The Value Added by Auditing and the Hidden Costs of Regulation: Public School Operation

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Abstract

We utilize a unique opportunity presented by an education reform instituted in the state of Georgia and examine how more stringent and complicated compliance rules affect auditing and monitoring effectiveness. We examine whether auditing produces economic benefits for stakeholders. The stakeholders in this study are taxpayers and interest groups. We assume that the ultimate goal of auditing is to provide monitoring. We then utilize a relative performance evaluation technique to estimate the average contribution of auditing. We directly estimate the impact of auditing on the reduction of nonproductive use of taxes, which may be a perquisite to local public officials. This approach to estimating the economic value of auditing is consistent with the notion that effective monitoring should enhance optimal resource allocation in society (Lev, 1988; and Penno, 1980). We show that auditing truly provides economic benefits to taxpayers by reducing nonproductive use of taxes. We also analyze external and internal monitoring systems in a politically competitive environment, and to assess the impact of new and complicated compliance standards for auditors on their resource allocation and monitoring effectiveness. We find that stringent compliance rules reduce auditing effectiveness by creating time allocation problems. We show complex compliance rules increase nonproductive use of taxes. Utilizing a unique data set on auditing time, our analysis shows auditing to be an integral part of monitoring strategy, the potential social costs of new policies imposed on auditors should be carefully considered to evaluate the effectiveness of monitoring strategy. We demonstrate that changes in policy really can decrease the efficiency of auditing, which has real economic consequences.

Keywords: Auditing effectiveness; public school auditing; agency theory; the costs of regulation

Data Availability: the data are available from the public sources identified in the text.

I. INTRODUCTION

A recent series of accounting scandals has led to political demand for greater public scrutiny, resulting in passage of the Sarbanes-Oxley Act. This major congressional intervention was intended to restore investors' confidence in financial reporting by restructuring accounting monitoring systems. Given the demand for good monitoring structures, it is important to understand how audited reports and auditing help to establish a reliable monitoring control system. Currently the hidden social costs of more stringent and comprehensive accounting and auditing disclosure rules are very unclear. In this study, we utilize a unique opportunity presented by an education reform, the Quality Basic Education (QBE) Act, instituted in the state of Georgia in 1985 to examine how more stringent and complicated compliance rules affect auditing and monitoring effectiveness. This setting is ideal to examine the impact of political competition on elected public officials' incentive to supply a monitoring system as discussed by Baber (1983, 1994) and Baber and Sen (1984).

The objectives of this study are to examine and estimate the economic benefit of auditing in the public school operations, to analyze external and internal monitoring systems in a politically competitive environment, and to assess the impact of new and complicated compliance standards for auditors on their resource allocation and monitoring effectiveness. We assume that the ultimate goal of auditing is to provide monitoring. We then utilize a relative performance evaluation technique to estimate the average contribution of auditing. Our technique to estimate an efficient frontier is suitable to examine the relative performance of auditors because accounting rules and regulations are uniformly applied to all institutions. We directly estimate the impact of auditing on the reduction of nonproductive use of taxes, which may be a perquisite to local public officials. This approach to estimating the economic value of auditing is consistent with the notion that effective monitoring should enhance optimal resource allocation in society (Lev, 1988; and Penno, 1980). We show that the auditing truly provides economic benefits to taxpayers by reducing nonproductive use of taxes.

Agency literature suggests that accounting is integral in reducing contracting costs (Watts and Zimmerman 1986; Baber 1983, 1994). Since auditors assess the reliability of financial reporting, such attestation should enhance contractual relations (e.g., Baber and Sen 1984; Datar, Feltham and Hughes 1991; Feltham, Hughes, and Simunic 1991). Auditing can mitigate wealth transfer from taxpayers to school district officials by detecting failure of internal control systems. Auditing also provides credibility when disclosing information to outsiders who evaluate the performance of political reforms (e.g., educational reform). We evaluate this monitoring system by using the properties of monitoring strategies proposed by Lambert (1985).

The QBE Act provides new funds to local school districts, but they were given stringent disclosure requirements concerning QBE funds. While auditors had to assure a school district's disclosure and an internal control system, they are not required to provide any new information on their auditing practices (e.g., auditing fees and times). This lack of disclosure about auditing practices makes it difficult to assess how a new policy affects auditing effectiveness. We have a unique data set on auditing time. This allows us to examine the effects of strenuous requirements on the use of QBE funds and asymmetric disclosure requirements on the monitoring role of auditing. We demonstrate that changes in policy really can decrease the efficiency of auditing, which has real economic consequences.

Our research contributes to prior studies in several different ways. First, we extend the studies by Baber (1983, 1994) and Baber and Sen (1984) on how political environment affects accounting and auditing practices in the public sector. Baber (1994) summaries prior studies and concludes that political competition affects accounting and auditing practices in various ways at the national, state, or local level. In particular, in the public sector, auditors are often required not only to verify financial reporting but also the effectiveness or efficiency of off-balance sheet wealth transfers. We analyze the effect of political competition at the state level in school district operations. We demonstrate that the demand for monitoring is high when elected officials earmark special funds for improving public education. These funds may be risky for elected public officials. The failure to use them to achieve the political promise may lead to negative consequences. Thus, "fund-specific risks" are high for QBE funds. This is the analogous to Datar, Feltham and Hughes (1991) and Feltham, Hughes, and Simunic (1991)'s proposition that firm-specific risks increase the demand for auditing in the private sector.

While information about school district operations concerning QBE funds is made available to the public, information about auditing practices is unavailable. This asymmetric disclosure requirement seems to affect the distribution of the costs of monitoring. Fortunately, we have some proprietary data on auditing times that allows us to study how political influence will interact with the asymmetric disclosure requirements.

Our results show that increased compliance rules in the use of QBE funds demands too much auditing time, which exceeds the benefits of disclosure over the costs of supplying attestation. The complexity in the use of QBE funds creates an extra burden for auditors. But because interest groups are more interested in disclosures about student test scores and the availability of funds, public officials probably have little incentive to increase auditing budgets despite the increase complexity. This may result in lower than necessary auditing time allocation.

Our analysis suggests a risk sharing relationship between elected public officials and auditors. Although expanding required auditor disclosures such as audit time, fees, and assessment of internal control system expose some risk for auditors, such disclosures have benefits. They help to assess the economic value of auditing and of the political reform.

Second, Feltham, Hughes, and Simunic (1991) and Baber (1994) stress the importance of controlling for size of clients when examining auditing practices because size and risk of audit client is generally positively correlated. Since our proxy for a political competition, student enrollments, is a commonly used a size proxy, our results might be driven by size of the school districts rather than an influence of political competition. To mitigate this problem, we also include a separate size variable, the dollar value, and an alternative specification. However, we feel that future research should further investigate this issue.

Third, we demonstrate the applicability of the econometric method of estimating an efficient frontier to evaluate the contribution of auditing. Prior studies have introduced the frontier estimation techniques as a relative performance evaluation in several different settings in the accounting literature: the two most widely use methods are data envelopment analysis (DEA) (Banker 1989; and Mensah and Li 1993; Dopuch, Gupa, Simunic and Stein 2003) and stochastic frontier estimation (SFE) (Dopuch and Gupa 1997; and Banker, Chang, and Cunninghan 2003; Dopuch, Gupa, Simunic and Stein 2003). These methods are very powerful to conduct relative performance evaluation where apparent variations in efficiency exist. We also utilize this frontier estimation technique and show how school districts' performance can be compared to their peers. In particular, we introduce ordinary least square (OLS) error adjusted approach to the accounting literature, which is a simplified version of the SFE approach.

Fourth, here we concentrate on the public sector, but note that the monitoring role of auditing, and political influence on accounting and auditing practices, are similar between the public and private sectors. We utilize Lambert's (1985) properties of monitoring strategies. He argues that a designing executive compensation schemes, it is optimal to tie remuneration to measures that can be further scrutinized by principals. In our framework, the compensation is an analogue to elected official's political place, which is tied to performance measures that interest groups can investigate. Since parents' concern about the quality of public education is generally high, there is a strong incentive for elected officials to improve its quality. We suggest that when principals can conduct an investigation of the agent's performance, Lambert's properties of monitoring strategies can be applied. Given this framework, we estimate the monitoring value of auditing and the effect of new regulations on auditor's effectiveness in the public sector as the dollar-value saved for stakeholders. We feel that our approach to estimating the economic benefits of auditing can be applied in the private sector setting. Such an investigation is important to assess the effectiveness of the Sarbanes-Oxley Act. We show the potential adverse effect of regulation.

Lambert's propositions are derived for the compensation of managers in private sector firms. Clearly, proposing that state legislators or local school board members have identical motivations is a very problematic analogy. But we feel that Lambert's these propositions should hold in a wide variety of principal/agent relationship, including the public sector setting.

The remainder of the paper is arranged as follows. In section 2, the background of the study and school auditing are discussed. In section 3, the agency model and hypotheses development are discussed. In section 4, the research design is discussed, and in the following section, data collection procedures are described. Section 6 describes the empirical model and results, and in the final section conclusions are drawn.

II. BACKGROUD OF STUDY AND SCHOOL AUDITING

Governmental accounting differs from that in private sector in several aspects. One major difference is the fund accounting system. Under the fund accounting system, the basic accounting entity for governmental operations is the fund (Zimmerman 1977; Ingram 1984). Each fund generally requires separate budget-based accounting and self-balancing. Expenditures denote the use of governmental resources, and financial statements report not only financial position and comparison of revenue and expenditure but also changes in fund balances.

Auditors' responsibilities are also different from that in the private sector. Under governmental auditing standards, auditors not only provide auditors' opinions on financial statements but also are required to provide a written report on an entity's internal financial control systems. Auditors examine compliance with the rules of specific funds, laws, and regulations (Raman and Wilson 1994; and Gauthier 1991). These additional demands on audited reports make governmental auditing complex (Zimmerman 1977) but, at the same time, provide an opportunity for auditing to play a critical role to enhance both external and internal monitoring systems.[1] Moreover, since auditors perform an audit of internal control, our research may provide useful information to evaluate audit effectiveness under new auditing standards instituted by the Public Company Accounting Oversight Board (PCAOB).[2]

The Quality Basic Education Act

In Georgia, the Quality Basic Education (QBE) Act was implemented in 1985. This act was implemented specifically for the purpose of ensuring Georgia students receive a quality K-12 education. Public officials in enacting this legislation made public education a central part of their political agenda. This provides an ideal setting to examine the effect of elected public officials' incentive to supply a monitoring system as discussed by Baber (1983, 1994) and Baber

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[1] Appendix 1 is funds information presented in a financial statement.
[2] Auditing Standard No. 2 denotes the auditing engagement concerning control as an audit, not merely a review or other limited exercise (Cunningham 2004).

and Sen (1984). The Georgia state constitution defines education as a primary responsibility of the state and Georgia Laws (O.C.G.A. 20-2-67(b)) specify, "local school systems should be in a form to be specified and prescribed by the state auditor." Under this law, state auditors take oversight responsibility for financial reporting. State auditors provide about 90 percent of all school districts' auditing. Thus financial information in this sector is a homogeneous audit-product.[3] This, in turn, creates an ideal setting to conduct relative performance evaluation. Moreover, the state department of education takes oversight responsibility for local school operations and makes school district specific information available to the public.

QBE funds were introduced to provide the support for specific student programs in an effort to improve the overall quality of public education.[4] Along with this introduction, new precise educational data become available at school district level, beginning from the 1994/95 academic year. The use of QBE funds requires precise disclosure of how each fund is allocated to a specific education program,[5] and, in turn, high auditing effort to assure compliance with the rules.[6] Disclosure of fees or time spent on auditing, however, is not required. "Fund-specific risks" on QBE funds is high for elected public officials due to their promise to improve public

[3] The Single Audit Act (effective January 1990) was implemented for most nonprofit organization receiving government funding to improve auditors' skills beyond those necessary for a standard CPA. Interested readers should refer to the study by Keating, Fischer, Gordon and Greenlee (2003) regarding the impact of compliance requirements on nonprofit organizations. Prior studies documented the existence of differential in audit services among auditors (Shields 1984, Simon 1985, Simunic and Stein 1987). The implementation of the Single Audit Act also indicates that the regulators feel a homogeneous audit-product improves the quality of the monitoring system provided by auditors.

[4] Examples of QBE funds include those for handicapped students, gifted students, special instructional assistance, remedial education, and limited English-speaking students. The programs for handicapped students are divided into four levels, Mild-resourced, Moderate-resourced, Moderate-self-contained, and Severe-self-contained. Different weights are assigned to each of these in the QBE formula.

[5] For example, auditors would assure compliance with the funding formula rules.

[6] Telephone conversation with a senior state auditor indicates that QBE funds tend to increase auditing time. According to a senior state auditor, the demand for timely auditing services may lead school districts to hire local auditing firms. There is an advantage in getting timely auditing services. School districts audited in a timely manner generally receive higher credit ratings and hence their cost of capital is generally low.

education.[7] Any misallocation of QBE funds or poor performance of educational reforms can directly damage elected officials' reputation. In this situation, according to demand-side prediction (Feltham, Hughes and Simunic 1991), risk averse elected officials choose a high level of disclosure because they need to establish public confidence in financial reports. Financial reports are used to communicate the performance of the educational reform with outsiders. However, the asymmetry in disclosure requirements generates a situation where auditing costs associated with QBE funds are unobservable to outsiders while the benefits arising from QBE funds are reported through student report cards. Thus, we posit that elected officials have a tendency to require excess levels of disclosure on the benefits of QBE funds: the cost of monitoring in the use of QBE funds exceeds the benefits of QBE funds.

Utilizing this unique example of educational reform, we analyze the Georgia public-school-district monitoring system. The audited reports are a critical part of monitoring system because they provide credibility regarding contractual relations between elected officials and interests groups. This is akin to the demand for the quality of auditing in the private sector where bondholders seek a way to assure high quality of accounting numbers used in the contract (e.g., Craswell, Francis and Taylor 1995; Reynolds and Francis 2001).

Performance Measures and Information Signals

Lambert's (1985) monitoring strategy can be applied to model a centralized monitoring system with two performance measures and two observable signals. In this application the two performance measures are the school district's student test scores (a non-financial measure) and the school district's financial information. The first observable signal is the student report cards, which are published by the state department of education. An additional information signal is

[7] Fund-specific risks are analogue to firm-specific risk discussed by Datar, Feltham, and Hughes (1991) and Feltham, Hughes and Simunic (1991). The elected officials face the likelihood of significant negative consequences if the school districts fail to achieve the stated goal.

constructed by conducting relative performance evaluation for public school districts. This signal is a joint distribution of two performance measures, and identifies a ranking in school district performance. This ranking is based on efficiency scores, which measure how well a school district improves an average student test score given the allocated budged. The difference between the estimated optimal school district and actual level of performance is "inefficiency," that is the level of student outcome would be attained if a school district has utilized all budget solely to improve student performance.

Since a large amount of state and local taxes are spent on public education, any abuse in the use of such funds is a welfare loss for local citizens. A good control system would reduce or minimize such nonproductive use of taxes. We, therefore, directly examine whether auditing reduces such nonproductive use of taxes, which can be manifest itself as wealth transfer from taxpayers to public officials. This is a straightforward estimate of auditor's contribution to social welfare, which is consistent with the notion that monitoring regulation should facilitate Pareto efficient resource allocation, discussed by Lev (1988) and Penno (1990).

III. AGENCY MODEL AND HYPOTHESES DEVELOPMENT

Agency Conflict and Governance Structure

Agency theory serves as a basis for the development of the model. Here, the principals are interest groups who represent voters and taxpayers, the agents are elected public officials who are centralized decision makers and supervise local school operations. Interest groups (the principals) in public school operation have a strong voice and demand quality public education. These interest groups also share the costs of failure to supply the quality of education with elected officials (the agents) who need to fulfill the demand. Because elected officials have to supply their political promise after the contract (e.g., an election), a moral hazard problem exists in their contractual relation.[8] This is similar to a situation where managers act as agents to fulfill their promise after their compensation contracts. According to agency theory (e.g., Jensen and Meckling 1976, Lambert 1985, Baber and Sen 1984; Baber 1983; 1994 Banker and Patton 1987), elected officials should voluntarily place an effective monitoring system to reduce external agency costs that arise from involvement of the interest groups.

QBE funds are specific budgets that are allocated to school districts to attain a political promise on the part of elected officials, therefore, they create "fund-specific risk" for these officials. According to the theoretical model of audit demand developed by Datar, Feltham, and Hughes (1991) and Feltham, Hughes and Simunic (1991), a greater firm-specific risk increases the demand for a higher quality audit. Analogous to this, we expect that a high "fund-specific risk" leads to higher level of disclosure and compliance requirements that school districts must follow in use of the funds. This, in turn, increases the demand for audits. The complex compliance requirements, however, come at a cost due to additional audit time requirements. Thus, QBE funds provide us an opportunity to closely examine economic consequence of elected officials' incentive to implement a good internal control system. They increase the level of disclosure conditioning on their pledged to improve public education.

Following Ingram (1984) and Baber (1983; 1994), we assume that political environment influences accounting practices. We illustrate governance structure in public school operation as a centralized monitoring mechanism, which should mitigate agency problems (e.g. Ingram 1984; Banker and Patton 1987). Elected public officials delegate monitoring responsibility to two state departments, the department of Audit and Accounts and the department of Education, where two types of information (financial statements and student report cards) are made available to the public. The state auditors take responsibility to assure the quality of accounting information

[8] This is similar to "firm-specific risks" where high uncertainty is associated with firm's future performance.

while the department of education takes responsibility to report student specific performance information. These two kinds of information are signals that elected officials use to assure their political promise.

External and Internal Monitoring Structures

A monitoring strategy with two information signals as advanced by Lambert (1985) is used here. This framework allows us to investigate how elected officials use state auditors to implement a centralized monitoring system. We assume that elected officials' expected salary is partly based on their performance and achievement of their political promises, which are evaluated by signals. The stakeholders can conduct investigation if they choose to do so.

Two signals are student report cards, *RC(y)*, and financial information reports, *c*. The *y* is school district's average student test scores as reported by the state department of education. The *c* are financial reports assured by the department of Audit and Accounts. Both *y* and *c* are made available to the public. We use these two kinds of information to construct efficiency scores that serve as relative performance indicators to evaluate the monitoring system. We estimate the dollar value of auditing contribution in this monitoring system.

Two types of monitoring are facilitated by the availability of financial reports and test scores. The first is an external monitoring that both the elected officials and interest groups use them to reduce contracting costs that arise when possibility of breaching their promise exists. The second is an internal monitoring that the elected officials use to align local school officials interest with their political promises. Because an elected official can influence the amount of school budgets, we assume that the student test score and financial reports are, to an extent, a function of elected officials' action, a.[9]

[9] For example, an elected official can decrease a student and teacher ratio or increase the amount of auditing budget by reallocating total budget for public school operations.

Following Lambert's (1985) optimal monitoring strategy, we define two information signals, student report card and efficiency scores, which reflect elected officials' efforts as follows,

(1) $$RC(y) + EFF(c, y) = \lambda + u\left[\frac{f_a(y \mid a)}{f(y \mid a)}\right] + u\left[\frac{g_a(c \mid y, a)}{g(c \mid y, a)}\right],$$

where *RC(y)* is student report cards at the district level that provide information about elected official's efforts to improve student test scores, y. *EFF(c,y)* is efficiency score that provides an additional information about elected official's efforts associated with both the use of school district budget (financial information c) and student test scores. The right-hand-side of equation is performance measures where the term $\frac{f_a(y \mid a)}{f(y \mid a)}$ is the likelihood estimate of the expected average student test scores at a district level given elected officials' efforts, *a,* and the term $\frac{g_a(c \mid y, a)}{g(c \mid y, a)}$ is the likelihood estimate of the quality of financial reporting at a district level given student test scores and elected officials' efforts. Student test scores and the prior distribution of the quality of financial reporting are assumed to be independent.[10]

Efficiency scores are a joint distribution of student test scores and financial information, which we explain more detail in the next two sections. They are the summary of relative performance evaluation that can be made available to the principals (interest groups). Because efficiency scores supplement the principal's prior information about expected school district performance and incorporate not only student test scores but also financial information, they are comprehensive information signals.

[10] When c and y are jointly observed and y is independent, h(y,c|a)=f(y|a)g(c|y,a), by taking derivative with respect to agent efforts and divided by an original function, this relationship can be further written as, $\left[\frac{h_a(y, c \mid a)}{h(y, c \mid a)}\right] = \left[\frac{f_a(y \mid a)}{f(y \mid a)}\right] + \left[\frac{g_a(c \mid y, a)}{g(c \mid y, a)}\right]$. Milgrom (1981) and Lambert (1985) demonstrate the log of the likelihood function with respect to efforts in this way.

Hypothesis Development

Using the standard principal and agency theory model, Lambert (1985) shows that performance measures (the right-hand-side of equation 1) directly relate to an agent's utility function.[11] We do not reproduce his derivations. Lambert's (1985) proposition one is the fundamental notion of good governance. It suggests that for a supplemental signal to be cost effective, its gross benefit must be strictly positive. That is, the marginal benefit of monitoring must to be positive. This requires the relative performance evaluation should reveal inefficiency in school district operation and the ability to disclose inefficiency should generate the economic benefits for principals (e.g., interest groups) over the cost of supplying monitoring.

The estimated inefficiency is the amount of student performance that school districts should have improved if a district has used the budget purely to produce educational outcome. Student test scores, which are a proxy for student performance, are a nonfinancial measure and the costs of supplying public education are a financial measure. These costs include the auditing, which provides credibility in reporting numbers.[12] These two performance measures together determine both the optimal level of school performance and inefficiency.

If auditing is an effective monitoring tool, it should reduce nonproductive use of taxes (inefficiency), which can manifest itself as a wealth transfer from taxpayers to bureaucrats. Moreover, this reduction should exceed the cost associated with auditors' effort exerting into the auditing. Our first null hypothesis tests a fundamental economic contribution of auditing:

H1: Public school auditing does not reduce excess nonproductive use of taxes.

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[11] Larmert's propositions are drived for the compensation of managers in private sector firms. It is obvious that proposing that state legistrators or local school board members have identical motivations is problamtic analogy. But Lambert's proposition should hold in a wide area of principal/agnet relationships, including a situation in the public sector.

[12] It is important to note that auditors are outside of a school district production function. Their role is monitoring and do not directly improve school district's operations.

We expect that inefficient use of taxes varies inversely with auditing time if auditing plays both internal and external monitoring roles. We test the ability of auditing to reduce nonproductive use of taxes by regressing auditing time on efficiency scores. We also calculate the dollar values of auditing contribution to improve inefficiency score. This amount is the direct economic impact of monitoring. Any improvement in the efficiency scores due to auditing rejects the above governance hypothesis, suggesting auditing truly works as a monitoring function.

Lambert's (1985) second proposition suggests that "a penalty system" should work better in the public sector than in the private sector because public officials are, in general, more risk averse than individuals in private enterprise. This proposition provides insight into Baber (1983) and Baber and Sen 's (1984) claim that political competition provides strong incentive to supply good monitoring. Baber (1983) and Mark and Raman (1987) show that state audit budgets are positively related to various political competition proxies. In our setting, a public promise serves as "a penalty" that is set by elected officials. This creates a politically competitive situation where the higher the numbers of students in the school districts, the larger the numbers of interest groups (parents, taxpayers) to whom elected officials wish to provide their promise. Therefore, there should be a positive relationship between the numbers of student enrollment in the school district and auditing efforts that elected officials allocate the budget. Our second null hypothesis is

H2: The auditing effort is not impacted by student enrollment or complexity in auditing requirements.

We test this political cost hypothesis by regressing the number of students enrolled on auditing time. Because complexity in compliance is one of attributes to increase auditing time, we include the proportion of QBE fund, local fund and federal fund to total budget to control for complexity in auditing procedures.[13] The total budget in dollars is also included to control for size. Because auditors might allocate a large amount of time for a large dollar recipient school district, the budget size might be a significant explanatory variable, separate from student enrollment (a proxy for political competition). The rejection of this hypothesis suggests that the degree of political competition affects auditing budgets, and indirectly indicates how a penalty plays in the contractual situation.

Elected Official's Incentive on Monitoring Structures

Lambert's third proposition suggests that a positive association between the variance of the term $\frac{g_a(c \mid y, a)}{g(c \mid y, a)}$ and the amount of information disclosure that outsiders can use to evaluate managerial actions. Intuitively, the term $\frac{g_a(c \mid y, a)}{g(c \mid y, a)}$ represents a measure of inference about elected official's effort that financial reporting provides given the inference already provided by student test scores. This variance is directly related to an agent's utility and his/her contractual relationship with the principals.

An improvement of public school performance means the sum of student performance in a local school district across state is greater in the post-QBE Act period than during the time before the QBE Act. Or the other way of viewing, the sum of nonproductive use of taxes in a local school district across state is less in the post-QBE Act period. The external control system is to make the performance of QBE funds observable for interest groups. The elected public officials achieve this goal by creating student report cards. The internal control systems align local public official's interests with their political agenda. The larger the district-wide variation in QBE funds, more signals for elected officials to closely monitor local school district's

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[13] Because QBE funds are the part of state fund this does not create linear dependency in the model.

performances. This variation reveals the nonproductive use of taxes at local-school-district levels. Thus, the elected public officials establish an internal monitoring system, which helps to reduce internal agency costs, by distributing and evaluating performance of QBE funds at a local school district level. Moreover, this monitoring system is consistent with Lambert's informativeness of information system, which produces financial information c.

To evaluate this monitoring system, in particular focusing on audit effectiveness, we consider two potential sources of adverse effect on monitoring. They are strenuous compliance requirements and asymmetry in the disclosures requirements (the high level of disclosures requirement on the use of QBE funds and no requirement on auditing fees or time). Because QBE funds have a high fund-specific risk, the elected officials have strong desire to closely monitor the use of this fund at the local-school-district level and impose compliance with the rules regarding QBE funds. This helps to increases transparency of local school operations, which should lead to reduce external agency costs since interest groups can observe the performance of educational reform. This requirement, however, comes at a cost by demanding the high level of auditing time. In the current system, there is no requirement to report or to keep a record about auditing fees or auditing time. This asymmetrical disclosures requirement potentially leads to inadequate audit budget allocation. Less than necessary is allocated to audit. We, therefore, test an impact of QBE funds on the audit budget. Our third null hypothesis is:

H3: QBE funds do not improve school district student performance and do not affect audit budget allocation that reduces auditing effectiveness.

We test this auditing effectiveness hypothesis jointly with the hypothesis one. Efficiency scores are a comprehensive performance measure that reflects both financial and nonfinancial measure.[14] We use efficiency scores as a dependent variable and test the impact of QBE funds and the combination of auditing budget and QBE funds on efficiency scores. Since we do not have dollar values for the auditing budget, we use audit time. We believe that audit time is a better proxy for the auditing budget because it is free from other factors in prices such as reputation, competition, and price differentiation.[15] We examine an impact of an interaction between QBE funds and auditing time on efficiency scores. If auditing time allocation is problematic, we expect that the coefficient on the interaction term is negative. The rejection of this hypothesis suggests: first, QBE funds improve the public school quality by efficiently allocating school budget and second, complexity in disclosure requirements impair the auditing effectiveness.

IV. RESEARCH DESIGN

The Selection of Efficiency Estimation Techniques

We use a frontier estimation technique to test hypotheses above. Efficiency score is a function of student test score, a vector of y, and financial information c as defined in equation 1. Several different methods are available to estimate efficiency scores, but the two most common approaches are data envelopment analysis (DEA) and stochastic frontier estimation (SFE).

Since these approaches differ in many ways, we use several approaches to estimate school district efficiency in the use of educational funds.[16] With two reasons, however, we focus our discussion on the SFE using an OLS error adjusted approach and a translog form of the distance function. First, this method is easily applicable because it is a modification of an

[14] Efficiency scores are, to an extent, similar to security returns adjusted for the observed optimal level of returns.
[15] Because we study a single auditor (state auditors), reputation may be less concern is some other cases. But price information is, in general, noisy. In addition, in our context of auditing effectiveness, audit time is a more appropriate measure than budget.
[16] These approaches include OLS error adjusted SFE using distance function of both Cobb-Douglas and translog functional forms, SFE with Cobb-Douglas functional form, DEA both constant return to scale and variable return to scale.

ordinary least squares (OLS) estimation technique. While Dopuch, Gupta, Simunic and Stein (2003) provide the review of efficiency estimation techniques about DEA and SFE, OLS error adjusted approach using a distance function has not previously discussed in the accounting literature. Second, we found the estimated efficiency scores among DEA and OLS error adjusted approaches are highly positively correlated to each other.

The distance function has a built-in interpretation of a performance measure, which is composed of two components of errors. These are the random and inefficiency components. It is also well suited to the use of a flexible functional form. This is desirable property because production or cost functions for school districts are known to be nonlinear (e.g., Grosskopf, Hayes, Taylor, and Weber 1997). Therefore, the following Grosskopf, Hayes, Taylor, and Weber (1997) and Grosskopf and Mountray (2001), we use the cost-indirect-output-distance-function (CIODF) of the translog form to estimate inefficiency. An adjusted OLS method, suggested by Greene (1980), can be adapted to the problem at hand, once the objective function is defined.

Translog Functional From of Distance Function

As noted by Banker and Patton (1987) and Grosskopf, Hayes, Taylor and Weber, (1997), school operations are based on and constrained by budgeted revenue. With this in mind, the CIODF is used to estimate the benchmark school districts.[17] The estimated benchmark school districts are the ones that produce the highest student value-added outcome given allocated budgets. An existence of inefficiency is a realistic assumption in the operation of public schools (eg., Grosskopf, Hayes, Taylor and Weber, 1997; Dopuch and Gupa 1997; Grosskopf, Hayes, Taylor and Weber, 1999). In our setting, inefficiency is a joint distribution of school district's

[17] The cost indirect output distance function models the technology of public school "that produce multiple outputs under conditions of budgetary constraint" (Grosskopf, Hayes, Taylor and Weber; 1997, p.117).

average student test scores and financial information as defined in equation 1. The translog form of CIODF for public school operation is, therefore, defined as follows:

(2)
$$\frac{1}{\| y_{st} \|} = ID_o\left[\frac{w_{st}}{c_{st}}, z_{st}, \frac{y_s}{\| y_{st} \|}; \alpha, \beta\right]\varepsilon_{st} ,$$

(3)
$$\ln\left(\frac{1}{\| y_{st} \|}\right) = \alpha_0 + \sum_{i=1}^{n}\alpha_i \ln\left(\frac{w_{ist}}{c_{st}}\right) + \alpha_j \ln z_{st} + 1/2\sum_{i=1}^{n}\sum_{j=1}^{n}\alpha_{ij}\ln\left(\frac{w_{ist}}{c_{st}}\right)\ln\left(\frac{w_{jst}}{c_{st}}\right)$$
$$+ \sum_{k=1}^{m}\beta_k \ln\left(\frac{y_{kst}}{\|y_{st}\|}\right) + \sum_{i=1}^{n}\sum_{k=1}^{m}\beta_{ik}\ln\left(\frac{w_{ist}}{c_{st}}\right)\ln\left(\frac{y_{kst}}{\|y_{st}\|}\right) + \sum_{i=1}^{n}\sum_{r=1}^{q}\gamma_{ir}\ln\left(\frac{w_{ist}}{c_{st}}\right)\ln z_{rs} + \ln\varepsilon_{s,t}$$

where ID_o is CIODF with a translog functional form, $\| y_{st} \|$ is the Euclidean norm of the outputs measure, $\| y_{st} \| = (y_{s1t}^2 + y_{s2t}^2 +,..., y_{smt}^2)^{1/2}$, y is the vector of educational outputs (seven different kind of student test scores), $\frac{w_{ist}}{c_{st}}$ is the vector of budget deflated input prices, i, j, k, and s are indices of observations for input prices (i = 1, 2, and 3), output quantities (k = 1, …,7), and school districts (s = 1,…, n), *t* is an index for time (t = 1,2 and 3), and *z* is the environmental variable, a student to teacher ratio. $y_{kst} / \| y_{st} \|$ is normalized output,[18] α and β are parameter estimates. The ε_{st} is the non-normally distributed error term that composes of random error, ν, and one-sided error, μ, as defined $\varepsilon_{it} = \nu_i + \mu_{it}$. This is a convenient built-in property of inefficiency in CIODF. The educational output is estimated using a value-added method, which will be discussed in the next section.

The input price variables are the average teachers' salary,[19] the average support personal salary,[20] and the adjusted Consumer Price Index for materials costs.[21] These material costs are

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[18] Modeling multiple outputs, the norm was chosen as $1/ \| y_{st} \|$.
[19] Full time teachers as well as part time teachers are included.

non-labor expenditures that are directly related to teaching and student activities such as books, food services, library and media services, and student transportation costs. The budget-deflated prices are the input prices divided by the budget. These budget-deflated prices represent the value of short-term costs of student activities. Since short and long-term decisions on budgets are often made at different levels of the decision making process, this analysis evaluates the more flexible portion of the school budget by concentrating on operating expenditures (the costs closely related to student and teaching activities).

Three categories of school district expenditures (total teacher salaries, support staff salaries and material expenses) typically make up about 75% of the total district expenditures on education. The sum of these three expenditures serves as the budget constraint and represents short-term budgets that are mostly allocated by the state departments of education (some portion is also from federal restricted funds).

Importantly, inputs unique to auditing are not included in this distance function because auditing does not directly involve in school district operation. Auditing is a monitoring function to improve the use of school district budgets, but auditors are outside of school districts purview. This is particularly privilege of our research design that allows us to evaluate auditing effectiveness on the school district performance.

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[20] Support personnel includes: Students Service personnel, information Services personnel, Librarian/Media Specialists, Special Education Specialists, and Recreational Therapists. The most of CPI Codes 400 are included in this category (The Report Cards 1996-97).

[21] Since figures for the annual Consumer Price Index, computed by the Bureau of Labor Statistics, are average figures from January to December, re-computation of an index has been done so the results correspond to the academic year. For instance, to estimate the index for the 1994/95 academic year, the twelve monthly observations from July 1994 to June 1995 are averaged. Annual index observations calculated by this method were highly correlated with educational price indices provided by Inflation Measures for Schools, College and Libraries,1995 update.

Because multicollinearity was a problem when the full translog model was estimated, the interaction terms among outputs were dropped from the model. The advantage of translog function is that the first derivatives of this flexible form with respect to $\ln(\frac{w_{ist}}{c_{st}})$ equal the budget share equations. By estimating the share equations and the distance function in a system of simultaneous equations, the efficiency of the estimated parameters is improved. Thus, by differentiating above equation with respect to $\ln(\frac{w_{ist}}{c_{st}})$, the following the budget shares for the i = 1,…, n inputs (n = 3 in this case),

$$B_{is} = (\frac{w_{ist} x_{is}}{c_{st}})$$

$$= a_i + \sum_j a_{ij} \ln(\frac{w_{ist}}{c_{st}}) + \sum_k \beta_{ik} \ln(\frac{y_{kst}}{\| y_{st} \|}) + \sum_r \gamma_{ir} \ln z_{rs}$$

are included along with several imposed restrictions in the system of simultaneous equations. The restrictions imposed are: (1) the homogeneity conditions for output, as follows:

$\sum_{k=1}^{m} \beta_k = 1$ and $\sum_{k=1}^{m} \beta_{ik} = 0$, k=1, …,m where m = 7;

(2) the budget share equations of the n inputs must sum to 1 as follows:

$\sum_{i=1}^{n} a_i = 1$ and $\sum_{i=1}^{n} a_{ij} = 0$, $\sum_{i=1}^{n} \beta_{ik} = 0$, and $\sum_{i=1}^{n} \gamma_{ir} = 0$

where j = 1, …, n, k = 1, …, m and r = 1, …, q; ,

and (3) by Young's theorem, it requires the twice continuously differentiable indirect output distance function that is symmetric in normalized input prices as follows:

$a_{ij} = a_{ji}$ for $i \neq j$. To avoid exact linear dependence of the error terms, one budget share equation is dropped in the actual estimation.

Our estimation shows that all share equations were positive. This indicates the demand functions are also positive when evaluated at the mean points.

Inefficiency Estimation

We estimate benchmark (frontier) school districts from the CIODF above. Build-in inefficiency is captured by negative non-normal component of error terms. That is, two components of errors are imbedded in the distance function, writing as $\varepsilon_{it} = v_i + \mu_{it}$ where v is random component of error and μ is one-sided error to captures inefficiency.[22] Although we do not explain detailed property of distance function, interest readers should refer to Färe and Grosskopf (1994,1996) and Färe, Grosskopf and Lovell (1988) who provide detail explanation of a theoretical description about distance functions.[23]

Because of the negative component of the error terms, the ratio of an inefficient school district to an observed best practicing school district is given by the following:

$$(4) \qquad 0 \le ID_o\left[\frac{w_{st}}{c_{st}}, z_{st}, \frac{y_s}{\|y_{st}\|}; \alpha, \beta\right]\varepsilon_{s,t} = \frac{f_d(w/c;\alpha,\beta)EXP(v_i - \mu_d)}{f_d(w/c;\alpha,\beta)EXP(v_i)} \le 1$$

where $f_d(w/c;\alpha,\beta)$ is an output oriented distance function for school district s, EXP is exponential function, v is random error distributed normally and μ is one-sided error goes into negative to the output oriented distance function. By taking log transformation, the difference

[22] An ordinary least squares (OLS) estimation is based on an average observations and underlined assumption -- residuals from the regression model is normally distributed with a mean zero and a constant variance – is that there is no inefficiency captured in regression residuals. In contrast, our method, SFE tests potential inefficiency captured in residuals by estimating the best practicing school districts (frontier). Any deviations from the frontiers are potential inefficiency that is captured by additional component of residuals. SFE allows the random component of errors in the estimation of inefficiency while DEA assumes all deviations are inefficiency. An adjusted OLS method is one type of SFE technique.

[23] The distance function and the notion of production frontier have been discussed by many researchers. For example Färe, Grosskopf and Lovell (1988) and Färe and Grosskopf (1994, 1996) discuss various types of distance functions. Chambers (1988) discusses production frontier and duality and Färe and Primont (1995) discusses duality and output and input relationships. Interesting readers can refer to these original papers.

between efficient and inefficient school district yields technical inefficiency, which can be written as:

$$(5)\quad \frac{I\hat{D}_o(w_s / c_s, \frac{y_s}{\|y_s\|} : \alpha, \beta)}{\frac{1}{\|y_s\|}} = \frac{\|y_s\|}{\|\hat{y}_s\|} = \frac{ACTUAL}{OPTIMAL}.$$

Since optimal school districts are assigned efficiency score of one and less than one for any other school districts, efficiency scores have an ideal scale-free measure. We estimate this efficiency scores by modifying the OLS residuals by employing the "corrected ordinary least-squares" approach discussed by Greene (1980) and Grosskopf, Hayes, Taylor, and Weber (1997). That is, we adjust the OLS residuals by using the smallest OLS residual as follows:

$$(6)\qquad EFF = \frac{\|y_s\| * \min(\varepsilon_{st})}{\|\hat{y}_s\|}.$$

This yields the distance function and efficiency score between zero and one.[24] Less than one indicates inefficiency, and smaller the efficiency scores, the larger the amount of a school's budget is being used for nonproductive purposes. That is, the difference between efficient and inefficient school district is nonproductive use of taxes, which is the amount of wealth loss for principals beyond the benchmark level. This amount indicates improvement of student performance that school district could have attained if its budget is used fully to improve student performance. In other words, this amount can manifest itself as a wealth transfer from taxpayers to local public officials (which serve as a proxy for public officials' potential perquisite consumption). Under politically competitive environment, elected officials have a strong incentive to reduce such welfare transfers.

Estimation of Value Added Educational Outcome

[24] Since observations include a random component of noise, without scaling the ratio is greater than one.

To estimate efficiency scores, we need to define educational outcomes. Our analysis is on elementary and secondary school operations at the school district level (grade 1 to 12). We choose student test scores as ultimate educational performance measure because they are the most commonly used educational outcome, in spite of perceived shortcomings (e.g., Hanushek 1986; Grosskopf, Hayes, Taylor and Weber; 1997).

It is well known that socioeconomic factors impact educational outcomes. To control for this impact, we first regress socioeconomic factors and previous test scores against the educational outcomes, prior to the estimation of school district performance. The residuals from this equation serve as our measure of student performance. The exogenous factors for student performance, therefore, are controlled in our student test scores. This technique is referred to as the value-added educational model, and has been employed by several authors (Hanushek 1986; Grosskopf, Hayes, Taylor, and Weber 1997).

The models for school districts' value-added outputs are as follows:

$$(7)\quad TEST_{t,d,s} = \delta_{1,t,d,} + \sum \delta_{2,t,d} ETHNICITY_{t,d} + \delta_{3,t,d} LUNCH_{t,d} + \delta_{4,t,d} POPD_{t,d}$$
$$+ \delta_{5,t,d,} TEST_{t-2,d,s} + \sum \delta_{6,t,d,} DUMY + \varepsilon_{t,d,s} \text{; and}$$

$$(8)\quad (1 - DROP_d) = \delta_{1,t,s,} + \sum \delta_{2,t,d} ETHNICITY_{t,s} + \delta_{3,t,d} LUNCH_{t,s} + \delta_{4,t,s} POPD_{t,s}$$
$$+ \delta_{5,t,s,} TEST_{11,d} + \sum \delta_{6,t,s,} DUMY + \varepsilon_{t,s},$$

where TEST is student test score, ETHNICITY is a racial composition which is used to control for cultural background factors,[25] LUNCH is the percentage of free/reduced lunch program participants which accounts for family income levels, POPD is population density that controls for rural characteristics, and $TEST_{t-2}$ is the previous test scores that control for the specific

[25] Characteristics of peers or the effects of other students have received attention from several researchers as an element of socioeconomic characteristics. The racial composition (white, black, Asian, and Hispanic) is one of these variables (Hanushek,1986; Johnson and Stafford,1997; and Benabou,1996).

cohorts' marginal effect on test scores. Dummy variables (DUMY) for each year are included to capture specific year effects in the model. DROP is a proportion of students who dropout (grade 9-12) during the year. The *t, d,* and *s* are indices, *t* indicates grade 5, 8, and 11; *d* indicates school district; and *s* indicates subject, mathematics and reading.[26] Since high student performance can be attained by a high student dropout rate, this variable is included to account for bad outputs from educational process.

Residuals estimated from above equations are the deviations of value-added in school district (subscript d) from the state mean. Since all test scores (grade 5, 8, and 11 for both reading and mathematics) and the complement of the dropout rate share common regressors; contemporaneous correlation among residuals is expected among these seven equations. To ameliorate this problem, we use the seemingly unrelated regressions. In addition, since a half of school districts will have negative residuals and the distance function requires positive outputs, the average intercept is added to the above equations (as suggested by Grosskopf, Hayes, Taylor, and Weber 1997). The final value-added output is:

(9) $$Output_s = INTER_{s,y} + g_{t,d,s},$$

where $INTER_{s,y}$ is the average intercept of each of seven value-added equations for separate year, t.

V. DATA DESCRIPTION

Three years of educational data (from the 1994/95 to the1996/97 academic years) were collected from the Georgia Public Education Report Cards provided by the Georgia Department of Education. Newer precise educational data, available at the school district level, beginning

[26] Data for student test scores are collected for grades 3, 5, 8, and 11. But since previous test score is used to capture the value added portion of student performance, these equations are for grade 5, 6 and 11 for both mathematics and reading.

1994/95 provides opportunities to analyze monitoring mechanism for Georgia public school operation.

Because the Georgia Department of Education changes definitions and classification of variables over these three years we reconstruct a consistent data set based on the definitions provided by the department of education (1996/97 academic year Georgia Public Education Report Cards).[27] During this time period, the Governmental Accounting Standards Board (GASB) statements 25 through 31 were implemented. These statements require finer assessment of financial risk and investments activities for governmental operation. This increases complication in the auditing procedures.[28]

Georgia has a total of 181 school districts. Seven counties did not have a high school, and six of these seven do not have a junior high school. The students from these counties attend junior high or high schools in nearby counties. Since sufficient data for these merged school districts are not available, these fourteen counties and one outlier are excluded from the analysis.[29] A final sample of 166 school district observations is available for each year (for a total of 498 observations).

The descriptive statistics for the budget and inputs variables are shown in Table 1. The average expenditure for teaching and student related activity per a student is about $4,000. The salary for teachers is the largest portion of expenditure, which represents about 38 percentage of the total budget accounted for this analysis.

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[27] One measure change is testing score reporting on the Report Cards. Despite of critique sounding this change, the test score specific to student in the state of Georgia is now reported. This test scores have no comparative measure with nationwide test scores. This change makes it difficult for us to extend our data collection period.

[28] For example Statement 30 requires a risk financing omnibus method to calculate deficiencies for financial risk and statement 31 requires reporting for certain investments for external investment pools.

[29] The fourteen counties consist of the seven counties with no high school, plus the seven adjacent counties in which the combined schools are located.

Auditing time data (hours spent on auditing) were collected from Georgia Department of Audit and Accounts. Current regulations do not require auditors to keep a record regarding to their auditing work. As a result, the only available data were for 1996/97, 1997/98 and 1999/00 academic years. No auditing fee data were available because the auditing department does not charge auditing fees separately to each school district. For each year, private auditors audit about 20 school districts. Since no auditing data are available for these school districts, we drop these school districts from the analysis. This results in total school districts of 145 for each year. Since school performance data are based on school years 1994/95 to 1996/97, which are two years lag behind of auditing data, we conduct several analyses to associate these two data sets. The following section explains these analyses.

Research Design to Associate Auditing Time and Education Data

Figure 1 summarizes the implementation of this monitoring mechanism and the time line of this system assumed in this analysis. We assume that the monitoring effect starts at the time when the implementation of the monitoring system is publicly announced. Accordingly, once the monitoring system is implemented, nonproductive use of taxes becomes a function of the expected future monitoring. This enables us to drop subscript t to evaluate auditing effectiveness.[30]

Analyses on Each Data Series

First, we examine an association among each data series for auditor's time and fund allocation. Prior studies suggest that public school operation is budget based (e.g., Banker and Patton 1987; Baber 1983; 1994, Chalos 1994). Due to the mismatch between the time frames of the data series, the only plausible way to associate auditor's time allocation to fund allocation is

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[30] This is an expectation model in that we examine how the expected future auditing (investigation) affects on current school district operation. This is limitation of our study because data are available only for limited period. But it is consistent with Lambert's model that examines the effect future investigation on monitoring effectiveness.

to analyze a relation between auditing time and funds allocation through time. To examine this relation, each series is first regressed on lags of its own value to determine if the levels remain stable through time.

If the auditors' time allocation is based on the prior year's time allocation then the coefficient estimate for a one-year autoregressive model should be one, and so on back through time. Since governmental decision-making is often a slow process the following two-year autoregressive model was also estimated for X_t, representing auditing time, the dollar value of QBE funds, LOCAL funds, and FEDERAL funds per student:

(10) $$X_t = \alpha_0 + \alpha_1 X_{t-1} + e_t ,$$

(11) $$X_t = b_0 + b_1 X_{t-2} + u_t ,$$

The subscript t indicates the time period. The descriptive statistics and the results of above autoregressive models are reported in Table 2 and 3, respectively. Descriptive statistics for auditing time show that auditing time increased between the first and second years but decreased between second and third years (Table 2). The average dollar values of the funds per student and the average number of student enrolment increased over three years. Table 3 shows that all of the coefficient estimates are significant at the α level 0.01. T-statistics show that all estimates, except for the two-period lag model for Federal funds, cannot reject the null hypotheses a_1 and b_1 equal to one. All of the four models have a similar pattern indicating that the allocation for current period of auditing time (or each fund) is the same as prior period's allocation except for a state-wide adjustment (reflected in the intercept). That is, the pattern for allocation in time period t and t+1 is essentially equal to that for period t-1. One way to interpret this result is that year-by-year changes in student characteristics have a relatively small impact on auditing time and budget allocations. These results are consistent with prior research; school operations are budget-based and once the budget is allocated to the district, each district uses up all budgets (Banker and Patton 1987; Baber 1983; 1994, Chalos 1994).

Next, we examine an association between auditing time and budgets that comes from three different sources. Federal, State, and Local funds reflect their own political regimes and we focus on QBE funds, the part of the state funding. We conduct the Pearson and Spearman correlation analysis among the proportion of each fund to the total budget and auditing time to examine whether the similar correlation pattern exists among these variables over three years. First, we use only year 1996 data and examine how these four variables are correlated to each other. Here, there is no time lag between auditing time and the budget. We, then, examine the correlation between one-year-lag auditing time and the budgets and between two-year-lag auditing time and the budgets, respectively.

These results are shown in Table 4. Panel A is year 1996 of 147 observations, no time lag between auditing time and fund source. Panel B has 294 observations and auditing time and fund source data has one-year–lag. Panel C has 435 observations and auditing time and fund source with a two-year-lag. We examine this correlation from two different perspective of audit budget allocation. The first is “the political-completion” based allocation. We expect that audit time be highly positively correlated with student enrolment (our proxy for political competition). The second is “the complexity-in-auditing” based allocation. We expect that audit time be highly positively correlated with the percentage of QBE funds in the total budget.

The patterns of correlation among variables are very similar regardless of time lag (Table 4). Auditing time is highly positively correlated with the student enrolment and negatively correlated with the percentage of QBE funds in the total budget. This pattern is consistent with “the political-competition” but inconsistent with “the complexity-in-auditing” based allocation.

The high audit budget is allocated to a school district with the high numbers of interest groups but not with the degree of complexity in auditing. A negative correlation between auditing time and the proportion of QBE funds in the total budget suggests that the political-competition based budget allocation potentially results in lower budget allocating to a school district with complex auditing procedures.

We also conduct year-by-year correlation analysis using data in Panel B and Panel C. The untabulated results are qualitatively similar to the results reported on Table 4. Thus, these results together verify that year-by-year changes in school district characteristics do not significantly influence resource allocation decisions but interest groups do.[31]

VI. THE EMPIRCAL MODEL AND RESULTS

Efficiency Estimation

Table 5 presents the estimated efficiency scores. Panel A shows correlation among the efficiency scores estimated by several different estimation techniques; a variable returns to scale (VRS) is efficiency scores estimated by DEA; two stochastic methods SFE and the OLS error adjusted method (within which two functional forms are estimated, those being the Cobb-Douglas (Cobb_SFE, Cobb_OLS) and Translog (Translog_OLS)).[32] The four efficiency scores are very highly correlated to each other, especially for efficiency scores from two types of stochastic methods (Cobb_SFE, Cobb_OLS) are virtually the same. These correlations provide evidence

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[31] We also conduct the correlation analyses between budget (total revenue) and total expenditure. As we expected, the untabulated correlation shows that school district's budget is highly correlated with total expenditures (the correlation coefficient is very close to one) for all three years. This result supports previous findings that school operations are budget-based (Banker and Patton 1987; Baber 1983; 1994, Chalos 1994). Once the budget is allocated, school districts use all budget every year. We believe that these results provide reasonable evidence that our research design to use two-year-lag auditing time does not create any serious data problem to distort our results.

[32] Because of the restrictions on share equations, we could not estimate efficiency scores based on translog form of SFE technique. We use a software package called Frontier By Coelli as well as TSP to write our own program to estimate efficiency scores based on SFE technique.

that the estimated efficiency scores are robust to different estimation techniques. Thus, the rest of our discussions are based on Translog_OLS efficiency scores.[33]

Figure 2 illustrates how the efficiency score is related to the unit free measure of nonproductive use of taxes, and how an impact of auditing on efficiency scores is estimated. All school districts on the frontier are the efficient school districts, which has a benchmark efficiency score one. School districts fall inside of this frontier (y* and y^o) are ones that do not utilize school budget fully to increase student performance. The radial distance between the observed school district performance and frontier, $1 - \frac{y^o}{ID_o(w/c, y)}$, measures inefficiency that has an interpretation; the amount of student outcome could have increased if school districts use the budget solely to improve student performance. Another view of this amount is wealth loss for a taxpayer, which potentially represents wealth transfer from taxpayers to local school officials. We directly estimate the impact of auditing on such wealth loss by measuring the reduction of radial distance.

The mean efficiency score is 0.913, shown in Panel B, which is higher than those reported by Grosskopf, Hayes, Taylor, and Weber's (1997) study of Texas school district data. They found a mean efficiency score of 0.708. This difference partially reflects differences in characteristics of the data. They restrict their samples by the school size measured by student enrollment (between 1000 and 5000 students).[34] We feel that that the wide coverage of school districts in our study

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[33] We estimate the translog model, equation 3. The model has 82 parameters with 36 restrictions resulting in a total of 46 free parameters. About 40% of parameters estimates are significant at $\alpha = 0.10$. Some might argue the superiority of the DEA method, but we do not believe DEA method is superior to SFE for our application. Moreover, Bauer, Berger, Ferrier and Humphrey (1998) compare the results of several estimation techniques and provide some indications that SFE approach provides the results that more closely match to a traditional accounting research method than the results from DEA.

[34] As shown in Table 1, the sample used here has an average enrollment of 7602 with a standard deviation of 13460. The Georgia data cover all school districts in the state and, hence, contain more variations in student and school related factors.

actually reduces variability among school district performance when we control for the budget size, resulting in efficiency score close to 1.0.[35]

The mean efficiency scores were lower for school districts that employ state auditors than that for the overall average, for all three years.[36] The mean efficiency score increases between 1994/95 and 1995/96 academic years, however, it decreases between the 1995/96 and 1996/97 academic years. Efficiency scores indicate that nonproductive use of taxes increases later year. In the next section, we discuss whether audit helps to reduce nonproductive use of taxes and works as a monitoring function.

Model and Results for Hypotheses

We develop the hypothesis one, two, and three based on Lambert's propositions about monitoring strategy. Since the hypothesis one and three are jointly tested in a single equation, we first discuss the hypothesis two. The hypothesis two is based on Lambert's second proposition; "a penalty system" should work better for more risk averse individuals than for less risk averse. We assume that the public officials are, in general, more risk averse than an individual in the private sector, and hence, a political promise serves as "a penalty" set by elected officials. Hypothesis two tests whether our proxy for a political competition is positively correlated with audit budget. We use auditing time as a proxy for audit budget and student enrollment as a proxy for political competition.

We incorporate the background of political regimes by including three fund sources, federal, QBE, and local funds. Each of these funds reflects its own political regime. The disbursement of QBE funds is a difficult task because of complex rules about how they may be spent, making auditing procedures complex. We test the impact of elected officials' incentive on

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[35] We do not think that the outliers are not the problems since we eliminate these school districts prior to our analysis.
[36] The auditing information is based data from the 1996/97 to 1998/99 academic years.

auditing budget, in a political cost hypothesis. For a competing hypothesis, we also test whether complexity-in-auditing is a driving force of audit time allocation.

Two equations are used to test the hypothesis. First, auditing time is regressed on the proportion of QBE funds, federal funds, local funds along with student enrolment. The proportion of each fund relative to total budget measures the degree of complexity in funds. To control for dollar value in size, we also include the dollar amount of per student total budget. A size variable is correlated with audit quality, which may be measured by audit time (De Angelo 1981; Feltham, Hughes, and Simunic 1991). If we do not control for a size, an observed positive relation between audit time and student enrolments may merely represent the positive relation between auditor and size.

Since QBE funds are more complex than other two, the proportion of QBE funds to the total budget captures the level of complexity-in-auditing. There is no requirement on disclosures of audit time. This means that the monitoring costs associated with complex funds are not publicly available. We expect that monitoring costs influence less on the elected officials' decisions than the pressure from political competition.

Second, auditing time is regressed on student enrolment controlling for each fund per student and the proportion of QBE funds to total budget. Each fund per student is a dollar value proxy for the elected officials' incentive to please interest groups. To test the complexity-in-auditing, we also include the proportion of QBE funds in the total budget.

A log transformation is used for all variables because the coefficient estimates for this model provide information regarding to the changes in the proportion of auditing time resulting from the changes in the proportion of student enrollment and particular funds that are potentially tied to a governmental unit of political promise. This elasticity measure is appropriate for analyzing the impact of the student enrolment on the proportion of auditing budget increased by auditing time. The models are:

(12) $LAUDT_t = \alpha_0 + \alpha_1 LQBER_{t-2} + \alpha_2 LFEDR_{t-2} + \alpha_3 LLOR_{t-2} + \alpha_4 LGTEN_{t-2} + a_5 LBUDS_{t-2} + e_t$

and

(13) $LAUDT_t = \alpha_0 + \alpha_1 LQBES_{t-2} + \alpha_2 LFEDS_{t-2} + \alpha_3 LLOS_{t-2} + \alpha_4 LGTEN_{t-2} + a_5 LQBER_{t-2} + e_t$

where $LAUDT_t$ is the log form of auditing time. All proportion is relative to total budget, $LQBER_{t-2}$ is the log form of the proportion of QBE funds, $LFEDR_{t-2}$ is the log form of the proportion of FEDERAL funds, and $LLOR_{t-2}$ is the log form of the proportion of LOCAL funds. The $LGTEN_{t-2}$ is log form of total student enrolment and $LBUGS_{t-2}$ is total budget per student. The $LQBES_{t-2}$, $LFEDS_{t-2}$, and $LLOS_{t-2}$ are each of funds in dollar value per student. The subscript t indicates the time period.[37]

The model in equation 12 explicitly examines the percentage change in complexity in budget coming from different political regimes and the change in political pressure on the percentage change in auditing time after controlling for district size in dollar value.[38] In contrast, equation 13 explicitly examines the change in elected officials' incentive in dollar value and the change in political pressure on the percentage change in auditing time after controlling for complexity in QBE funds.

Table 6 shows that the coefficient on student enrolment (LGTEN) is significantly positive (a α at a 0.001 level) regardless of the models (panel A or B). This result is consistent with the prediction that political competition influences audit budget discussed by Baber (1983; 1994). The

[37] We also estimate this model with a cross-section/time series approach that corrects for cross-sectional correlated errors by using the fuller method. The result are similar was used to correct cross sectional correlated errors.
[38] Baber (1994) discusses that the effect of political competition on accounting and audit practices varies where it is at national, state, and local level.

larger the number of student enrolment, the higher budget is allocated to such a school district. On the contrary, the coefficient on LQBER, a proxy for complexity, is negative for both models. As the complexity-in-auditing increases the percentage of auditing time decreases, which is an opposite of the complexity-based on prediction. Panel B shows that the coefficient on QBE fund per student (LQBES) is positive (a α at a 0.1 % level), suggesting that an increase in the change in QBE fund per student increases in the change in auditing time.

Our results indicate that the complexity in funds does not directly affect audit time. However, the proxy for political competition, the number of student enrolment, clearly influences audit budget allocation. In other words, the audit time allocation is not associated with demand for audit based on complexity but based on the intensity of political competition. [39]

Our results reveal a potential problem associated with the underlined assumption that investors are aware of audit quality. Our specific case, investors cannot observe the difference in audit quality. School audits in Georgia are mostly a single audit. The quality differences in audit, therefore, purely arise from the amount of time that the auditor spends. But this information is unavailable to the public. The elected officials have an incentive to place high weights on political competition when they allocate the budgets. Thus, we feel that no association between the complexity in funds and audit time is potential outcomes of this elected officials incentive. That is, the elected officials' incentive to supply the quality of education results in inadequacy in audit budget allocation for school districts that receive relatively large amount of QBE funds. We discuss the results for hypotheses one and three in light of these findings.

Hypotheses one and three are jointly tested. We use the estimated efficiency scores as a dependent variable and test a fundamental role of monitoring, examine an external monitoring

[39] In our setting, the high fund-specific risks create explicit rules that school districts have to follow when they receive QBE funds. This, in turn, should demand high audit time to assure that school districts are in compliance with the rules.

indicator, and assess economic consequence of political competition on an internal control system. Inefficiency indicates the amount of student improvement that would have attained if school districts utilize the budget solely to increase student performance, and, hence, has an interpretation as welfare loss for taxpayers and parents. Our empirical model is to regress auditing time on efficiency scores and test whether auditing reduces a potential losses that can manifest itself as wealth transfer from taxpayer to local public officials.

An external monitoring indicator is QBE funds, which are tied to political promises. There is no requirement to disclose monitoring audit costs associated with QBE funds while the benefits are widely disclosed.[40] This asymmetry in disclosure requirements for the use of QBE funds and the allocation of audit time across school districts makes the costs associated with strenuous compliance standards unobservable. We test whether the demand for greater disclosure about QBE funds creates inadequate allocation of auditing time, resulting in the reduction of the efficiency of a control system. To do this, we include an interaction between auditing time and the proportion of QBE funds to total budget (AUDT*QBER) in the model.[41] The coefficient on this variable should capture an impact of audit quality measured by auditing time on efficiency scores. We also include the student grade 11 mathematical test scores to control for student's educational level.[42] Prior studies suggest that as size of organization becomes larger, the ability of top management to manage organization attenuates. This suggests a possible negative correlation between size and efficiency scores, thus we include a size proxy in the model. The model is:

(14) $EFF_i = \alpha_0 + \alpha_1 AUDT_i + \alpha_2 AUDT_i * QBER_i + \alpha_3 QBER_i + \alpha_4 TM_i + a_5 LGTEN_i + e_t$

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[40] The student's performances across school districts are made available to tax payers and interest groups on the student report cards.

[41] AUDT is auditing time, which can be used to measure auditing effort. We prefer to refer it as audit budget allocation because we are not sure that whether a lack of auditing effort arises from auditors or a policy set up by the elected officials.

[42] The student educational level is a significant factor for school district operations. Higher the student educational level, less complex in school district operation generally becomes.

where EFF is efficiency scores, AUDT is auditing time,[43] TM is grade 11 student's mathematical test score. We do not expect TM to be correlated with auditing time. We use two models that have a different proxy for size. The larger is the student enrolment, more complex school district operation becomes. In this aspect, student enrolment is a good proxy for the size. However, since this variable is strongly correlated with auditing time, an inclusion of this variable potentially generates a multicollinearity problem. This variable is also used as a proxy for a political competition in pervious analysis. To circumvent this problem, we also use the dollar value of local, federal, and QBE funds per student as a size proxy in the second model. The second model follows:

(15)

$$EFF_i = \alpha_0 + \alpha_1 AUDT_i + \alpha_2 AUDT_i * QBER_i + \alpha_3 QBER_i + \alpha_4 TM_i + a_5 QBES_i + a_6 LOCS_i + a_7 FEDS_i + e_t$$

All variables are as previously defined.

Since efficiency scores are bound between zero and one, a Tobit model is used to test the hypotheses. Table 7 presents the results for both models (Panel A and Panel B).[44] All results are based on the analysis after controlling for the effect of student educational level (a positive impact) and district size measured by student's enrolment or dollar values of funds per student (a negative impact).

We find that a fundamental relationship between auditing and efficiency, the estimated coefficient on auditing time a_1, is significantly positive (a α at a 0.001 % level) in both models.

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[43] There are two year lag between auditing time and other variables. But as it was discussed before, we test an impact of monitoring system on efficiency scores and, hence, time lag is not our concern.

[44] A Tobit model is recommended by prior studies in this situation (McCarty and Yaisawarng 1993). We also estimate this model using Maximum likelihood estimation as well as Ordinary Least Square (OLS) regression model. The results are quantitatively the same. In the OLS model, we test whether multicollinearity is the potentially the problem by using variance inflation factors (VIF). The highest VIF was 27.5 for both models.

This indicates that auditing truly works as a monitoring function and helps to reduce nonproductive use of taxes, and hence, generates direct economic benefit to interest groups.

The coefficient on the interaction term is negative for both models. This negative coefficient a_2 indicates that political competition reduces the allocation of auditing time for large recipients of QBE funds, resulting in the reduction of the monitoring effect. We observe a negative correlation between auditing time and QBE funds in Table 4. We also see that the larger amount of auditing budgets are allocated to large school districts (influence of political competition) but no association between complexity in QBE funds and audit time (Table 6). Collectively, these results suggest that the incentive of elected officials allocates auditing budget less than the optimally demanded level of audit time for school districts, resulting in increase nonproductive use of taxes.

The coefficient on the proportion of QBE funds, a_3 is significantly positive for both models. The positive correlation indicates that QBE funds improve the use of school funds to increase student performance. The coefficients on size proxies are generally negative, indicating that larger school districts more likely have inefficiency.[45]

In summary, three coefficients, a_1, a_2, and a_3 in Panel A and B suggest that the nonproductive use of taxes decreases as both the proportion of QBE funds and auditing time increase. However, a negative impact observed on the interaction term (AUDT*QBER) indicates that as the complexity of QBE funds increases auditing effectiveness declines, resulting in increase inefficiency. Given this adverse consequence of QBE funds, our analysis suggests that the cost of imposing a strenuous compliance with the rules can outweigh the benefit of the reform, and asymmetry in disclosure requirements potentially harvest such an adverse effect.

[45] Since student enrolment is used as a proxy for political competition in the previous analysis, this result may be interpreted as the influence of political competition, which results in reducing efficiency.

The Dollar value of Auditing Contribution

We calculate dollar value of auditing contributions to the reduction of nonproductive use of taxes. First, since an average expense per student is $4,064.81 and an average efficiency score is 0.9118, the current level of efficiency results in nonproductive use of taxes of about $360 per student or 8.8 % for each 145 school districts, on average, each year. In other words, the 8.8% of nonproductive use of taxes results in total of $271 million dollar cost to taxpayers for each year.[46]

Second, *Ceteris Paribus*, the coefficient on auditing, 0.0065 shown in the panel B of Table 7, suggests that an average auditing effect on efficiency score is 0.0369.[47] This means that the auditing increases efficiency and consequently reduces nonproductive use of taxes, on average, about 4 % or approximately $113 million dollars per year for the state.[48] This amount is equivalent to the reduction of nonproductive use of taxes illustrated in figure 2. Ceteris Paribus, the distance between $y*$ and y_0 is the monitoring effect that results in the reduction of nonproductive use of taxes.

The estimated coefficient for the interaction term, however, is negative, – 0.0133, and it is bigger than the impact of auditing alone. Since QBE funds are, on average, about 55% of the total funds received by school districts, an impact on efficiency scores is, on average, –0.0073, which wipes out all of the benefit of auditing. Thus, this result rejects a null hypothesis H3 and supports Baber (1983: 1994) and Baber and Sen (1984) political competition affects a monitoring system and accounting practices. Our results on three hypotheses consistently show that there is a budget

[46] Dollar value of inefficiency is calculated as follows: (1-0.9118)*4,061.81=358.2516. Then, this value in terms of year average is that 358.2516*5222*145= 271,264,529. The sample for this analysis consists of 145 school districts rather than the 166 analyzed in the pervious section. Private auditors were used by 21 school districts, and thus data on auditing time was unavailable. Thus, these 21 districts were dropped from the data set for these tests.
[47] This is calculated as 0.0065*567.940 /100, where 567.940 is three-year average auditing time is 567.940 hours.
[48] An average nonproductive use of taxes for year per student is $ 389.9437. The calculation for the total dollar = 0.0369 * 4064.81*5222 * 145 =113,572,055, where 4064.81 is average expense for student from Table 1, 5222 is the average student enrollment for the 145 school district. We use more conservative, smaller coefficient value (panel B) to calculate an impact. Obviously if we uses 0.008 (panel A) positive auditing impact is stronger.

allocation problem. Our analyses suggest that the influence of political competition reduces audit quality, resulting in weakening the monitoring effect.[49]

VII. CONCLUSION

We analyze the monitoring structure of public school operation using the properties of monitoring strategy proposed by Lambert (1985). We utilize a unique educational reform where elected officials pledged the improvement of public education as a political agenda. As a result of this promise, various new monitoring structures were implemented. This provides an ideal setting to examine the economic benefits of auditing and the consequence of political competition on supplying a new monitoring structure for public school operations.

We provide direct evidence that auditing produces economic benefits for stakeholders by reducing nonproductive use of taxes. We find auditing reduces the nonproductive use of taxes by about 4 percent of the total school district budget, on average, for each of the three years we examined. However, we also find that audit budget allocation problems reduce the monitoring effect of the audits. Our results suggest that inadequate audit budget reduces auditing time allocation for large school districts with high percentage of QBE funds.

The current system does not require auditors to disclose their auditing information (ex. auditing fees and auditing time). That is, the supply side of information about mentoring is unavailable to the public. In contrast, precise disclosure is required on how these funds are spent on the financial statements. This asymmetry in information disclosure may reflect the fact that QBE funds are directly related to elected officials' political agenda. The use of QBE funds is highly restricted, and compliance with these rules requires auditors to assure the appropriate use of the

[49] We conduct sensitivity analyses by repeating all models with one-year lag between audit and educational data. The results and the fundamental relation remain the same. The model without log transformation is also conducted. The results qualitatively remain the same. Thus, these findings are robust in different specification of the models.

funds. This attestation demands high audit time. Our results suggest that inadequate auditing time allocation arises from the increased complex compliance rules on QBE funds that create an extra burden for auditors.

We feel that our findings are important in the current accounting and auditing environment, and will be of interest to accountants, standard-setters, and regulators. Our interest is not on an incentive for auditors but rather on an incentive for the elected officials who need to demonstrate the veracity of their political promises. Any change in a public policy imposes costs in implementation.

Since auditors have traditionally not disclosed the time they spend on audits, it was impossible to see how a change in policy and standards affects auditing time allocation and efficiency. We have a unique data set on the auditing time. This allows us to demonstrate that changes in policy really can decrease the efficiency of auditors, which has real economic consequences. Our results imply that demands for greater and more comprehensive disclosure of accounting information have considerable implicit costs, which should be taken into consideration when considering further reforms in accounting systems in the period following the enactment of the Sarbanes-Oxley Act. To our knowledge, this is one of the first studies to attempt to estimate the direct contribution of auditing on stakeholders' welfare. Our study shows that the stringency of compliance with the rules can undo much of the benefits of a proposed reform.

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Table 1
Descriptive Statistics for Per Student Teaching and Student Related Costs, Input Prices, Expenditures Proportion, and Budget Constraints Costs

Variable[a]	Mean	Std Dev	Median	Minimum	Maximum
TOT1R	$4,064.81	$426.948	$4,035.90	$2,594.43	$5,677.81
SPSAL	$38,265.03	$3,343.23	$38,117.40	$29,539.50	$49,856.50
TEASAL	$32,300.59	$2,426.81	$32,083.50	$26,673.40	$39,995.02
CPI	$154.607	$3.474	$154.50	$150.410	$158.910
TSPSAL	$1,549,729	$3,609,499	$570,973	$62,389	$41,687,767
TTEASAL	$15,800,631	$29,880,921	$7,102,193	$880,222	$207,771,719
TMAT	$14,759,036	$28,692,093	$6,710,074	$884,526	$221,636,473
TENR	7602.03	13459.91	348.35	4750.00	90311.00
SPSHA	0.03303	0.0095	0.0318	0.0122	0.1045
TEASHA	0.3813	0.0501	0.3844	0.1954	0.5684
MARSHA	0.3560	0.0492	0.3618	0.1475	0.4648

[a] Variable definitions are as follows: TOT1R are the teaching and student related expenses per student; SPSAL are the average of support staff salaries; TEASAL are the average of teachers' salaries; CPI is the price for materials related to teaching and students; TSPSAL is the budget constraint for support staff; TTEASAL is the budget constraint for teachers; TMAT is the budge constraint for material costs; and TENR is total enrolment. SPSHA is the share for support staff in total expenditures; TEASHA is the share for teachers' salaries in total expenditures; MATSHA is the share for materials in total expenditures;

Table 2 The Descriptive Statistics for Auditing time, Funds allocation, and Student Enrolment.

Variables[a]	Year	Mean	Std Dev	Median	Minimum	Maximum
AUDT	1996	509.276	239.104	464.000	179.000	1789.000
	1997	619.428	294.853	571.000	201.000	2173.000
	1998	575.117	300.178	524.000	173.000	2474.000
QBES	1994	$2755.388	$305.700	$2795.488	$847.863	$3253.002
	1995	$2908.034	$310.230	$2947.273	$1037.345	$3749.528
	1996	$3096.509	$319.648	$3140.178	$1230.029	$4262.168
FEDS	1994	$488.118	$173.846	$480.448	$115.011	$1346.793
	1995	$537.525	$172.831	$523.172	$197.376	$956.204
	1996	$547.533	$172.792	$544.472	$173.994	$981.148
LOCS	1994	$1407.059	$659.185	$1243.232	$336.871	$3884.546
	1995	$1493.622	$688.527	$1309.090	$484.750	$4072.394
	1996	$1554.017	$673.317	$1371.437	$391.719	$4015.931
LGTEN	1994	8.129	0.801	8.045	6.207	11.335
	1995	8.153	0.807	8.047	6.163	11.377
	1996	8.172	0.812	8.087	6.203	11.411

[a] ADUT is auditing time (hours) for the school data of the academic years from1996/97 to 1998/99, QBES is the dollar value of QBE funds allocated to school districts per student for the academic years from1994/95 to 1996/97, LOCS is the dollar value of LOCAL funds allocated to school districts per student for the academic years from 1994/95 to 1996/97, FEDS is the dollar value of FEDERAL funds allocated to school districts per student for the academic years reom1994/95 to 1996/97, and LGTEN is the log form of the total enrolment for a school district for the academic years from1994/95 to 1996/97.

Table 3. Time Series Correlation for Auditing Time and Funds Allocation

Panel A $X_t = \alpha_0 + \alpha_1 X_{t-1} + e_t$

Variable[a]	Intercept	Coeff. Est.	R^2	T-Statistic[b]
AUDT	109.397* (20.000)[b]	1.007* (0.032)	0.8584	0.2186
QBES	243.197* (54.938)	0.982* (0.019)	0.9418	-0.9474
LOCS	114.366* (40.567)	0.973* (0.022)	0.9201	-1.2273
FEDS	46.934* (15.143)	0.931* (0.027)	0.8755	-2.5556**

Panel B $X_t = b_0 + b_1 X_{t-2} + u_t$

Variable[a]	Intercept	Coeff. Est.	R^2	T-Statistic[b]
AUDT	66.953* (22.264)	0.985* (0.036)	0.8239	-0.4167
QBES	445.369* (83.911)	0.962* (0.031)	0.8567	-1.2258
LOCS	137.043* (32.856)	1.015* (0.019)	0.9452	0.7895
FEDS	131.945* (21.328)	0.848* (0.042)	0.7113	-3.6191**

[a] AUDT is auditing time for year t, QBES is the dollar value of QBE funds allocated to school districts per student, LOCS is the dollar value of LOCAL funds allocated to school districts per student, FEDS is the dollar value of FEDERAL funds allocated to school districts per student.
* Denotes significance at the 0.001 level for a two tailed test t-test.
** Denotes significance level at the 0.01 level for a two tailed test t-test.
The values in parentheses are standard errors.

[b] The t-statistic is for the null hypothesis that the coefficient estimate equals one.

Table 4 Pearson and Spearman Correlation among Variables

Panel A: No lag in auditing time (observation 147)

Variables	$QBER_{96}$	$FEDR_{96}$	$LGTEN_{96}$	$AUDT_{96}$
$QBER_{96}$	1.0000	0.4464	-0.2919	-0.2660
$FEDR_{96}$	0.4605	1.0000	-0.4213	-0.1487[a]
$LGTEN_{96}$	-0.2754	-0.4097	1.0000	0.5966
$AUDT_{96}$	-0.2391	-0.1200[a]	0.4333	1.0000

Panel B: One-year-lag in auditing time (observation 294)

Variables	$QBER_{t-1}$	$FEDR_{t-1}$	$LGTEN_{t-1}$	$AUDT_t$
$QBER_{t-1}$	1.0000	0.3578	-0.2237	-0.2681
$FEDR_{t-1}$	0.3583	1.0000	-0.4188	-0.1931
$LGTEN_{t-1}$	-0.2079	-0.4046	1.0000	0.6349
$AUDT_t$	-0.2361	-0.2037	0.5340	1.0000

Panel C: Two-year-lag in auditing time (observation 435)

Variables	$QBER_{t-2}$	$FEDR_{t-2}$	$LGTEN_{t-2}$	$AUDT_t$
$QBER_{t-2}$	1.0000	0.3048	-0.1657	-0.2494
$FEDR_{t-2}$	0.3156	1.0000	-0.3406	-0.1515
$LGTEN_{t-2}$	-0.1522	-0.3556	1.0000	0.6251
$AUDT_t$	-0.2060	-0.1445	0.4971	1.0000

Upper triangle is Pearson and lower triangle is Spearman Rank correlation.

$AUDT_t$ is the auditing time
$QBER_{t-2}$ is the percentage of QBE fund source allocated to a school district,
$FEDR_{t-2}$ is the percentage of federal fund source allocated to a school district,
$LGTEN_{t-2}$ is the log form of the total enrollment for a school district.
The total amount of fund includes state funds that are not part of QBE funds.
[a] indicates no significance.
All values are significance at an α level is greater than 0.005, except for the Correlation for $AUDT_{96}$ and $FEDR_{96}$.

Table 5 Efficiency Scores

Panel A: Correlation in Efficiency Scores among Different Estimation Techniques

	VRS	Cobb_OLS	Cobb_SFE	Translog_OLS
VRS	1.00000	0.77658	0.72913	0.58814
Cobb_OLS	0.77459	1.00000	0.95890	0.72622
Cobb_SFE	0.79175	0.99475	1.00000	0.69129
Translog_OLS	0.59721	0.77458	0.76596	1.00000

Panel B: Estimated Efficiency Scores (Translog _OLS)

Variable	Number of Observations	Mean Efficiency	Standard Deviation	Minimum	Maximum
EFFW	498	0.9129	0.0187	0.8622	1.0000
EFFAUD	435	0.9119	0.0169	0.8622	0.9725
EFFA94	145	0.9121	0.0183	0.8698	0.9713
EFFA95	145	0.9142	0.0169	0.8703	0.9725
EFFA96	145	0.9096	0.0152	0.8622	0.9613

VRS is the efficiency score employing the variable return to scale model in DEA.
Cobb_OLS is the efficiency score employing a Cobb-Douglas function in OLS error-adjusted-method.
Cobb_SFE is the efficiency score employing a Cobb-Douglas function the error decomposition method.
Translog_OLS is the efficiency score employing a Translog function in OLS error-adjusted method.

Upper triangle is Pearson and lower triangle is Spearman Rank correlation.
All value are significant at an " = 0.0001.

EFFW are the efficiency scores for the entire sample,
EFFAUD are the efficiency scores for school districts that have used state auditors for all three years, EFFA94 are the efficiency scores for school districts using state auditors for year 1994, EFFA95 are the efficiency scores for school districts using state auditors for year 1995, EFFA96 are the efficiency scores for school districts using state auditors for year 1996.

Table 6 Hypothesis 2: Political competition hypothesis: the Link between Auditing Time and Budget Resources.

Panel A: The proportion of fund allocation as control variables[a]

$$LAUDT_t = \alpha_0 + \alpha_1 LQBER_{t-2} + \alpha_2 LFEDR_{t-2} + \alpha_3 LLOR_{t-2} + \alpha_4 LGTEN_{t-2} + a_5 LBUDS_{t-2} + e_t$$

Parameter	Estimate	Standard Error	T-statistics
Intercept	0.511	1.3249	0.39
$LQBER_{t-2}$	-0.120	0.1387	-0.87
$LFEDR_{t-2}$	0.148**	0.0491	3.01
$LLOR_{t-2}$	-0.053	0.0591	-0.89
$LGTEN_{t-2}$	0.322***	0.0212	15.19
$LBUDS_{t-2}$	0.386**	0.1637	2.36

Panel B: The fund per student as control variables[b]

$$LAUDT_t = \alpha_0 + \alpha_1 LQBES_{t-2} + \alpha_2 LFEDS_{t-2} + \alpha_3 LLOS_{t-2} + \alpha_4 LGTEN_{t-2} + a_5 LQBER_{t-2} + e_t$$

Parameter	Estimate	Standard Error	T-statistics
Intercept	0.511	1.3249	0.39
$LQBES_{t-2}$	0.291*	0.1829	1.90
$LFEDS_{t-2}$	0.148**	0.0491	3.01
$LLOSs_{t-2}$	-0.053	0.0591	-0.89
$LGTEN_{t-2}$	0.322***	0.0212	15.19
$LQBER_{t-2}$	-0.411**	0.1307	-3.14

[a] The number of observations equals 435, the Adjusted R-square was 0.3766 and the highest variance inflation factor is 3.5776.
[b] The number of observations equals 435, the Adjusted R-square was 0.3766 and the highest variance inflation factor is 3.1795.
All proportion measure is relative to total budget:
$LAUDT_t$ is the log form of auditing time, $LQBER_{t-2}$ is the log form of the proportion of QBE funds, $LFEDR_{t-2}$ the log form of the proportion of FEDERAL funds, $LLOR_{t-2}$ the log form of the proportion of LOCAL funds, and $LGTEN_t$ is log form of total enrolment to control for school size. $LBUGS_{t-2}$ is total budget per student. The $LQBES_{t-2}$ is the log form of QBE fund per student, $LFEDS_{t-2}$ is the log form of federal fund per student, and $LLOS_{t-2}$ is log form of local fund per student.
* ,**, *** Denotes significance level at the α = 0.1, 0.05, 0.001 level for a two-tailed test.

Table 7 The Tobit Model to Test the Hypothesis

$$EFF_i = \alpha_0 + \alpha_1 AUDT_i + \alpha_2 AUDT_i * QBER_i + \alpha_3 QBER_i + \alpha_4 TM_i + a_5 LGTEN_i + e_i$$

Panel A: Student Enrolment as a Size Variable

Parameter	Estimate	Standard Error	Chi-Square
INTERCEPT	90.7585***	1.2220	5516.0983
AUDT	0.0080***	0.0014	34.6657
AUDT*QBER	-0.0138***	0.0027	26.0846
QBER	7.3909***	1.7029	18.8368
TM	0.0584***	0.0073	64.8840
LGTEN	-0.8658***	0.1175	54.2906

The number of observation: 435
Log likelihood: -791.581

Panel B: Budget Source per Student as Size Variables

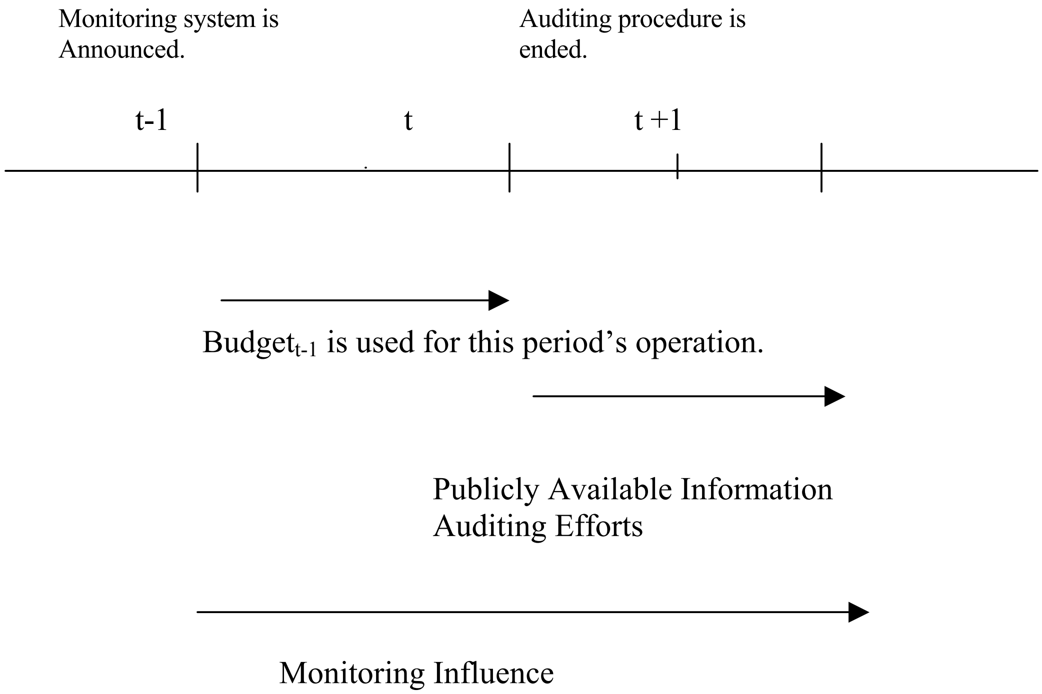
$$EFF_i = \alpha_0 + \alpha_1 AUDT_i + \alpha_2 AUDT_i * QBER_i + \alpha_3 QBER_i + \alpha_4 TM_i + a_5 QBES_i + a_6 LOCS_i + a_7 FEDS_i + e_t$$

Parameter	Estimate	Standard Error	Chi-Square
INTERCEPT	86.3228***	1.42341	3677.8526
AUDT	0.0065***	0.0013	23.4966
AUDT*QBER	-0.0133***	0.0027	24.3824
QBER	5.4840**	1.9628	7.8062
TM	0.0795***	0.0085	88.5342
QBES	-0.0008**	0.0003	7.8546
LOCS	-0.0008***	0.0002	15.6990
FEDS	0.0028***	0.0005	30.8232

The number of observation: 435
Log likelihood: -791.889

EFF is the efficiency score multiplied by 100,AUDT is the auditing time
AUDT*QBER is the interaction of auditing time and the percentage of QBE funds to total budget, QBER is the percentage of QBE fund to total budget, LGTEN is a log form of the total enrollment for a school district. The QBES is the QBE fund per student, FEDS is federal fund per student, and LOCS is local fund per student. TM is the grade 11, student mathematical test scores.
* ,**, *** Denotes significance level at the $\alpha = 0.1, 0.05, 0.001$ level for a two-tailed test.

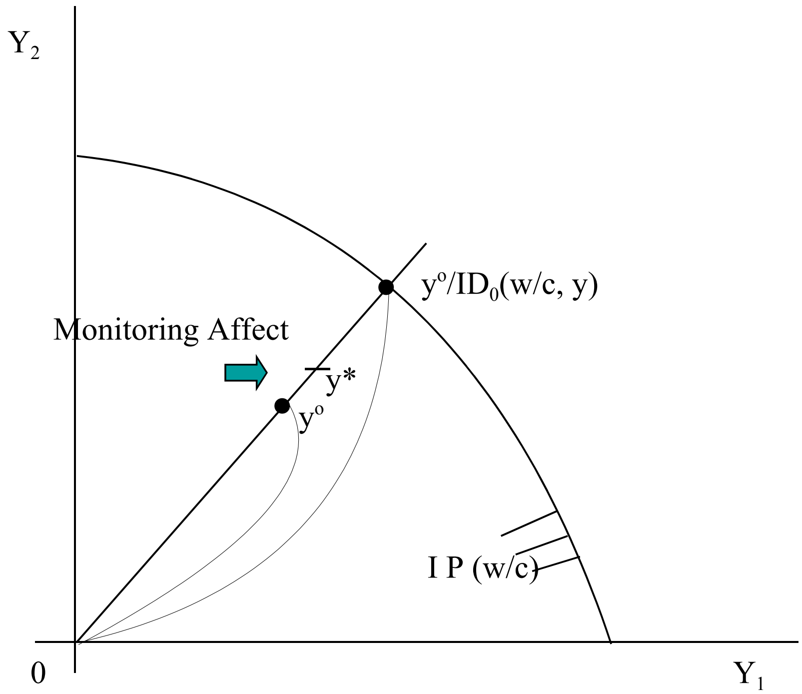
Figure 1 Summary of Relationship among Auditing Time, Budget Allocation, Publicly Available Information about School Performance and Monitoring Effect.



There is a time lag between school operation at the end of the fiscal year (t) and the time of performance information becomes available to the public (about the middle of period between t and t+1). Monitoring effects start at the time that the implementation of the monitoring system becomes publicly available information. In this figure, the announcement is made at the time t-1. Current school district's operation is based on budget in t-1 so that there is at least one year lag between auditors actually exhaust their effort on the client's audit and school district budget.

This study does not intend to capture a specific time effect nor a one-to-one effect between auditing time and nonproductive use of taxes. Instead, the hypothesis tests whether implementation of monitoring system would reduce the amount of nonproductive use of taxes.

Figure 2 Output Distance Function and Non productive use of Taxes



y^O is school performance without auditing,
y* is actual operation,
ID_0 (w/c, y) is the cost indirect output distance function,
and IP (w/c) is the budget constrained production possibility set

Appendix 1

Rockdale county board of Education Schedule of state revenue year ended June 30, 1995

ROCKDALE COUNTY BOARD OF EDUCATION
SCHEDULE OF STATE REVENUE
YEAR ENDED JUNE 30, 1995

SCHEDULE "6"

AGENCY/FUNDING	GOVERNMENTAL FUND TYPES: GENERAL FUND	GOVERNMENTAL FUND TYPES: SPECIAL REVENUE FUND	TOTAL
GRANTS			
Education, Georgia Department of			
Quality Basic Education			
General and Career Education Programs	$ 21,654,312.00		$ 21,654,312.00
Special Education Programs	2,838,807.00		2,838,807.00
Remedial Education Program	311,959.00		311,959.00
Media Center Programs	921,618.00		921,618.00
Staff Development Programs	283,225.00		283,225.00
Indirect Cost	6,140,711.00		6,140,711.00
Pupil Transportation			
Regular	925,685.00		925,685.00
Bus Replacement	272,201.00		272,201.00
Limited English Speaking	44,650.00		44,650.00
Middle School Incentive	864,715.00		864,715.00
Special Instructional Assistance	44,405.42		44,405.42
In-School Suspension	200,920.00		200,920.00
Mid-term Adjustment	920,264.00		920,264.00
School Counselors Grades 4 and 5	55,392.00		55,392.00
Local Fair Share	-5,861,501.00		-5,861,501.00
Educational Equalization Funding Grant	1,261,636.00		1,261,636.00
Food Services		$ 227,702.00	227,702.00
Vocational Education	120,910.83		120,910.83
Other State Programs			
At-Risk Summer School Program	33,178.06		33,178.06
Governor's Emergency Funds (1)	2,000.00		2,000.00
Mentor Teacher Program	5,100.00		5,100.00
Preschool Handicapped Program		113,943.00	113,943.00
Remedial Summer School Program	4,155.70		4,155.70
Teachers' Retirement	60,153.31		60,153.31
Lottery Programs			
Algebra Classrooms		2,302.90	2,302.90
Applied Technology Labs		71,891.42	71,891.42
Distant Learning		33,428.08	33,428.08
Instructional Technology		201,844.65	201,844.65
Media Center and Library Equipment		261,576.14	261,576.14
Safe Schools Grant		143,389.49	143,389.49
CONTRACT			
Education, Georgia Department of			
Leadership Development Program	10,000.00		10,000.00
	$ 31,114,497.32	$ 1,056,077.68	$ 32,170,575.00

(1) The purpose of these funds is for 1995 Georgia School of Excellence at Margaret G. Barksdale Elementary School.