A Municipal Audit Fee Model Using Structural Equation Modeling

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Abstract

The purpose of this project is to model municipal audit fees using an audit economics framework and then analyze this conceptual framework empirically using structured equation modeling. The sample is large cities using 1996 data. The theoretical model uses five constructs to explain audit fees: (1) client size, (2) complexity of client operations, (3) financial risks including demographic characteristics, (4) auditing factors, and (5) governance structure. Client size increases audit complexity. Large organizations require more audit effort because there are more transactions. Complex client operations are expected to require more audit time and greater expertise, both expected to increase the cost of the audit. Auditors are increasingly focusing on financial risk to determine the level of audit effort (e.g., internal control checks and substantive testing) and audit pricing. Various auditing factors can influence audit fees. The types of auditor's opinion, whether this is a first year audit, and whether a Big 6 auditor is used, are examined. The governance structure should influence factors related to client complexity and financial risk, increasing audit effort and price. The final model includes six variables directly related to audit fee plus five mediating variables. The results demonstrate that SEM modeling can explain audit fees and provides more information on how the highly correlated independent variables are interrelated in the context of explaining audit fee levels.

A Municipal Audit Fee Model Using Structural Equation Modeling

Governmental audit fee models are well established in the literature. Most are run with large numbers of independent variables, usually a dozen or more. For example, Ward et al. (1994) used a 21-variable model to analyze audit fees of Michigan cities. The rationale is that with a large sample size, most variables are statistically significant. Despite obvious correlation across variables, standard diagnostics (e.g., variance inflation factors) don't indicate a multicollinearity problem when using regression.

In a large-variable framework, this approach is conceptually inferior to a more detailed analysis available through structured equation modeling (SEM). Theoretically, there are important conceptual issues and interrelationships that should be explored to better understand how audit fees are structured. The purpose of this project is to carefully model municipal audit fees using an audit economics framework and then explore this conceptual framework empirically using SEM. A sample of large cities using data from 1996 is used for analysis.

This should be a useful approach for several reasons. First, there are relatively few governmental fee studies and each generally tests different types of governments for different time periods. Second, the SEM approach has not been used in this context and should provide information on the interrelations across important variables. Third, the SEM results will be compared to OLS regression, the typical approach for analyzing audit fees. The comparison will demonstrate the relative strengths and weaknesses of the two approaches.

When interested only in the direct effects of independent variables on audit fees, OLS regression would be preferred to SEM. In fact, the direct effects SEM results are usually almost identical to OLS without the complexity of evaluating indirect effects. SEM provides a more complete analysis, incorporating mediation processes determined simultaneously in the model. For example, City Manager has no direct effect on audit fees in this model, but influences several other variables that are significant direct effects.

The next section provides model development based on audit economics theory and previous literature. Section three describes the sample. Section four explains the SEM approach and other empirical methods used for analysis. Section five is the results and the last section concludes.

Model Development

Empirical testing of audit fee models started with Simunic (1980) using commercial firms. Some measure of audit fees is the dependent variable, to be explained by various exogenous variables that identify the audit production function or capture various measures of size, risk, and other concepts that are built into audit pricing. Baber et al. (1987) was the first paper to empirically test audit fees of local governments. Baber et al. (1987) found audit fees of North Carolina counties associated with population, audit scope, audit firm size, as well as financial and political variables. Rubin (1988) used a sample of large cities with similar results. Auditor tenure, bid versus no-bid audits, and busy season audits also were significant. In a study of Michigan cities, Ward et al. (1994) found a fee premium for auditors with more municipal audit experience and lower fees when audits were bid.

Copley et al. (1994) used simultaneous equations to test audit fees and quality from a General Accounting Office (GAO) sample of 118 governmental audits. Copley et al. (1995) used alternative fee and quality models under two-stage least squares for a sample of 162 large cities (over 50,000 in population). Significant variables in the initial audit reputation model were tax share, property tax percentage, population, and marginal audit fees. Significant variables in the marginal fee model were population, per capita debt, bond rating, and reputation.

The current model uses five theoretical constructs to explain the level of audit fees. The five constructs are: (1) client size, (2) complexity of client operations, (3) financial risks including demographic characteristics, (4) auditing factors, and (5) governance structure. Client size should be associated with audit complexity. Larger organizations require more audit effort because there are more transactions. Complex client operations are expected to require more audit time and greater expertise, both expected to increase the cost of the audit. Auditors are increasingly focusing on financial risk to determine the level of audit effort (e.g., internal control checks and substantive testing) and audit pricing (Rubin 1988, Deis and Giroux 1996). There are several auditing factors that can influence audit fees. The type of auditor's opinion, whether this is a first year audit, and whether a Big 6 auditor is used are examples. Finally, the governance structure is expected to influence many factors related to client complexity and financial risk and, therefore, audit effort and price. The initial model, including empirical surrogates used to test the theoretical constructs, is presented in Table 1 and Figure 1.

***** Insert Table 1 and Figure 1 *****

The log of audit fees (LNFEE) is used as the dependent variable. Population is used to capture relative client size. The log of population (LPOP) is used in the multivariate analysis to control for skewness. Following Rubin (1988), Bamber et al. (1993) and McLelland and Giroux (2000), a positive sign is expected.

Three variables are used as surrogates for the complexity of client operations. Own source taxes usually represent the most stable revenue source and also demonstrate the relative wealth of the government. TAXSHARE is own source revenues per capita, as measured by (total revenue less intergovernmental grants) / population. It is not clear what the effect on audit fees is. Higher audit fees are associated with a higher local revenue stream may represent more transactions to audit; alternatively, TAXSHARE may indicate more sophisticated financial-related technology that improves audit efficiency. No sign is predicted. Defined benefit pension plans are complex, require additional audit time, and increase financial risk when underfunded.

PENSION is measured as a dummy variable where 1=an underfunded defined benefit pension plan. The coefficient should be positive. Component units are legally separate organization for which the elected officials of the primary government are financially accountable (Government Accounting Standards Board Statement No. 14 (1991). The number of component units reported by the city is used (COMPUNIT), a measure of additional complexity and additional audit effort to comply is GASB No. 14. The additional audit time required should result in a positive sign (McLelland and Giroux, 2000).

Five variables are used as proxies for financial risk, three related to financial characteristics of the city plus two demographics factors. Debt per capita (DEBTPC) is used to proxy for credit risk. Higher debt levels are associated with greater credit risk and a positive sign is expected. Financial viability (FV), defined as the ratio of general fund equity divided by general fund revenues, is used as an empirical surrogate for financial condition (McLelland and Giroux, 2002). The relative equity position in the general fund is an indicator of financial health, roughly analogous to retained earnings for a commercial firm. A low measure can signal fiscal stress, increasing audit risk. A negative sign is expected. Running a current fiscal-year deficit should indicate increasing financial risk. Surplus/deficit (SURDEF) is measure as revenues/expenditures. A value of one represents a balances budget, greater than one a surplus, and less than one a deficit. A negative sign is predicted.

Demographic characteristics represent the economic base of the city, both related to potential revenues and relative spending requirements. The two measures are average income and population change. Average income (ANGINC) is a proxy for financial strength and a negative coefficient expected in the fee model (Baber et al. 1987, Deis and Giroux 1996). Income levels are usually associated with greater financial health and a positive coefficient is predicted. Population change (CPOP) should capture the relative population dynamics. "Rust belt" cities typically have declining populations, while "sunbelt" cities often have growing populations. Both substantial increases and decreases in population may cause disruptions that could increase audit risk and no sign is predicted.

Three audit-related variables which are common in the literature are analyzed. The audit opinion (OPINION) is a dummy variable, where 1=a clean opinion. A qualified opinion indicates audit problems and should be associated with greater audit risk and therefore a higher fee. In most audit fee studies, a premium for a BIG6 auditor is found, usually associated with the reputation effect (e.g., Copley et al. 1995). A positive sign is predicted. An initial audit (FIRSTYR) may be associated with "lowballing," which would reduce audit fees (DeAngelo 1981).

The alternative governance structures (MGR) in cities are (1) city manager and (2) mayor-council. The mayor-council form means that the chief executive is elected and presumably is interested in reelection. The city manager is a full-time professional manager. The city manager structure has obvious principal-agent relationships, with the city manager the agent of the city council (Selden et al., 1999). This should be associated with a strong financial structure free of fiscal stress, relatively low taxes and low debt levels, a problem-free audit, and financial reports that signal complete reporting in a competent manner. The mayor-council governance structure should be associated with a focus on political rather than financial characteristics, such as meeting the needs of important special interests. Therefore, there are few obvious incentives to achieve a strong financial structure. Assuming that governance structure incentives predominate (that is, regulatory environment and economic conditions are relatively less important), the city manager form should result in lower audit costs and a negative sign expected.

Cities can sign up to be inspected for a Certificate of Achievement (CA), indicating excellence in financial reporting for those receiving the CA. Receiving a CA suggests a city committed to transparency and implies lower audit risk. A negative coefficient is forecast.

Sample

To test the audit fee model, a national sample of cities over 100,000 in population for the fiscal year ending in 1996 was used. The 1996 period was over a decade after significant regulatory changes and was well into the economic boom. Many of the studies cited used large cities. The position of mayor of a large city can be considered a major political position, requiring a full-time politician. The City Manager position in a major city can be considered a significant accomplishment and a highly visible position for a governmental professional. Cities of this size are large enough to have a large core of professional governmental employees and well-developed political structures. Annual reports were requested from 209 cities in 1996 over 100,000 in population. Reports were received from 166 cities. Cities with missing information and extreme values were eliminated, reducing the final sample to 140.

Method

The variable of interest is audit fees for 1996. Audit fees are expected to be explained based on the theoretical constructs identified in the model development above. Fourteen empirical variables are initially used to test the five constructs identified in the theoretical model. Descriptive statistics for these variables include mean, standard deviation, and range.

Multivariate analysis will use a structural equation modeling (SEM) procedure. Model development will be partially based on expected theoretical relationships and correlations as measures of potentially significant relationships; consequently, a correlation matrix is shown and evaluated. Multivariate analysis includes SEM and an OLS regression analysis for comparison. The OLS model will use the same variables identified in the SEM model.

Figure 1 is used as the starting point to develop an SEM model. This is a path diagram based on the theoretical model building described above. There are five theoretical constructs, each representing a latent variable (that is, not directly observable and presented in the ovals). Specific empirical surrogates to test these relationships are in the rectangles, with expected directional relationships shown by arrows. These relationships will be refined through the iterative SEM process.

Correlation analysis is used to understand basic empirical relationships across the variables under study. Correlations will be used as the starting point for converting the theoretical model to SEM testing. Significant relationships will be used to construct a new path diagram to be empirically tested using CALIS, the SEM program available on SAS. The analysis takes multiple iterations to determine the best available model, using maximum likelihood (ML) estimation. A key consideration is the various indirect effects that are modeled using SEM, but would be ignored when using standard regression procedures. Statistical diagnostics based on covariance analysis are extensive and the final model should include all significant relationships of theoretical interest.

The SEM approach provides preliminary results, including a thorough set of diagnostics. The overall model includes a set of goodness of fit tests, such as the goodness of fit index. The model fit is evaluated with the standardized coefficient estimates based on maximum likelihood. The exogenous variables are not evaluated, but the covariances of exogenous variables are reviewed to determine if these relationships should be incorporated in the overall model. Additional tests are used to consider all potential fits of variables not in the original model and the impact of the error terms. The key is significant relationships. Insignificant relationships generally are deleted and all significant relationships are included (these are usually done one variable at a time since all relationships are tested simultaneously). Overriding all decisions is the theoretical fit to the model.

Results

Results include an analysis of both univariate and multivariate analysis. Univariate tests include a descriptive analysis and correlations. Multivariable results are based on the SEM model, which are compared to OLS regression results. Univariate results are summarized in Tables 2 (descriptive) and 3 (correlations). The final SEM results are summarized in Figures 2 and OLS results in Table 4.

Univariate Results

Table 2 summarizes univariate results for the sample of 140 large cities with complete data. The average audit fee was almost $120, 0000, with a large range of $21,000 to over $1 million. Population averages 310,879, with the substantial range of 100,000 to over three and a half million. Own source revenues as measured by taxshare averaged $692, with a large range. The average large city had four and a half component units, ranging from none to 26. Only fifty cities had overfunded pensions, meaning that over 64% of the cities had underfunded pensions.

The mean debt per capita was $887, with the huge spread from $80 to over $4,000. Financial viability was 28.7%, which represents average general fund balance as a percentage of total revenue. All cities had a positive fund balance, while a few had fund balances greater than revenues. The average city had a 2% surplus for 1996 (that is, revenues were 102% of expenditures), but a substantial number of cities had deficit spending. Average income, a demographic wealth measure, averaged $14,283, with a range up to over $27,000. On average, population increased 7.2% across the sample, with population losses up to 10.7% and gains up to 87.7%.

Ninety-three per cent of the cities had unqualified opinions, with only ten modified reports. The Big 6 audited 75 (53.6%) of the large cities, and 17 cities (12.1%) changed auditors in 1996. Eighty-three cities used city managers (59.3%), while 119 (85.0%) received a Certificate of Achievement.

***** Insert Table 2 *****

Correlations based on Pearson's are summarized in Table 3. Correlations are a major factor in determining the initial SEM models. Many variables were correlated with audit fees. Three variables were significantly correlated at .0001 included population, tax share, and debt per capita. Five additional variables were correlated at .1. Population change was negatively correlated with audit fee, suggesting that high-growth cities required less extensive audit effort. All other correlations were in the expected direction component units, financial viability, Big 6, and city manager). An analysis of correlations across the independent variables was used to model the other relationships across the audit fee spectrum. For example, population was correlated with several of the other variables, as were financial viability, population change, Big 6, and manager. These are likely to be mediating variables (that is, they affect some variables and are affected by others) within the audit fee process.

***** Insert Table 3 *****

Multivariate Results

The initial audit fee SEM models, based on the variables in Figure 1 and correlations (i.e., to identify significant relationship), contains the following equations:

Initial OLS model used:

$$LNFEE = \alpha + \beta_1 \text{ LNPOP} + \beta_2 \text{ FV} + \beta_3 \text{ TAXSHARE} + \beta_4 \text{ PENSION} +$$
$$B_5 \text{ COMPUNIT} + \beta_6 \text{ DEBTPC} + \beta_7 \text{ FV} + \beta_8 \text{ SURDEF} + \beta_9 \text{ AVGINC} +$$

B_{10} CPOP + β_{11} AUDOPN + β_{12} BIG6 + β13 FIRSTYR +β_{14} MGR + β CA + e

Initial SEM Model used:

LNFEE = β_1 LNPOP + β_2 FV + β_3 TAXSHARE + β_4 PENSION +
B_5 COMPUNIT + β_6 DEBTPC + β_7 FV + β_8 SURDEF + β_9 AVGINC +
B_{10} CPOP + β_{11} AUDOPN + β_{12} BIG6 + β13 FIRSTYR +β_{14} MGR + β CA + e1

FV = β_{15} MGR + e2

TAXSHARE = β_{16} MGR + β_{17} FV + β_{18} DEBTPC + e3

BIG6 = β_{19} LPOP +β_{20} FV + β_{21} TAXSHARE + e4

COMPUNIT = β_{22} LNPOP + e5,

where α=intercept, β=coefficient and e=error term.

As expected, the initial model was disappointing. Most goodness of fit tests were poor and many of the independent variables were insignificant. For example, only six of the initial independent variables had significant t-values for explaining audit fees. There also were relatively large correlations among the exogenous variables, which required some additional analysis. Consequently, many additional runs were made to refine the model. The final model is summarized in Figure 2. It is a much simpler model, based on significant and theoretically defensible relationships. The independent variables are as described above. The final SEM equations are:

LNFEE = β_1 LNPOP + β_2 FV + β_3 TAXSHARE + β_4 COMPUNIT +
B_5 CPOP + β_6 BIG6 + e1

FV = β_7 MGR + e2

TAXSHARE = β_8 MGR + β_9 FV + e3

BIG6 = β_{10} LPOP + β_{11} TAXSHARE + e4

COMPUNIT = β_{12} LNPOP + e5

***** Insert Figure 2 *****

Seven of the eleven original variables are in the final model, as summarized in Figure 2. Six of these directly explain audit fees: LNPOP, COMPUNIT, FV, TAXSHARE, CPOP, and BIG6. The six direct-effects variables had a combined R^2 of 60.2% and all goodness of fit tests were highly significant. MGR has no direct effect on audit fees but influence fees indirectly through three other variables. In addition, COMPUNIT, BIG6, FV, TAXSHARE, and CPOP serve as mediating variables for other effects. The number of component units and the likelihood of a BIG 6 auditor increased with population. A larger TAXSHARE increase the probability of the BIG 6 audit. TAXSHARE also was likely inversely related to a city manager form of governance and lower financial viability, unexpected relationships. Perhaps city managers are more efficient and require fewer own-source revenues (including applying for more intergovernmental grants) and a lower level of FV. Alternatively, city manager cities may offset lower taxes with a lower financial cushion as measured by FV. Across the exogenous variables, only LNPOP and MGR had a significant covariance. Larger cities are more likely to have mayors as chief executives.

Several goodness of fit tests were analyzed. The chi square was 30.79 and significant at .01. As a rule of thumb, a chi square dividend by degrees of freedom of less than five is a good fit. In this case, it is 30.79 / 13 or 2.4. Other goodness of fit tests include Bentler & Bonnett's normed fit index (NFI) with a fit of 88.3%, root mean square error of approximation which barely made the .1 cutoff, and the goodness of fit index (GFI) which was a fit of 95%. See, for example, Bollen 1989 for an explanation of goodness of fit tests and detailed information on SEM analysis.

OLS regression is used for comparative purposes. The Regression run includes the variables in the final models from the SEM analysis and shown in Table 4. Five of the independent variables are significant: LPOP, TAXSHARE, FV, CPOP, and MGR, all in the expected direction. The negative sign for CPOP suggests that lower (or negative) growth cities require greater audit effort. Alternatively, this may suggest that negative growth cities have greater audit risk. The R^2 was 64.6%, slightly larger than for the SEM model. The advantage of SEM is the complete analysis of relationships across all variables, such as the mediation relationship of MGR through several variables.

***** Insert Table 4 *****

Conclusions

The objectives of this project were to model municipal audit fees using an audit economics framework and then explore this conceptual framework empirically using structured equation modeling. A sample of large cities using data from 1996 is used for analysis. The theoretical framework uses five constructs to explain audit fees: (1) client size, (2) complexity of client operations, (3) financial risks including demographic characteristics, (4) auditing factors, and (5) governance structure. Client size should be associated with audit complexity. Larger organizations require more audit effort because there are more transactions. Complex client operations are expected to require more audit time and greater expertise, both expected to increase the cost of the audit. Auditors are increasingly focusing on financial risk to determine the level of audit effort (e.g., internal control checks and substantive testing) and audit pricing. Various auditing factors can influence audit fees. The type of auditor's opinion, whether this is a first year audit, and whether a Big 6 auditor is used are examples. Finally, the governance structure is expected to influence many factors related to client complexity and financial risk and, therefore, audit effort and price.

Seven variables are in the final model SEM model. Six of these directly explain audit fees: LNPOP, COMPUNIT, FV, TAXSHARE, CPOP, and BIG6. The six direct-effects variables had a combined R^2 of 60.2% and all goodness of fit tests were reasonably significant. MGR has no direct effect on audit fees but influence fees indirectly through three other variables. In addition, COMPUNIT, BIG6, FV, TAXSHARE, and CPOP serve as mediating variables for other effects. The results demonstrate that SEM modeling can be used in the context of explaining audit fees and provides more information on how the highly correlated independent variables are interrelated in the context of explaining audit fee levels.

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Figure 1
Conceptual Audit Fee Model (Simplified)

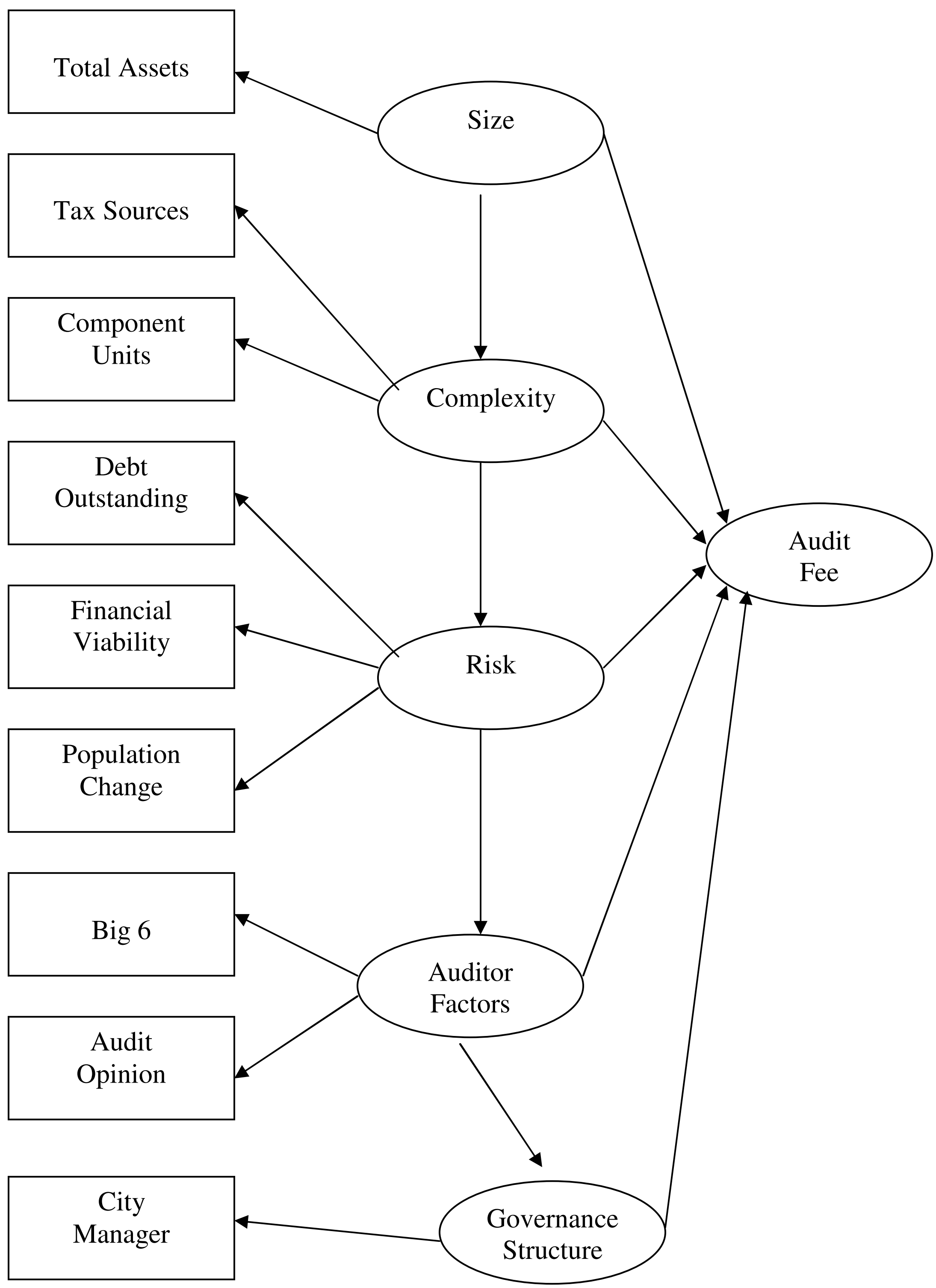
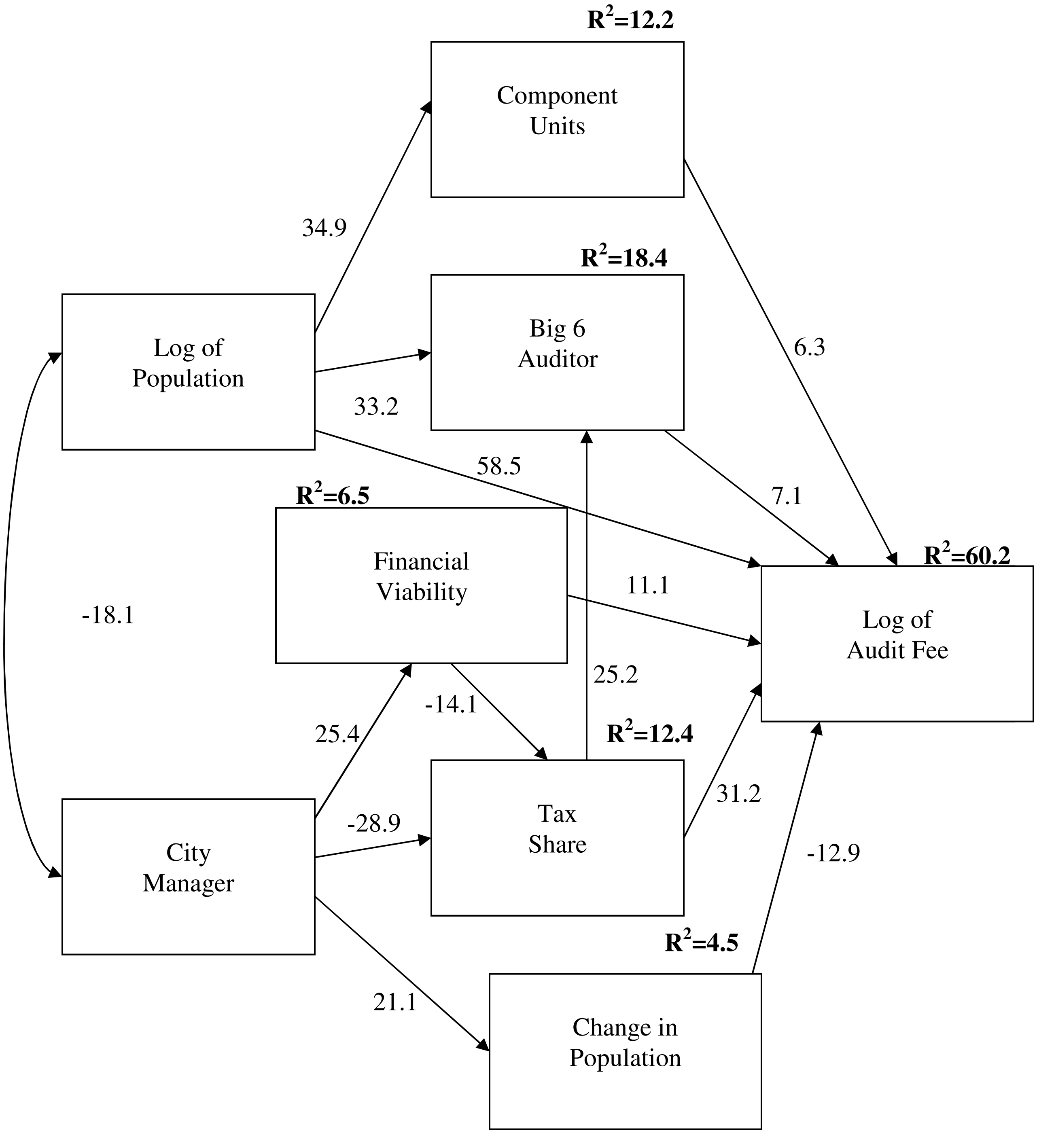


Figure 2
SEM Model—Based on Standardized Coefficients



Goodness of Fit Tests:

Chi Square	30.79	**NFI**	0.883
Df	13	**RMSEA**	0.099
Sign.	0.0036	**GFI**	0.9501

Table 1
Initial Model

I. Client Size

Population (LNPOP)

II. Complexity of Client Operations

Own Source Tax Revenues per Capita (TAXSHARE)
Defined Benefit Pensions (PENSION)
Component units (COMPUNIT)

III. Financial Risk (including Demographic Characteristics)

Debt outstanding per capita (DEBTPC)
Financial viability (FV)
Surplus/deficit (SURDEF)

Average Income (AVGINC)
Population change, 1990-96 (CPOP)

IV. Auditing Factors

Audit Opinion (AUDOPN)
Big 6 Auditor (BIG6)
Initial Audit (FIRSTYR)

V. Governance Structure

City Manager or Mayor (MGR)
Certificate of Achievement (CA)

Table 2
Descriptive Analysis (n=140)

Panel A: Continuous Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Audit Fee	$119,598	146634	21,000	1,075,000
Population	310,879	428048	100,000	3,554,000
Tax Share	$692	356	231	2,352
Component Units	4.48	3.82	0	26
Debt Outstanding per Capita	$887	639	80	4,358
Financial Viability	28.7%	0.287	.0004	1.693
Surplus/Deficit	1.02	0.08	0.69	1.26
Average Income	$14,283	3,474	6,284	27,092
Population Change	7.2%	0.119	-0.107	.877

Panel B: Dummy Variables

Variable	Frequency (# 1/Yes)	% of 1/Yes
Pensions (Overfunded)	50	35.7%
Audit Opinion	130	92.9
Big 6 Auditor	75	53.6
Initial Audit	17	12.1
City Manager	83	59.3
Certificate of Achievement	119	85.0%

Table 3
Correlation Matrix (Pearson's)

	Population	Taxshare	Pensions	Comp Unit	Debt PC
Audit Fee	62.9*	42.2*	-4.4	16.3**	23.2*
Population	-	12.3	-11.1	28.0	12.6
Taxshare		-	-0.9	3.0	45.5*
Pensions			-	-4.7	2.2
Comp Unit				-	-3.0

	FV	Sur/Def	Avg Inc	Pop Chg	Opinion
Audit Fee	-24.7**	-7.9	1.9	-18.9**	4.1
Population	-17.9**	3.6	-2.5	-8.3	7.6
Taxshare	-21.5**	-9.6	27.4**	-23.1**	0.4
Pensions	25.7**	-17.7**	20.8**	5.2	3.3
Comp Unit	-12.9	2.8	-11.8	-16.3**	2.0
Debt PC	-1.6	-10.8	1.3	7.5	-2.5
FV	-	9.3	18.8**	20.0**	2.7
Sur/Def		-	11.5	25.2**	-2.4
Avg Inc			-	12.2	19.6**
Pop Chg				-	9.1

	Big 6	First Year	Manager	C of A
Audit Fee	28.4**	6.7	-29.0**	10.3
Population	16.5**	6.8	-17.8	11.8
Taxshare	31.2**	6.6	-32.5*	5.7
Pensions	-11.3	-9.5	22.3**	-6.3
Comp Unit	14.0	-4.7	-10.6	-15.2
Debt PC	14.6**	6.8	-19.0	4.9
FV	-14.9	-6.1	25.4**	2.3
Sur/Def	3.5	-0.2	5.5	2.3
Avg Inc	8.9	-4.8	9.2	16.9
Pop Chg	4.4	4.1	21.1	12.5
Opinion	13.1	-6.7	10.9	66.0
Big 6	-	3.9	1.6	13.0
First Year		-	-0.4	3.4
Manager			-	14.0

* Significant at .0001; ** Significant at .1

Table 4
Regression Analysis with Coefficients (t-values)
Dependent Variable: Log of Audit Fees

Variable	Expected Sign	Coefficient	t-value
Log of Population	+	.588	8.93*
Tax Share	+	.000	4.68*
Component Units	+	.012	1.01
Financial Viability	-	-.262	-1.71**
Population Change	?	-.770	-2.13**
Big 6	+	.120	1.29
City Manager	-	-.082	-0.90
Intercept		7.806	21.33*
R^2		64.6%	
F Value		34.41*	
n		140	

* Sign. At .0001; ** Sign. at .1