and significant interaction term between Big4 and assets_sq.

However, unless the interaction with Big4 auditors is taken into account, the squared terms for revenue_sq and assets_sq remain small on their own, indicating that there is no obvious non-linear link between these variables and audit fees. The Big4 auditors may use a different (perhaps more aggressive) pricing strategy as the firm's size (as determined by sales and assets) grows, according to the interaction terms' positive and significant coefficients. The Big4 status, squared terms for income and assets, and their interactions account for over half of the variation in audit fees, according to the model's strong fit, as indicated by the R-squared value of 0.658. This implies that when Big4 auditors are involved, the relationship between audit fees and corporate attributes like revenue and assets is in fact more complicated, and that these interactions have an impact on these companies' pricing strategies.

Wilcoxon Rank-Sum Test

Furthermore, we calculate a two-sample Wilcoxon rank-sum test, commonly referred to as the Mann-Whitney test, to further validate our results. The distributions of audit fees across companies audited by Big4 and non-Big4 auditors are compared using this non-parametric test. When the data distribution is skewed or non-normal, the Wilcoxon test can offer a more reliable comparison because it does not rely on the same assumptions as regression models, which assume a normal distribution of residuals.

The Wilcoxon test serves as a robustness check for the results derived from the regression models, offering additional confidence in the findings regarding the difference in audit fees between Big4 and non-Big4 auditors.

Table 12. Robustness Check (Wilcoxon Rank-Sum Test)

Big4	N	rank sum	expected	Big4	N	rank sum	expected	Big4	N	rank sum	expected
0	10271	1.13E+08	2.48E+08	**0**	10271	1.40E+08	2.48E+08	**0**	10271	1.09E+08	2.48E+08
1	38093	1.06E+09	9.21E+08	**1**	38093	1.03E+09	9.21E+08	**1**	38093	1.06E+09	9.21E+08
combined	48364	1.17E+09	1.17E+09	**combined**	48364	1.17E+09	1.17E+09	**combined**	48364	1.17E+09	1.17E+09
unadjusted variance 1.577e+12 adjustment for ties -291317.04				unadjusted variance 1.577e+12 adjustment for ties -2.177e+09				unadjusted variance 1.577e+12 adjustment for ties -9670.0603			
Ho: auditfees (Big4 ==0) = auditfees (Big4==1) **z = -107.880** Prob > |z| = 0.0000				Ho: totalnonauditfees (Big4 ==0) = totalnonauditfees (Big4==1) **z = -86.070** Prob > |z| = 0.000				Ho: totalfees (Big4 ==0) = totalfees (Big4==1) **z = -111.177** Prob > |z| = 0.0000			

Source: Provided by Authors, Calculated in Stata 14.2

There is a noticeable difference between companies audited by Big4 and non-Big4 auditors based on the findings of the Wilcoxon rank-sum (Mann-Whitney) test for audit fees. The rank sums for the two groups—Big4 auditors (Big4 = 1) and non-Big4 auditors (Big4 = 0)—are compared in the test. With 10,271 observations, the group of non-Big4 auditors has a rank total of 1.13E+08, while the group of Big4 auditors has a far larger rank sum of 1.06E+09 with 38,093 observations. Under the null hypothesis that there is no difference between the two groups, the predicted rank sums for Big4 auditors and non-Big4 auditors are 9.21E+08 and 2.48E+08, respectively. A significant negative result, -107.880, is reported for the Z-statistic, further demonstrating the disparity between the two groups. The p-value of 0.0000 indicates that the difference in audit fees between firms audited by Big4 and non-Big4 auditors is statistically significant. This allows us to reject the null hypothesis (Ho: auditfees for Big4 = auditfees for non-Big4), suggesting that the audit fees charged by Big4 auditors are indeed significantly higher than those charged by non-Big4 auditors.

A significant difference between companies audited by Big4 and non-Big4 auditors is also evident in the findings of the Wilcoxon rank-sum (Mann-Whitney) test for total non-audit fees. With 10,271 observations, the non-Big4 group (Big4 = 0) has a rank sum of 1.40E+08, while the Big4 group (Big4 = 1), with 38,093 observations, has a significantly larger rank sum of 1.03E+09. If there is no difference between the two groups, the predicted rank sums are 9.21E+08 for the Big4 group and 2.48E+08 for the

non-Big4 group. The correction for ties is -2.177e+09, while the unadjusted variance is 1.577e+12. The Z-statistic is reported as -86.070, and the p-value is 0.000, providing strong evidence that the null hypothesis (Ho: totalnonauditfees for Big4 = totalnonauditfees for non-Big4) can be rejected. This indicates that the total non-audit fees charged by Big4 auditors are significantly higher than those charged by non-Big4 auditors.

The Big4 and non-Big4 auditor groups can be distinguished from one another using the Wilcoxon rank-sum (Mann-Whitney) test for total fees. The rank sum for the 10,271 observations in the non-Big4 group (Big4 = 0) is 1.09E+08. In contrast, the rank sum of 1.06E+09 for the Big4 group (Big4 = 1), which has 38,093 observations, is noticeably greater. If there is no difference between the two groups, the predicted rank sums are 2.48E+08 for the non-Big4 group and 9.21E+08 for the Big4 group. With a tie adjustment of -9670.0603, the unadjusted variance is 1.577e+12. With a p-value of 0.000 and a Z-statistic of -111.177, the null hypothesis (Ho: totalfees for Big4 = totalfees for non-Big4) is rejected. This result provides strong evidence that total fees charged by Big4 auditors are significantly higher than those charged by non-Big4 auditors.

CONCLUSIONS

Regarding the impact of Big4 auditors on audit pricing and the non-linear correlations between audit fees and corporate characteristics, the analysis offers a number of important conclusions. First, it became clear that Big4 auditors charge much more for audits than non-Big4 auditors. This held true for several regression models that included business attributes including earnings, assets, and revenue. In particular, it was discovered that the fee structure of Big4 auditors was impacted by firm size (as determined by revenue and assets) as well as the ways in which these factors interacted with Big4 status. This suggests that Big4 auditors' pricing strategies are not consistent and instead change according to the size of the client's financials. The impact of firm characteristics on audit fees is also more noticeable for Big4 auditors, according to the regression results that included squared terms (such as revenue squared and assets squared). Positive interaction coefficients suggested that Big4 auditors charge disproportionately higher fees as firm size increases. This demonstrates how Big4 auditors strategically set their prices, charging greater audit fees to larger clients with more intricate financial profiles. Although the effect was not as strong as it was for audit fees, non-audit fees—especially those linked to taxes—also demonstrated a significant and positive relationship with business characteristics. The results indicate that the relationship between company characteristics and audit fees is non-linear and context dependant, and that Big4 auditors use their size and reputation to charge premium audit rates. These findings highlight the necessity of taking into account both audit and non-audit fee structures when assessing the financial transparency and competitive dynamics within the auditing business, offering insightful information to regulators, investors, and policymakers.

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