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Tax Audit Productivity in New York State

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Abstract

This study employs both linear and non-linear approaches to examine tax audit productivity in New York State. The linear approach shows a positive relationship between audit revenue and the number of audit staff within the New York State Department of Taxation and Finance's Audit Division. Using a narrower definition of "direct staff" which excludes upper level supervisors (staff at grade level 27 or higher, we find that the impact of an additional auditor is $590 thousand; using a broader definition of "direct staff", which includes upper level supervisors (staff at grade level 27 or higher), the impact is $496 thousand. The non-linear approach discovers the diminishing marginal returns. At the current direct staff level (877 as of November 2008, the narrower definition) in the Audit Division, the marginal return of an extra direct staff member is $602 thousand, which is consistent with the results of the linear model. The results also show that in order to maximize net audit revenue the State needs to increase the number of auditors to 1,522, assuming the marginal cost of an additional auditor is constant at $200 thousand. The non-linear model provides a convenient way to determine the optimal level of staff, given the marginal cost of an additional auditor. Hence policymakers can use this non-linear model as a tool to maximize the State's net audit revenue.

1. Introduction

This study examines the tax audit productivity in New York State. The purpose of this study is to help tax practitioners and policymakers better understand the relationship between the audit effort and the audit revenue generated by the effort, which, in turn, may help policymakers to better structure the audit organization to meet expectations of the public and to generate more revenue for the State.

In the literature, researchers traditionally use the tax deficiency as the audit output. Some of these researchers use the tax deficiency per hour of audit effort and others use total deficiency as

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the dependent variable. For example, see Adams (1987) and Sinha (2007). The current study, however, uses the audit revenue collections instead of the tax deficiency and uses the number of audit staff in the New York State Department of Taxation and Finance (DTF) instead of audit hours.

There are two advantages for using audit revenue collections and the number of staff. First, it avoids using the firm level data, which researchers have traditionally used in their studies. When using firm level data, both the input (audit effort) and output (tax deficiency) refer to the actions taken against a particular firm, i.e., input is the hours auditors work on that firm and output is the difference between the true tax liability and the reported tax liability of that firm. The audit effort spent in the audit selection process (to choose which firms to audit) is often ignored and, as a result, the tax audit productivity may be overstated. In this study, we use the number of audit staff in DTF as the input and, therefore, the input includes effort spent both in the firm selection process and in the actual audit process.

Second, the audit revenue collections reflect the real audit output. Theoretically, tax deficiency and audit revenue collections should be equal in the long run. In reality, however, the difference between these two measures may be huge due to various reasons. For example, in the collection stage, a firm may declare bankruptcy after an assessment, or an individual may move to another state without trace, or the State may lose in legal proceedings. All of these may cause the tax deficiency to deviate from audit revenue collections. As a result, audit revenue collections are a better concept to measure the tax audit productivity.

Many alternative approaches to find the relationship between audit effort and audit revenue collections are explored in our research. In this paper, results of two types of models will be presented. In the first, linear models are used to examine which audit effort measures have the closest relationship with audit revenue collections and to quantify the impact of the audit effort. In the second, non-linear models are used to check if the current number of auditors in DTF is at the optimal level, i.e. whether DTF should decrease or increase auditors to maximize net audit revenue collections (gross revenue collections minus cost).

The remainder of this paper consists of four sections. Section 2 introduces data used in this study. Section 3 discusses modeling methodology. Section 4 presents estimation results, and Section 5 completes the paper with a summary and conclusions.

2. Data

2.1 Audit Output

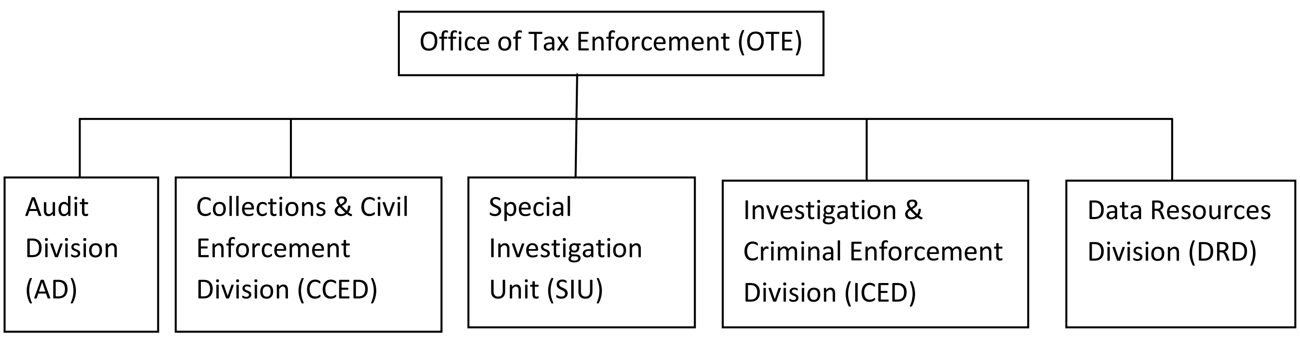
For the audit output data, the State share of audit revenue collections is used in this study. The data are maintained by Office of Tax Policy Analysis (OTPA) within DTF. While the audit amount assessed by the Audit Division is also available as explained in the Introduction, it is recognized that a portion of the assessed value may never be realized. Therefore, the State share of audit collections is considered a better measure of audit output.

2.2 Audit Effort

DTF maintains two measures of audit effort. One measure is staff counts and working hours collected by Human Resources Management for payroll purposes. The data have a short span, from 2005 to 2007. The other measure is monthly staff counts by staff functions listed in the Monthly Report, prepared by Office of Tax Enforcement (OTE). The staff data in the Monthly Report are chosen as audit effort measures in this study because of the data's longer span, from 2000 to 2008, and because the staff listed in the data could be easily classified into direct staff and indirect staff without much ambiguity.

Within DTF, the Office of Tax Enforcement is responsible for both civil enforcement and criminal enforcement. It contains five divisions, including the Audit Division. Figure 1 presents the organizational structure of OTE.

Figure 1. Organizational Structure of Office of Tax Enforcement



In this study, alternative staff aggregates in OTE are defined as audit effort measures. The following describes these aggregates, in that OTE staff is classified into different categories according to the function of the staff. See Appendix I for a detailed discussion of the staff classification in the Audit Division and CCED.

a. Direct staff vs. indirect staff

AD and CCED are the two divisions which are most closely related to the actual audit work among all the divisions in OTE. Based on the Monthly Report for November 2008, the staff in these two divisions account for 95 percent of the total OTE Staff while the other divisions account for only 5 percent. The staff in both AD and CCED are divided into direct staff and indirect staff according to their job functions, while the staff in the other divisions are regarded as indirect staff.

b. Two measures of direct staff

The broader definition (D1) is the direct staff which includes staff members at grade level 27 or higher; the narrower definition (D2) consists of direct staff which excludes staff members at grade level 27 or higher, i.e., D2 includes only staff who do actual audit work and excludes managers who supervise auditors.

c. Technical support staff vs. administrative support staff

The indirect staff in AD and CCED are further classified into two categories, technical support staff and administrative support staff based on the nature of their work within these divisions.

d. Other audit effort measures

Besides the aggregates of staff within each of the two divisions defined above, we also tried other aggregates as audit effort measures in our research, including:

T1: Total staff in Audit Division;

T2: Total staff in CCED;

T3: Total staff in the Audit Division and CCED;

T4: Total staff in the Office of Tax Enforcement.

2.3 Economic Indicators

Economic situations affect tax audit revenue collections. In a booming economy, audit collections tend to increase due to increased economic activities. For example, the increase in wages may boost personal income tax revenue and the increase in retail sales transactions may boost the sales tax revenue. If the tax evasion ratio is constant, then the increased economic activities would cause the audit revenue collections to rise, even if the audit effort remains constant.

Several economic indicators are tried to control the effect of the economic situations on the audit revenue collections. One of the indicators is the New York State Economics Coincident Indicator published by the New York State Division of Budget (Megna and Xu, 2003), as the Indicator is supposed to capture the general economic situations in the State. Another indicator is the total wages of New York State (Data source: US Bureau of Labor Statistics), as the sales tax and personal income tax are closely tied to the total State wages. We also tried New York State wages in the private sector, New York State personal income, New York State disposable income, and US gross domestic product. (Data source: Bureau of Economic Analysis)

3. Modeling Methodology

In the modeling process, we want our models to be statistically fit and structurally simple. Also, we want our models to be capable of answering the following questions:

1. Is there a positive relationship between the audit output (audit revenue collections) and the audit effort (number of staff)?
2. Which audit effort measures defined in the previous section have the closest relationship with the audit output as compared with other measures?
3. How can we quantify the relationship?
4. Are there any diminishing returns as the audit effort increases? If so, what is the optimal level of the audit effort?

Numerous functional forms of both the structural and time series models were tried. The general form of a structural model can be written as

$$y = \sum_{i=0}^{n} \alpha_i X_i + \sum_{j=1}^{m} \beta_j Z_j + \varepsilon \qquad \text{(E1)}$$

where *y* is the audit output, defined as audit revenue collections; Xs are measures of audit effort in number of staff; and Zs represent factors other than audit effort affecting the audit output, such as State personal income or total wages. In addition, dummy variables for data outliers are also represented by Zs.

In the modeling process, we tried many variations of Equation E1. The following are some examples:

a. Uncertain about the underlying structure, we tried both the linear and non-linear models;

b. A few variations of *y*, audit revenue collections, were tried as the dependent variable to see if these variations of *y* could be better explained by our models. The variations include log of *y*, difference of *y*, and growth rate of *y*;

c. For the independent variables, Xs, we tested alternative staff measures as defined in the previous section. Also, a few variations of *X*, such as log of *X* and difference of *X*, were tried. For example, we tried the following Cobb-Douglas Production function (log-log model):

$$\log(y) = \beta_1 * \log(direct\ staff) + \beta_2 * \log(support\ staff) + \varepsilon \quad \text{(E2)}$$

where the number of direct staff and the number of supporting staff are used as two inputs in the production function;

d. Various lags of Xs were tried to see if the past behavior of the independent variables have an impact on audit revenue collections in the current period;

e. Different orders of AR and MA terms were added to the general structural model to correct the serial correlation of the disturbance terms;

4. Estimation Results

A couple of the models and their regression results are presented in this section. Models represented by Equations E3, E4, and E8 are among the best of the models we tried. They are chosen for their parsimonious nature, relatively good power to explain the variations of audit revenue collections, and the significant T statistics for the regression coefficients with the signs as expected. Some models with unsatisfactory statistics, represented by Equations E5, E6, and E7, are also presented in this section. They are chosen as examples to show that certain staff measures are not good independent variables to explain the variation of the audit revenue collections.

4.1 Results of Linear Models

4.1.1 Impact of Audit Division Staff:

a. The effect of D2, the narrower definition of the direct staff, which excludes auditors at grade level 27 or higher:

$$y = \sum_{i=0}^{1} \alpha_i X_i + \sum_{j=1}^{3} \beta_j Z_j + \varepsilon \quad \text{(E3)}$$

where

y = audit revenue collections;
X_0= 1;
X_1 = direct staff at grade level lower than 27;
Z_1= lagged (lag three) New York State total wages;
Z_2 = dummy variable for the outlier in October 2006;
Z_3 = dummy variable for the outlier in February 2008.

Statistics of Equation E3:

Adj Rsq	α_0	α_1	β_1	β_2	β_3
0.7132	-545105	590	0.0042	483694	449523
P value	(0.0099)	(0.0107)	(<0.0001)	(<0.0001)	(<0.0001)

The statistics shows that this model has significant T statistics for each independent variable and is a good fit. The adjusted R Square, 71.32 percent, is considered high among empirical studies in economics, which implies that the predictive ability of this model is good and reliable. The low p-value for each coefficient indicates that the independent variables are significant to contribute to the variation of the dependent variable and should not be dropped from the modeling. In addition, the signs of the coefficients are as expected.

The results show that, as indicated by the coefficient α_1, an increase of a direct audit staff with average ability and average experience will result in an increase of $590 thousand in audit revenue collections.

b. The effect of D1, the broader definition of the direct staff, which includes auditors at grade level 27 or higher:

$$y = \sum_{i=0}^{1} \alpha_i X_i + \sum_{j=1}^{3} \beta_j Z_j + \varepsilon \qquad \text{(E4)}$$

The functional forms of Equations E4 and E3 are identical. The only difference between them is the definition of X_1, the staff measure. In Equation E3, X_1 does not include auditors at grade level 27 or higher. While in Equation E4, X_1 includes all auditors regardless of their grade levels.

Statistics of Equation E4:

Adj Rsq	α_0	α_1	β_1	β_2	β_3
0.7079	-467351	496	0.0036	485997	429111
P value	(0.0239)	(0.0260)	(0.0001)	(<0.0001)	(<0.0001)

Similar to Equation E3, the statistics shows that Equation E4 has significant T statistics for each independent variable and the model is a fair fit. The results show that, as indicated by the coefficient α_1, an increase of a direct audit staff (including auditors at grade level 27 or higher) with average ability and average experience will result in an increase of $496 thousand in audit revenue collections.

c. The effect of T1, total staff in the Audit Division:

$$y = \sum_{i=0}^{1} \alpha_i X_i + \sum_{j=1}^{3} \beta_j Z_j + \varepsilon \qquad \text{(E5)}$$

Again, as Equation E4, Equation E5 has the same functional form as Equation E3. The only difference between them is the definition of X_1, the staff measure. In Equation E3, X_1 refers to direct staff excluding auditors at grade level 27 or higher. While in Equation E5, X_1 refers to total staff in the Audit Division, including both direct staff and supporting staff.

Statistics of Equation E5:

Adj Rsq	α_0	α_1	β_1	β_2	β_3
0.6985	-542437	300	0.0048	506301	443306
P value	(0.1237)	(0.1311)	(<0.0001)	(<0.0001)	(<0.0001)

The results show that T statistics for both the intercept and X_1 are not significant. The p-value for X_1, 0.1311, indicates that we could not reject the null hypothesis that audit revenue collections do not increase with total staff in the Audit Division, i.e., we could not find a positive relationship between the staff measure and audit revenue collections at the 90 percent confidence level.

d. The lagged effect of D2, the narrower definition of the direct staff, which excludes auditors at grade level 27 or higher:

It is expected that there is an effect lag between the time when an auditor is added and the time when that auditor makes an impact on audit revenue collections. To test the expectation, we build models with different time structures. Lag one through lag 36 of staff measures are added, independently or combined, to the models to check if such lagged staff measures have any impact on the audit revenue collections in the current period. The following is an example of the models we tried:

$$y = \sum_{i=0}^{7} \alpha_i X_i + \sum_{j=1}^{3} \beta_j Z_j + \varepsilon \qquad \text{(E6)}$$

where

y = audit revenue collections;

$$X_i = \begin{cases} 1, & i < 1 \\ \text{direct staff at grade level lower than 27}, & i = 1 \\ \text{lagged } X_1 \ (\text{lag}\,(i - 1)), & i > 1 \end{cases}$$

Z_1 = lagged (lag three) New York State total wages;
Z_2 = dummy variable for the outlier in October 2006;
Z_3 = dummy variable for the outlier in February 2008.

Statistics of Equation E6:

Adj Rsq	α_0	α_1	β_1	β_2	β_3	
0.7164	-262992	714	0.0045	507743	492740	
P value	(0.3693)	(0.0259)	(<0.0001)	(<0.0001)	(<0.0001)	
	α_2	α_3	α_4	α_5	α_6	α_7
	-355	272	417	-439	182	-527
P value	(0.3486)	(0.4720)	(0.2572)	(0.2317)	(0.6251)	(0.1522)

While the adjusted R square is high and T statistics for coefficients, α_1, β_1, β_2, and β_3, is statistically significant and with signs as expected, this model suffers several serious flaws. First, the T statistics for α_0 is not significant, suggesting we should drop the intercept term from the model. Second, none of the T statistics of the coefficients of the lagged staff measures, α_2 to α_7, is significant, indicating the contribution of lagged staff measures to audit revenue collections in the current period cannot be detected. And third, the signs of the coefficients of the lagged staff measure flip over time, implying the model is most likely over-specified. We tried to improve the model by dropping the intercept term. The results show that the last two flaws still exist after the modification.

We applied various lags of the staff measure (one lag at a time or in different combinations of the lags, with longer or shorter time spans, with or without the constant term) to the models. The results of all trials confirm that as long as the current staff measure is included in the models, the impact of the lagged staff measures on audit revenue collections cannot be identified.

4.1.2 *Impact of Other Staff Measures:*

Besides the staff measures within the Audit Division, some other staff measures are also tested as the audit effort variable in our modeling, including:

1. Direct staff in CCED;
2. Total direct staff in CCED and the Audit Division;
3. Total staff in CCED;
4. Total staff in CCED and the Audit Division;
5. Direct and technical support staff in CCED and the Audit Division;
6. Total staff in OTE.

The results of the trials show that we could not find satisfactory models with positive relationships between these staff measures and audit revenue collections. The following is an example of using total direct staff in the Audit Division and CCED (narrower definition, excluding staff at grade level 27 or higher).

$$y = \sum_{i=0}^{1} \alpha_i X_i + \sum_{j=1}^{3} \beta_j Z_j + \varepsilon \qquad \text{(E7)}$$

where

y = audit revenue collections;
X_0= 1;
X_1 = total direct staff of the Audit Division and CCED at grade level lower than 27;
Z_1 = lagged (lag three) New York State total wages;
Z_2 = dummy variable for the outlier in October 2006;
Z_3 = dummy variable for the outlier in February 2008.

Statistics of Equation E7:

Adj Rsq	α_0	α_1	β_1	β_2	β_3
0.6954	250199	-178	0.0036	493933	434495
P value	(0.2623)	(0.2338)	(0.0003)	(<0.0001)	(<0.0001)

The statistics shows that the T statistics of both α_0 and α_1 are insignificant. Furthermore, the sign of the coefficient of X_1, α_1, is negative. All of these indicate that a positive relationship between the total direct staff of Audit Division and CCED and audit revenue collections could not be detected. Many alternative models using cross-division staff measures were tried, but none of these models could reveal a positive impact of the staff measures on audit revenue collections.

4.2 Results of Non-Linear Models

The linear models presented above assume that there is a constant return of the audit effort, i.e., the coefficient of X_1, α_1, is constant over different levels of X_1. While the results of the linear models are valid, assuming X_1 does not vary much over time, it is worthwhile to relax the constant return assumption and try the non-linear approach to examine whether there are diminishing returns and, if so, to determine the optimal level of auditors.

We tried a variety of non-linear models in this research, such as log-log models, semi-log models, and quadratic models. Although the results of most of these models are not satisfactory, there is one model that fits the data well. The specification and regression results of the model are presented next.

The effect of D2, the narrower definition of direct staff in the Audit Division, which excludes auditors at grade level 27 or higher:

$$y = \alpha_0 + \alpha_1 \left(\frac{1}{X}\right) + \sum_{j=1}^{3} \beta_j Z_j + \varepsilon \qquad \text{(E8)}$$

where

y = audit revenue collections;
X = direct staff at grade level lower than 27 in the Audit Division;
Z_1= lagged (lag three) New York State total wages;
Z_2 = dummy variable for the outlier in October 2006;
Z_3 = dummy variable for the outlier in February 2008.

Statistics of Equation E8:

Adj Rsq	α_0	α_1	β_1	β_2	β_3
0.7127	500128	-463000000	0.0043	483891	449345
P value	(0.0152)	(0.0118)	(<0.0001)	(<0.0001)	(<0.0001)

The estimation results of the reciprocal model show that this model fits well with significant adjusted R Square. The low p-value for each coefficient indicates that the independent variables are significant to contribute to the variation of the dependent variable. In addition, the signs of the coefficients are as expected. A comparison between Equation E8 and Equation E3 also reveals that the coefficients of *Z*s in these two models are similar.

One advantage of the reciprocal model is that it gives the limit of *y*, the dependent variable. Also, it allows diminishing returns. For a detailed discussion about the reciprocal model, see Johnston (1984). To examine diminishing returns, we first exclude the effect of *Z*s and just concentrate on the relationship between *Y* and *X*. From E8, we have

$$y_1 = \alpha_0 + \alpha_1 \left(\frac{1}{X}\right) + \varepsilon \qquad \text{(E9)}$$

where $y_1 = y - \sum_{j=1}^{3} \beta_j Z_j$. The slope of E9 in the (y_1, X) dimension is $dy_1/dX = -\alpha_1/X^2$. If α_1 is positive, the slope is negative. If α_1 is negative, as in the case of this model, the slope is positive. Also, if the slope is positive, it decreases as X rises, indicating diminishing returns. In addition, since $\frac{1}{X} \to 0$ as $X \to \infty$, α_0 denotes the limit value for y_1 as X increases.

The slope $dy_1/dX = -\alpha_1/X^2$ is the marginal return of the audit effort. Given

$\alpha_1 = -463{,}000{,}000$, we can calculate marginal returns at different levels of X. Table 1 presents the marginal returns for selected *X*s in the range from *X* = 500 to *X* = 1200.

Table 1: Marginal returns of the direct staff in the Audit Division

Number of Staff, *X*	Marginal Return, $-\alpha_1/X^2$, Unit: $ thousand
500	1852
600	1286
700	945
800	723
900	572
1000	463
1100	383
1200	322

The results indeed show diminishing returns. At the current level of direct staff in the Audit Division (877 as of November 2008), the marginal return is $602 thousand, $12 thousand higher than the results of the linear model represented by Equation E3.

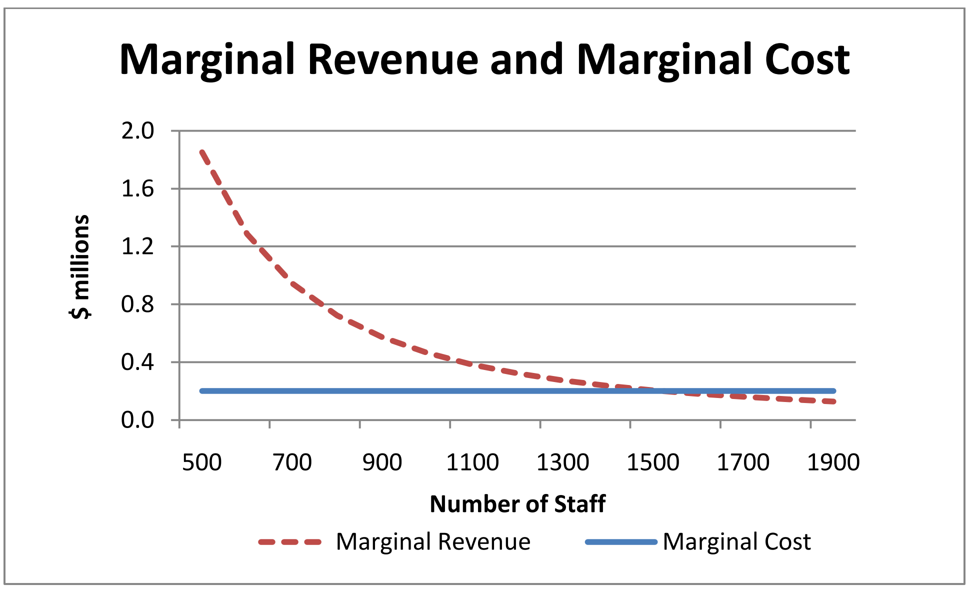
If we have the total cost of adding an average auditor, including wages, benefits, and all other costs associated with the auditor and his support stuff, we can then calculate the breakeven point, at which the marginal return equals to the marginal cost. For example, assume that the marginal cost is a constant at $200 thousand. Then

$$-\alpha_1 \frac{1}{X^2} = 200$$

$$X = 1{,}522$$

Using this example, as long as the number of direct staff is less than 1,522, the marginal return is always greater than the marginal cost of hiring an additional auditor. The marginal revenue and marginal cost curves are presented in Figure 2.

Figure 2: Marginal Revenue and Marginal Cost



In Table 2, the marginal revenue curve and the marginal cost curve intersect at X = 1,522. Therefore, the State should increase the number of auditors from the current level, 877, to 1,522 in order to maximize the net audit revenue collections. It is clear that the position of the equilibrium point is affected by the marginal cost. If the marginal cost is higher than $200 thousand, then the State should hire less than 1,522 auditors. If the marginal cost is lower than $200 thousand, then the State should hire more than 1,522 auditors.

The reciprocal model has a limitation when X is at the low end. At the low end of X, the marginal revenue, $-\alpha_1 \frac{1}{X^2}$, is extremely high, indicating the model may not be suitable.

Fortunately, the extremely low levels of direct staff do not exist during the entire historic period we are considering.

5. Summary and Conclusions

Many structural and time series modeling methods are explored in our study to detect the impact of audit effort on audit revenue collections in New York State. For the independent variables, alternative audit effort measures and economic indicators are tried to explore the relationship between them and the audit output. Regression results of selected models are presented in this paper.

The audit output measure used in this study is different from those used by others in the literature. First, this study uses audit revenue collections while many other studies use total tax deficiency or tax deficiency per audit hour as the output measure, which often has the tendency to overstate the productivity of the audit effort. Second, this study uses aggregate total audit collections while many others use assessment data at the firm level, in which the cost associated with the firm selection process is often ignored.

There are several findings from this analysis that deserve attention. First, the analysis reveals that direct staff in the Audit Division has a positive relationship with audit revenue collections. It is, however, unable to detect a positive relationship between audit revenue collections and other audit effort measures, such as direct staff of CCED, direct staff of OTE, or total staff of OTE. The amount of the impact of direct staff in the Audit Division depends on the specific staff measures and model specifications. The linear model shows that for the narrower definition of direct staff, which excludes staff at grade level 27 or higher, the impact of an additional auditor is $590 thousand; for the broader definition of direct staff, which includes staff at grade level 27 or higher, the impact is $496 thousand. The non-linear model shows that at the current staff level, the impact of an additional auditor (narrower definition of the direct staff) is $602 thousand, which is consistent with the linear model. These results strongly suggest that an increase in direct staff in the Audit Division will boost audit revenue collections well in excess of associated cost.

The second finding of the analysis is that there appears no time lag between the time when an auditor is added and the time when there is an impact. This finding may seem counterintuitive until the analysis is reviewed more closely. The study does not distinguish staff fluctuations caused by alterations in hiring patterns from those that result from changes in retention rates. All staff members, therefore, enter the analysis as typical auditors with the average ability and average experience.

The third finding is that we are unable to show how an increase in the number of auditors in the past periods affects the audit revenue collections in the current period, as indicated in the statistics of Equation E6. We tried dozens of models similar to equation E6 with alternative lagged structures on the right hand side of the equations and all models point to the same conclusion: as long as both the current staff measure and the lagged staff measure appear on the right hand side of the equation, the T statistics of the lagged staff measure are always insignificant, telling us the lagged staff measure adds nothing to the model. This finding is consistent with the second finding that there is no time lag between the time when an auditor is added and the time when there is an impact.

A final finding of the analysis is the indication of diminishing marginal returns as the number of auditors increases, as shown in the non-linear reciprocal model of Equation E8. The results show that in order to maximize net audit revenue the State should increase the number of auditors from the current level of 877 to 1,522, assuming the marginal cost of an additional auditor is $200 thousand. The non-linear model provides a convenient way to find out the optimal level of staff, given the marginal cost. Hence policymakers can use this non-linear model as a tool to maximize the State net audit revenue collections.

APPENDIX I

Staff Classification in the Audit Division and CCED

The Staff of the Audit Division and CCED are classified into three groups: direct staff, technical support staff, and administrative support staff. The technical support staff and administrative support staff are regarded as indirect staff. All of these measures are tried in our modeling process to determine which measures have a close relationship with audit revenue collections.

1. Staff in the Audit Division

Direct staff (D1) = TA + PA + IN + CA
Direct staff (D2) = TA + PA + IN + CA – (staff at grade level 27 or higher)
Technical support staff = TE + CC + SA + CP + CO
Administrative support staff = AO + MA + AS + OC +AD

where:

TA = tax auditor
PA = data processing auditor
IN = investigator
TE = tax technician
CC = calculation clerk
SA = system aide
CA = compliance agent

CO = conflict conciliator
CP = computer programmer
AO = associate attorney
MA = manager
AS = assistance supervisor
OC = other clerk
AD = administrative assistant

D1 is the broader definition of the direct staff which includes auditors at grade level 27 or higher and D2 is the narrower definition of the direct staff which excludes auditors at grade level 27 or higher.

2. Staff in CCED

Direct staff = TR (grade lower than 27) +TC
Technical support staff = AC + BS +DP + FA + AA + IT + TT
Administrative support staff = AO + CK + TM + SV +TR (grade 27 or higher)

where:

TR = tax compliance representative
TC = telephone collector
AC = associate statistician
BS = business system analyst
DP = dp fiscal system auditor
FA = financial analyst
AA = administrative analyst
IT = IT specialist
TT = tax technician
AO = associate attorney
CK = clerk
TM = tax compliance manager
SV = supervisor

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