

This page intentionally left blank



Office of the State Auditor Stacey E. Pickering

Performance Audit Division Report #141

K-12 Public Schools: How to Increase Funding for Classrooms without Spending a Dime

September 22, 2015

Executive Summary

Adopting Two OSA Recommendations:

Eliminating Inefficient Personal Services Contracts

And

Increasing Shared Services

could save Mississippi's K-12 Public School Districts at least **§223,718,162** per year that could be returned to the classroom, resources, and teachers. The Office of the State Auditor (OSA) has legislative authority under §7-7-211 to review personal service contracts in government. While generally that effort has been limited to specific contract analysis and review, recent events in Mississippi government relating to poor contracting practices have made clear how important effective contracts are to efficient government operations. Further, even with well constructed contracts that are protective of the taxpayer and which create effective operations, proper oversight and quality control of those contracts is paramount.

Government contracts should always seek to protect and wisely use taxpayer money. This is especially true in K-12 public education because it accounts for the largest expenditure of state government's taxpayer funded revenues and is one of the larger portions of local government taxes as well. It is particularly important to pay attention to contracting in public education for several reasons—the most obvious is that education is so fundamentally tied to all other aspects of the state's well-being.

To that end, and as part of its ongoing attention to government contract and purchasing accountability, the Office of the State Auditor has completed a study of contracting and shared services in K-12 public school districts. Both shared services¹ and contractual services² have been discussed as ways to increase educational efficiency by reducing costs, without reducing or hindering service or the quality of education.

Several important results and findings were identified in this OSA review.

Result #1:

OSA Creation of a Contractual and Shared Services Information Database for K-12 Public Education Expenditures

The OSA compiled information on the use of contracts and shared services by school districts; before the OSA's efforts, there was no readily accessible centralized source of that information. Simply having this information available in one place is of service to the government and the public; it is impossible to begin any sort of meaningful broad analysis until it is known which school districts are or are not using contractual or shared services. OSA recommends that the Mississippi

¹ Shared Services: where cost, financial responsibility, and/or decision-making for a function are divided among two or more school districts.

² Contractual Services: where a third-party provider is paid to perform some service for a school district.

Sharing Services Works

<u>Savings</u> per student/per year associated with shared services:

\$738.97

Overall annual savings if shared services were required of all districts at current efficiency:

\$116,682,180.70

Contractual Services Are Inefficient

Per-student *additional* <u>spending</u> associated with contracting for the 2012-13 school year:

\$638.93

Overall savings achieved <u>IF</u> all K-12 contracts were required to be as efficient as the same services provided in-house:

\$107,035,981.50

Department of Education (MDE) build on the information gathered by OSA and seek to maintain such information so that trend analysis for better decision making can be conducted in the future.

Result #2: Information for Decision Makers about Better Ways to Put More Taxpayer Dollars Back into Classrooms

This report should provide decision makers at all levels with relevant information for both the short-term and long-term. The analysis provided in the body of this report helps provide a pathway for more efficient and effective ways to spend taxpayer funds by directing them away from the idea of no-bid contracts and to the concepts of evaluating contract pricing relative to the cost of doing the same work in-house. Additionally, the analysis shows the efficacy of shared services for school districts. Where that is taking place across the state, there is a higher level of efficiency and cost savings, *without a loss of classroom achievement*. Additionally, the total annual savings amongst all districts state-wide is as much or more than the amount the school districts and others claim is an underfunding of MAEP.

Finding #1: Shared Services are Efficient in K-12 Public Education

The use of shared services was associated with cost **savings** of \$738.97 per student, or, aggregately more than \$116 million statewide. Sharing costs has always been an efficiency best practice in both the public and private sector, because it allows for economies of scale that lower per unit costs. Furthermore, the savings obtained from the use of shared services is readily apparent outside of the classroom. The judicious use of shared services in the K-12 public school system was associated with greater instructional spending and less non-instructional spending per student. Schools that share services are, in effect, able to move money into the classroom. The OSA used rigorous analytic methods to determine that this savings was not due to chance, and to rule out possible alternative causes for such savings.

Finding #2: Contracting in K-12 Public Education is NOT Efficient or Effective

On the other hand, in the current K-12 public school environment, not only did use of contracting by school districts *not save money, it actually cost more money*— \$638.93 per student in the 2012-13 school year—than if the same services had been provided in-house or through shared services. Eliminating inefficient contracts could save the State's public K-12 system \$107 million annually. Had most of these services been conducted using "in-house" employees, cost savings for many districts would have been significant, thus allowing those savings to be utilized on more student and classroom oriented uses. Anecdotally, OSA observed a high number of contracts with no "deliverables" or which had not been competitively bid. As a best practice for costly contracts, competitive bidding can often force vendors to be more realistic in final contract pricing. Finally, the same analytic methods employed by OSA to evaluate shared services were used to rule out chance and alternative causes for the results of districts' use of contractual services.

Other Findings

From a purely financial perspective, sharing costs of purchasing services is shown to work in public education; it saves money, helps to redirect and funnel greater funds back into the classroom, and, most importantly, does not result in lower district grades according to the measurements created by the MDE. Requiring the use of shared services at the current level of efficiency would have resulted in over \$116 million in savings in the 2012-2013 school year, with similar savings projectable in other years—these are not one-time savings as they rely annually on efficient management, planning, and preparation. Finally, as recent events related to certain state agencies have come to light, it should be noted that while contractual inefficiency is in no way proof of malfeasance, it is an inevitable symptom of corruption when corruption is present.

This is a preliminary report that studied actual contract expenditure data. Further review is warranted to determine specific causes for the observed effects.

Recommendations

Recommendation #1

OSA recommends that districts competitively bid contracts, not tie themselves to sole source vendors, and require stringent deliverables with strong penalties and claw-back features for non-performance and non-compliance.

Recommendation #2

OSA recommends that the legislature should include local school districts in <u>www.transparency.mississippi.gov</u> —similar actions have been taken by other states—or the legislature could create a new transparency website for our K-12 public education system requiring contracts and expenditure information.

Recommendation #3

OSA recommends a centralized location for all commodities and centralized purchasing, perhaps similar to the Express Products List maintained by Information Technology Services (ITS). OSA also recommends that RESAs be given more responsibility regarding the goal of centralized procurements.

Recommendation #4

OSA recommends MDE consider reestablishing the role of Purchasing Officer as described by the report to the MDE Board from the Commission on District Efficiency at a recent board meeting.

Recommendation #5

OSA recommends legislative action is necessary to require a fiscal note attached to all local school district contracts to ensure that a cost savings is actually occurring.

Final Facts:

The tax dollars currently wasted in K-12 public school districts by not taking advantage of shared services and overpaying for contractual services amounts to spending \$75 annually for every man, woman, and child in Mississippi, with no educational benefit whatsoever.

Correcting this much inefficiency in K-12 public schools would free up money on the same order of magnitude as the difference between MAEP calculations and actual appropriations over the last several years.

While contractual inefficiency is in no way proof of malfeasance, it is an inevitable symptom of corruption when corruption is present. This study shows that

shared services both save

money and effectively

funnel money into the

classroom by

disproportionately

decreasing non-

instructional costs.

On the other hand,

contractual services as

currently implemented in

most K-12 public school

districts actually cost

money; using them is less

efficient overall than simply not using them.

Significant inefficiency in

Mississippi school districts

in the 2012-2013 year

resulted in over \$223

million wasteful

educational expenditures

that could have been

avoided by jointly (1)

universalizing shared

services at the current

level of efficiency and (2)

implementing a minimum

standard of efficiency for

contractual services.

Page 4

Introduction

This study examines the potential cost effectiveness of shared and contractual services in Mississippi public school districts. Both shared services—in which cost, financial responsibility, and/or decision-making for a function are divided among two or more school districts—and contractual services—in which a third-party provider is paid to perform some service for a school district—are both opportunities for increasing educational efficiency by reducing costs.

The purpose of this study is twofold: to obtain information on the use of shared and contractual services in Mississippi public schools, and to test whether shared and contractual services' effectiveness reduces spending and moves money toward the classroom.

This study established³ to a high degree of statistical confidence that shared services both save money and effectively allow for those savings to be funneled into the classroom decreasing non-instructional costs. On the other hand, contractual services as currently implemented actually cost school districts money that could have gone into direct classroom spending for teachers, supplies, and other resources. Using them is less efficient overall than simply not using them.

As a result, this study has identified significant inefficiency in Mississippi school districts. In the 2012-2013 school year, over \$223 million in educational costs could have been avoided by jointly (1) universalizing shared services at the current level of efficiency and (2) implementing a minimum standard of efficiency for contractual services. This study projects that similar savings are obtainable in future years. However, OSA recommends that additional research be undertaken to determine what specific practices are responsible for the observed effects.

The idea of governmental consolidation of services is not new; the Office of the State Auditor (OSA) has made recommendations to lawmakers about how Mississippi can improve these perceived cost-saving measures across the state beginning with better contractual processes and procedures in state government. In recent years, state lawmakers, the Mississippi Department of Education (MDE), and other state agencies have begun the process of identifying opportunities to increase efficiencies, as in the state's Performance Based Budgeting efforts. As mentioned in previous reports from this office, and from having studied more than a decade of detailed expenditure data from public schools, OSA believes that there are significant cost savings available in K-12 public education that can be made without reducing any direct classroom spending, and in fact, could significantly increase resources for students and teachers. The OSA believes the results of this study can help inform the public and stakeholders of possible cost savings, as well. However, it is important to note that this report makes no claims regarding individual districts' educational performance.

This report examines two categories of proposed cost saving measures: contractual services and shared services.⁴ The OSA defined these measures as follows:

³ This study employed a permutation method comparison of means analysis on data obtained from a survey of all current Mississippi school districts. Also, data and analysis provided in this report are aggregated in order to not single out any particular district and to preserve data hygiene to guard against inaccuracies and inconsistencies in coding at the district and school level.

⁴ Shared services include interlocal agreements, defined as contracts between two or more governmental units that work together to provide services to the public by sharing their budgets to reach a common goal that they might not be able to reach separately or at a lower cost.

Contractual Services: A specific function contracted out to a third-party vendor/provider to complete a service to the school district.

Shared Services: Shared cost/financial responsibility and decision-making for a function among two or more school districts.⁵

The argument for utilizing these activities has often been that these cost saving measures will free up money that can, in-turn, be put back into the classroom. This study is designed to establish whether this claim is true, using information provided by the school districts.

It is important to note that, in our research, the OSA did not identify any districts that consistently used all of the nominal cost saving measures discussed in this study. As such, the survey data are important even independent of the results of the analytical portion of this study.



To gather data for this study, OSA designed and sent a survey (See Appendix 1) to all Mississippi school districts. In order to guarantee comparability for the data used in the analytic portion of this study, a second survey was sent specifically concerning the school year 2012-2013 (See Appendix 2). Only two districts—Corinth and Moss Point—failed to return useful responses. Some notable characteristics of the responses will be discussed in the Results section of this report.

Because agricultural high schools do not have the same expenditure structure as other districts, they were excluded from the final population of this study.⁶ There were 143 school districts in the final population of the study. OSA used average daily attendance for the 2012-2013 school year data as reported by MDE. Information on expenditures for that same period was also obtained from MDE.

External factors influencing study design

For purposes of this study, much traditional analysis would have been inappropriate. Classic statistical analysis often relies on random assignment of subjects to conditions, random selection of subjects from a population, or a known frequency distribution of some trait of interest. None of these was applicable to this study.

It is not possible—or at least practical or ethical—to randomly assign schools to treatment groups; districts generally employ either/both/no shared or contractual services based on their perception of their own needs⁷.

This sort of study is also often used in economics, and for similar reasons; one may want to study poverty, but one doesn't want to assign it. Random selection of subjects was also not practical for this study. Collecting samples of school districts from multiple years would be inappropriate; because economic conditions vary across time, to do so would be to introduce a confounding variable into the study. The number of school districts in a state

Using information provided by the school districts, this study is designed to test the truth of the claim that these cost saving measures (both shared services and contracting services) will free up money that can in turn be put into the classroom.

143 school districts in the final population of the study.

Average Daily Attendance and school expenditures data used in this study

came from the Mississippi Department of Education.

⁵ These definitions were taken from: Joint Legislative Committee on Performance Evaluation and Expenditure Review. (2013). Identifying *Options for Improving the Efficiency of Mississippi's School Districts: Phase One*. (PEER Report #578). Jackson, MS: Author.

⁶ As such, the final population consisted of the public school districts from 2012-2013, minus agricultural high schools, districts closed or consolidated since that time, and districts that did not respond usefully to the survey.

⁷ In other words, districts do not base their use or non-use of such services based on the beliefs of the researcher. As such, this study took the form of a natural experiment. Natural experiments are those in which the variables of interest – in this case, use of shared services or contracting – are not under control of the experimenter. This sort of design is frequently used in cases in which an ability to make causal inferences is desirable, but random assignment of conditions is not practical. As such, it is often used in medical studies – in which, for instance, one cannot practically assign a random subset of the study population cancer, and shouldn't, even if one could. The keys to making causal inferences from natural experiments are careful control of confounding variables and appropriate statistical methodology; this study's efforts at both will be discussed shortly.



is sufficiently small that selecting subjects from a single year would lead to inadequate statistical power; collecting a powerful representative sample would virtually entail studying the entire population.

Finally, this study did not benefit from a known distribution of some trait of interest. School spending is not known to be normally distributed in Mississippi, and indeed there is excellent evidence that it is anything but.⁸



Study Results

This study can be divided into descriptive and analytic portions. The descriptive portion of the study was designed to provide information about the actual use of shared and contractual services by Mississippi school districts.

Of those 143 K-12 public school districts, 90 employed shared services, while 61 employed contracting (some districts did both). Of note is the fact that districts employing contracting made up a proper subset of districts employing shared services; in other words, there was no district that employed contracting that did not also employ shared services.⁹ Nearly 63% of the population utilized one or both of the measures under study.

The analytic portion of this study was designed to determine whether, and to what degree, use of shared and contractual services results in cost savings for the school districts in the study population. The results of this portion of the study are summarized in Figure One, below.¹⁰

Hypothesis	Probability of achieving results at least as great by chance (99.9% confidence)	Significant at traditional p <.05 level?	Effect size (\$/student)
Contracting increases instructional (I) spending	0.053 +/- 0.023	No	\$315.06
Contracting increases non-instructional (N) spending	0.009 +/- 0.010	Yes	\$323.87
Contracting increases overall (I+N) spending	0.015 +/- 0.013	Yes	\$638.93
Contracting decreases I/N ratio	0.172 +/- 0.039	No	N/A
Use of shared services decreases instructional (I) spending	0.081 +/- 0.028	No	\$-253.46
Use of shared services decreases non-instructional (N) spending	0.006 +/- 0.008	Yes	\$-485.51
Use of shared services decreases overall (I+N) spending	0.020 +/- 0.015	Yes	\$-738.97
Use of shared services increases I/N ratio	0.023 +/- 0.016	Yes	N/A

Figure One: Effects of Contracting and Shared Services on Spending

Implementing an efficiency threshold such that all contracts must be at least as efficient as the average cost obtainable by simply not using contracting would have saved over \$107 million in 2012-2013 at that rate. As Figure One shows, district use of shared services decreases overall spending to a significant degree, with a disproportionately strong, statistically significant effect on non-instructional costs.¹¹ As such, use of shared services both saves money and results in a higher proportion of dollars spent able to go into the classroom.

Far from having a statistically significant effect in reducing spending, or even having no effect at all, use of contracting actually increases noninstructional and therefore, overall spending to a statistically significant degree. Generally, the more contracted services in a district, the more of the

⁸ Joint Legislative Committee on Performance Evaluation and Expenditure Review. (2013). Identifying *Options for Improving the Efficiency of Mississippi's School Districts: Phase One.* (PEER Report #578). Jackson, MS: Author.

⁹ Thus, 90 schools employing shared services and 61 employing contracting involves a total of only 90 schools, out of the 143 total, since every school that employed contracting also employed shared services. There were 53 schools that employed neither shared services nor contracting. ¹⁰ A brief explanation of the confidence intervals and probabilities shown in Figure One is provided later in the text.

¹¹ 'Instructional' and 'Non-instructional' were defined in this study as per Miss. Code Ann. § 37-151-97. For this study, that means that any expenditure with a function code up to and including 2290 was instructional, any expenditure with a function code greater than 2290 but less than 4000 was non-instructional, and any expenditure with a function code of 4000 or greater was non-operational and thus included in neither category.

OSA recommends:

Districts should competitively bid contracts and rarely, if ever, use sole source vendors;

K-12 school contracts should have deliverables as well as penalties and claw back features for noncompliance and nonperformance;

The Legislature should consider mandating contract transparency in the K-12 school system, just as State Agencies, Universities, and Community Colleges are required to do, by requiring school districts to participate in an online, publicly accessible system. district budget that is not going into the classroom. However, contracting cannot be said to move money away from the classroom in the same way that use of shared services moves money toward the classroom. Nonetheless, use of contracting involves a significant per-student inefficiency in this study.

Use of shared services resulted in overall savings of \$738.97 per student in this analysis. In the 2012-2013 school year, implementing shared services in all districts, at the current level of efficiency, would have saved over \$116 million. Use of contracting, on the other hand, resulted in costs of \$638.93 per student in this analysis. Requiring that all contracts must be at least as efficient as the average cost of in-house service provision would have saved over \$107 million in 2012-2013 at that rate.

Recommendations

An important step toward solving the problems discussed in this study is establishing a performance threshold for contracts. Unless a contract is at least as efficient as accomplishing the task using shared services or in-house resources, it should simply be rejected. When a school district chooses to award a non-competitive contract, rather than using existing expertise within the district or shared from another district, then that is more money not available for classroom use.

If there is no way of efficiently accomplishing a task in-house, serious consideration should be given to the relative long-term costs of contracting versus establishing the in-house capacity to perform the task. Sometimes contracting is the least expensive and most effective solution, and sometimes it is less costly to supply the needed services from inside government.

Additionally, if contracting seems to be the only viable solution, then, at a minimum, OSA recommends that districts competitively bid contracts, and not use sole source vendors—except under very specific circumstances. Further, OSA recommends that no government, tax-payer funded entity should ever enter into contracts that have no deliverables and few or no penalties and clawback features for non-performance and non-compliance. State agencies already have rules and regulations through the Personal Services Contract Review Board (PSCRB) that could be used to establish a framework of contract review for the local school districts. Currently, the law regarding contract bids explicitly exempts K-12 public school districts from the authority of the PSCRB. Because the school districts have autonomy in this regard, they do not publicly document or release their contracts to the Mississippi taxpayers, while **all** Mississippi state agenices, universities, and community colleges are required to do so. This task could also be accomplished by allowing the PSCRB the authority review the public school districts' outside contracts (not including teacher contracts-based on the commonality and sheer volume of them).

Miss. Code Ann. §27-104-152, requires a searchable website for all Mississippi taxpayers to be able to review how the state is spending their money. The Department of Finance and Administration (DFA) developed and maintains www.transparency.mississippi.gov. This website is a vital tool for accountability. Noticeably absent from this website are the contracts and expenditure information of our K-12 public local school districts, which are not currently required to report this information. OSA recommends that the legislature should require local school districts to participate in www.transparency.mississippi.gov or they should require MDE and the districts to create a single unified transparency website just for the K-12 public education system requiring contracts and expenditure information of non-teacher contracts, such as is maintained by IHL and the Community College Board. Requiring public schools to be transparent regarding how they spend taxpayers' money and showing the local decisions they are making with regard to educating children should be transparent and available. There OSA recommends:

Centralized system for purchasing commodities and resources;

MDE should consider reestablishing the role of Purchasing Officer;

MDE and RESAs should find a way to enhance their ability to assist school districts in better buying techniques and opportunities; are several other states that require such disclosure—Mississippi should be no different. More than 40% of Mississippi taxpayer dollars are going to fund this system with very little transparency regarding where and how school districts are spending money and the results they are—or are not—achieving. Factual evidence shows that with increased transparency comes increased accountability, which will lead to more efficient and effective contracts at our local school districts.

As this report highlights, shared services, if used effectively, can actually save local school districts money, which in turn could be used in the classrooms-where it belongs. To create economies of scale, efficiency, and to improve purchasing opportunities, OSA recommends a centralized location for all commodities and centralized purchasing. Conceptually, it might result in something similar to the Express Products List (EPL) maintained by the MS Department of Information Technology Services (ITS). However, all commodities and resources could be part of this centralized purchasing system. They could range from textbooks to toilet paper and could be accomplished two ways. Besides creating a single statewide purchasing system under MDE, another way would be to give the RESA's the resources and mandate necessary to accomplish the task codified in MS code §37-7-345, to develop, manage, and provide support services and/or programs as determined by the needs of the local school districts. Widening the scope of the RESAs to include procurement could create savings, because of the nominal service sharing network that already exists. Such an expansion should be seriously examined in light of the results of this study.

Centralizing this operation at MDE may also be a viable option. OSA recommends MDE consider reestablishing the role of Purchasing Officer as described by the report to the MDE Board from the Commission on District Efficiency at a recent board meeting. The Purchasing Officer could, among other things, provide training and technical assistance to local school districts to help them in navigating through contracts and establishing if the contracted payment is comparable to the prescribed deliverable along with that task they could establish, maintain a source of centralized purchaing. The purchasing power for the state of Mississippi is much greater than the purchasing power of each individual local school district. MDE could also work in conjunction with the RESAs to maximize purchasing power.

Already MDE's Textbook Inventory Management System (TIMS) and the School Book Supply Company of Mississippi offer opportunities for school districts to get the materials they need and also to save money in the process through trading (TIMS) and bulk purchasing power. The School Book Supply Company, which has been serving the State's K-12 schools as the publishers' textbook depository for adopted materials in the State of Mississippi since 1925, has a stated goal to provide Mississippi schools with a central source for their educational needs at the lowest cost with the fastest service possible. Unfortunately, OSA has found that very few schools really access the buying power and ability to access used textbooks in the depository or as part of TIMS. Often times, school districts end up paying more than they have to by not utilizing the centralized purchasing power, or they do without needed resources. MDE still gives the districts the option of buying directly from a textbook vendor even when a better price might be available through the State. This is something that the State Board of Education has the ability and authority to change.

At a minimum, in order to ensure that each local school district is being fiscally responsible and performing due diligence when entering into the activities discussed in this report, OSA recommends legislative action is necessary to require a fiscal note attached to all local school district contracts to ensure that a cost savings is actually occurring.

Discussion and Future Research

The high degrees of significance involved in this study suggest that there is a real phenomenon under observation; the large amounts of money suggest that it is important to the state's interests to investigate further.

This study treated the use of shared services as a single phenomenon, and the use of contracting as a separate one as well. However, it seems unlikely to the point of impossibility that every example of shared services is similarly efficient, and every example of contracting is similarly inefficient. Future research could be directed toward breaking down the categories of contractual and shared-services expenditures, in order to determine the best opportunities for savings in both cases.

While this study made considered efforts to control for confounding variables, it is possible that there are variables below the threshold of its sensitivity that are responsible for the observed effects. For instance, it is possible (although surely unlikely; the example is purely theoretical) that there is a single contractor working across the state who is so inefficient that contracting with this provider (and not contracting generally) that is responsible for the overall inefficiency in this area.¹² The investigation necessary to determine the relative efficiency of different categories of contractual and shared services would itself shed some light on this question.

It is important to note that this study provides essentially a measure of inefficiency in education, which is not the same as pointing to money that can immediately be reclaimed; the possible savings may not be achievable in the short term. For instance, a district that has historically contracted out its lawn care services simply may not have the facilities necessary to take over the task for itself, even if its contractor is fantastically inefficient. This problem can be solved over the mid- to long-term, and it is in the interests of the State to solve it, but it is not likely that perfect efficiency is achievable in all school districts immediately in the short term.

¹² Although if this were the case, implementing a blanket efficiency requirement on contracts would still solve the problem.



Statistical methods

Because of this absence of random samples and known distributions of traits of interest, this study used a permutation method comparison of means as its primary analytical mechanism. Permutation method comparisons of means deliver meaningful p-values for nonrandom samples – indeed, for populations that aren't samples at all – and they are entirely nonparametric; in other words, they do not depend on background assumptions about the distribution of any particular characteristic of interest. The p-value delivered by this test is also highly intuitive: It is simply the probability of achieving a result equal to or greater than the observed difference in means, assuming that there is no real difference between the populations and thus all variation in the characteristic of interest is by chance.¹³

First proposed by Fisher,¹⁴ this method has many advantages, but is impractical for many purposes because of its extreme computational demands.¹⁵ However, Dwass¹⁶ proposed that a Monte Carlo simulation could be used to greatly lessen these demands; the Dwass method effectively takes a sample from the very large space of permutations that would otherwise be required, rendering the test practical at the cost of introducing a small, but precisely measurable, amount of uncertainty into the p-value. Depending on the amount of uncertainty acceptable in the study, a smaller or larger set of simulations might be used; for purposes of this study, 1,000 simulations were considered to provide an acceptable balance of certainty and practicality. This number of simulations is well within standard practice in the literature on permutation methods;¹⁷ the confidence intervals resulting from this practice are reflected in the results in Figure One.

A possible disadvantage to permutation methods is that they must obtain their generalizability by non-statistical means. That is, traditional randomselection statistical methods claim, by the nature of the mathematics involved, to be able to give results that generalize to the population as a whole. Permutation methods, on the other hand, produce results that apply directly only to the population members actually examined; generalizability beyond that point must be obtained by extra-statistical argumentation. But this relative disadvantage is no disadvantage at all for the current study.

No study whose results are intended to make a causal generalization can ever randomly select its subjects from "the entire population of interest." At

¹⁴ Fisher, R. A. (1935). *The Design of Experiments*. Oliver and Boyd, Edinburgh.

¹³ The p-values delivered by a Monte Carlo sample from a permutation test like this one must be interpreted slightly differently from traditional p-values obtained by random-sampling methods. This "achieving results" is not a matter of sampling – pulling a sample with the appropriate characteristics from a universe in which the null hypothesis is true – but a matter of the likelihood of the specific members of the study population performing as they did if the null hypothesis were true. While the traditional 0.05 benchmark for calling a result "significant" remains worth respecting, and has been taken a guideline in this study, it need not be treated as carved in stone. Rather, we can pay attention to what the p-value means and judge the results based on how much assurance we require before taking certain actions. In this context, a p-value of 0.1 represents only a ten percent chance of achieving the effect in question assuming the null hypothesis; if that level of certainty is sufficient for a given project, then we can treat that result as "significant" for purposes of that project. In general, we hold that the actual confidence-interval modified p-values are worth more to the detailed investigator than conventional binary judgments of significance, but we have included some such judgments in the tables and main text of this study as guidelines.

 $^{^{15}}$ For example, a full-scale permutation analysis of the population of this study – that is, an analysis sufficient to deliver 100% confidence with zero margin of error about the probabilities involved, as opposed to the 99.9% confidence actually delivered – would have required considering over $3.85*10^{247} -$

 ¹⁶ Dwass, M. (1957). Modified Randomization Tests for Nonparametric Hypotheses. *Annals of Mathematical Statistics* 28, 181-187.
¹⁷ Burton, A., Altman, D. G., Royston, P. & Holder, R. L. (2006). The Design of Simulation Studies in Medical Statistics. *Statistics in Medicine* 25, 4279-4292.



the very least, if the author of a study intends that study to make claims about the future, he or she has a problem, since we cannot study future subjects. As such, any actual sample must be drawn from some proper subset of the total population, and extra-statistical arguments must be used – or implied – in order to establish that that subset is representative.¹⁸

Because for this study a random sample could at best be drawn from a single year, random-sample methods would require no more and no less argument to establish their generality than the permutation methods used herein. This study's population is drawn from the 2012-2013 school year; since study of a single year is necessary, and that year is the most recent one available, this study is at least as representative of the population of Mississippi schools under current and future conditions as the best random-selection sample could be. Such a random-selection sample is the gold standard for statistical generalizability; the schools in our population can be taken to represent Mississippi schools in the future at least as well.

Thus, with the computational difficulty surmounted and worries about generalizability put to rest, permutation methods have relevant advantages over more traditional analyses, with no relevant disadvantages.

Control for confounding variables

As mentioned above, in order to obtain a fair comparison among schools, it was necessary to control for confounding variables. One simple expedient accomplished much of this control: This study relativized all costs to average daily attendance. Since, in this population, average daily attendance accounted for about 97% of the variance in instructional and non-instructional costs, most potential confounding—notably, that from school size—is controlled for by doing so.

For further security, point-biserial correlations were established between use of shared services and average daily attendance (on the one hand) and use of contracting and average daily attendance (on the other hand). Both values are nonsignificantly weak; both are in the opposite direction to suggest confounding, given the final results of the study.

Research by Deloitte¹⁹ suggests that student population does not just affect educational spending in absolute dollars; rather, higher per-student expenditures are associated with both smaller and larger student populations. If this were true for the population of this study, it would also be a potential confounding variable. However, research by the Joint Legislative Committee on Performance Evaluation and Expenditure Review (PEER)²⁰ has found that the relationship does not hold for Mississippi schools in a previous year; this study independently verified that there is no such relationship for the current year.

Control for the effects of shared services on contracting, and vice versa, was obtained by conducting two layers of permutation analysis. The first phase of analysis treated shared services and contracting as separable only to the degree that they actually are in the population; it assumed, in other words, that it is impossible to manipulate both variables. The results of this preliminary phase of analysis are presented in Appendix Three. Under the

UnitedStates/Local%20Assets/Documents/us fed DrivingMoreMoneyintotheClassroom 031411.pdf

¹⁸ Such arguments need not be complex. In medical studies of this sort, the argument is often implicit: Human beings, broadly speaking, are biologically similar to one another, and thus the causal mechanisms uncovered in one set of humans will be broadly similar to those in all humans. Of course this kind of argument doesn't leave us with mathematical certainty; even if a new pill is discovered that works its intended purpose on the vast majority of the population, there can still be individuals for whom the pill is nonfunctional or indeed dangerous. But the presence of such individuals doesn't harm arguments about the generalizability of medical studies. Indeed, this sort of argument is often considered to be more secure than attempts at statistical generalizability; the capacity to argue from causal similarity is why physicists almost never use statistical methods to generalize from the results of an experiment.

¹⁹ Eggers, W. D., Wavra, R., Snell, L., & Moore, A. (2005). Driving More Money into the Classroom: The Promise of Shared Services. Retrieved from: http://www.deloitte.com/assets/Dcom-

²⁰ Joint Legislative Committee on Performance Evaluation and Expenditure Review. (2013). *Identifying Options for Improving the Efficiency of Mississippi's School Districts: Phase One*. (PEER Report #578). Jackson, MS: Author.

guiding assumptions of this analysis, one can implement or stop implementing shared services, but use of contracting will then necessarily vary approximately as it does in the population. On the other hand, one can implement or stop implementing contracting, but then shared services will move. This is a conservative set of assumptions, but also likely unrealistic; there seems to be no reason in principle one couldn't adjust both shared services and contracting independently.

This phase of analysis found that use of shared services seems to move money into the classroom by slightly decreasing all expenditures, but decreasing non-instructional expenditures to a greater degree. On the other hand, use of contracting slightly increased expenditure in all categories, though not to a highly significant degree.

This phase of the research yields several important points. First, the failure to reject the null hypothesis in the case of contracting is important: One might think that contracting saves money or moves money into the classroom, but it does neither. Second, even the marginal savings observed under these conditions are worth obtaining: One would tend to expect, under this assumption, savings of about \$266 per affected student if shared service could be implemented where it is not currently; this savings would amount to over \$41 million for the 2012-2013 school districts.

However, as mentioned above, there is strong reason to believe that this first phase of analysis does not present the most accurate picture possible. From a theoretical perspective, it is absolutely certain that studying shared services and contracting as though they are inseparable confounds the effects of each variable with one another. From a practical perspective, there seems to be no reason the variables couldn't be manipulated separately – many districts already use shared services without using contracting – and the particular pattern of effects observed strongly suggests separable factors interfering with one another.

The second layer of permutation analysis examined the effects of shared services and contracting independent of one another by conducting two sets of smaller permutation analyses, holding the variable not under study constant; this procedure compensated for the fact that there was no naturally occurring case of a district that employed contracting and did not employ shared services. The above analyses of possible confounding variables also apply here; the representativeness of these permutations does not appear to be lessened from the larger study.

The results of the two layers of analysis – with and without controlling for confounding by the variables under study – tend to confirm one another; the pattern of results fits the hypothesis that use of shared services and contracting are the actual causal agents under examination. Contracting and shared services tend to be used out of the classroom more than in the classroom; teachers are mostly school employees. As such, one would expect that the influence of contracting and shared services would be felt mostly out of the classroom, in whatever direction.

The counfounded, first-layer analysis has shared services leading to a large savings in non-instructional expenditures; contracting, in that analysis, increases in-class expenditures to a small degree and out-of-class expenditures almost imperceptibly. This disproportionality is counterintuitive by itself, but fits precisely if we assume that contracting has reasonably evenly distributed cost effects, biased toward the non-instructional, but counterbalanced unevenly by the disproportionately non-instructional effect of shared services. And indeed, this is what the second-layer analysis shows.

Thus, the second layer not only results from a rigorous statistical process, it also provides a confirmatory test for a plausible, explanatory hypothesis regarding the first layer of analysis. As such, the second layer of analysis, presented in the results section, can be considered to provide an accurate representation of the effects of shared services and contracting, barring as-yetundiscovered countervailing evidence.

Simulation integrity

Random number sequences used in the Monte Carlo simulations for this study were generated by Random.org, out of preference for a true random number generator over a pseudorandom one. Sequences were checked for duplicates both within a given simulation (to ensure the integrity of that particular simulation) and across all simulations used to test a given hypothesis (to ensure a genuine sample without replacement from the space of permutations, which provides superior estimates to a sample with replacement).²¹

Confidence intervals on p-values

Since the p-values obtained in this study were derived from a Monte Carlo simulation, they have associated confidence intervals; the meaning of these confidence intervals is precisely the same as in traditional randomsample research, except that they are applied to probabilities rather than intrinsic characteristics of members of the population.

In Figure One, the 99.9% confidence interval for the relevant p-values is given. The meaning of this confidence interval is straightforward and traditional, given the caveat in the previous paragraph. Thus, for instance, when Figure One indicates that the p-value attached to the hypothesis that the use of shared services decreases non-instructional spending (or more properly, its null hypothesis) is 0.006 + 0.008 at 99.9% confidence, it is just saying that we may be 99.9% confident that the probability of achieving the observed results under the assumption that the null hypothesis is true is between 0 (non-inclusive) and 0.014 (inclusive).

Hypothesis	P(null) at 99.9% confidence	Significant at traditional p <.05 level?	Effect size (\$/student)
Contracting increases instructional (I) spending	0.16 +/- 0.038	No	\$151.24
Contracting increases non-instructional (N) spending	0.46 +/- 0.052	No	\$10.06
Contracting increases overall (I+N) spending	0.29 +/- 0.047	No	\$161.30
Contracting decreases I/N ratio	0.38 +/- 0.051	No	N/A
Use of shared services decreases instructional (I) spending	0.42 +/- 0.051	No	\$-39.92
Use of shared services decreases non-instructional (N) spending	0.07 +/- 0.026	No	\$-266.00
Use of shared services decreases overall (I+N) spending	0.13 +/- 0.035	No	\$-305.92
Use of shared services increases I/N ratio	0.04 +/- 0.019	No	N/A

²¹ Smyth, G. K. & Phipson, B. (2011). Permutation P-values Should Never Be Zero: Calculating Exact P-Values When Permutations Are Randomly Drawn. *Statistical Applications in Genetics and Molecular Biology* 9 (1), 1-12.

Note any Changes Below

Appendix A Survey of School Districts use of Shared Services. Contractual Services and Interlocal Agreements

Some Terms used in Survey				
Shared Services	Shared cost/financial responsibility and decision-making for a function among two or more school districts			
Contractual Services	A specific function contracted out to a third-party provider to complete a service to the school district			
Interlocal Agreements	A contract between two or more governmental units that work together to provide services to the public by sharing their budgets to reach a common goal that they might not be able to reach separately or at a lower cost.			

School District Number: School District Name: Business Manager: Phone: Email Address:

PLEASE PROVIDE THE FOLLOWING INFORMATION ABOUT YOUR DISTRICT:

1. Does your district own any buildings or grounds that require upkeep and maintenance not connected with a specific school?

Central Office ()	🔲 Bus Barns ()
Athletic Fields ()	Transportation Buildings ()
Maintenance Buildings ()	Other

- Does your school district have any written policies or procedures requiring or encouraging shared services, contractual services, interlocal agreements, or other measures to promote efficiency through collaboration with other boards of education, other public entities, or private entities? YIN If so, please attach any related materials.
- Does your school district currently have any contracts or other arrangements (formal or informal) with another board of education, other public entity, or private entity (including RESA's) to engage in shared services, contractual services, interlocal agreements, or other collaboration? Y N If so, please check all that apply.

	Textbooks		Facilities maintenance		Health services
	Transportation		Custodial services		Security
	Child study team services		PT, OT, speech therapy		Professional Development
	Special education classes		School business services		Food services
	Insurance		IT Support		Legal Services
Other Administration/Supplies/Instruction					

3a. For each item checked in #3 above, please attach the agreements or contracts and any other related materials for each. (This does not include District Employee Contracts)



- 3b. For each item checked in #3 above, please describe or attach any related materials on benefits, including cost-savings associated with the arrangement.
- 3c. For each item checked in #3 above, please describe or attach any related materials on all costs associated with negotiating or administering the arrangement, such as legal services, staff time devoted to communicating/coordinating with the other entity, etc.
- 3d. For each item checked in #3 above, please describe or attach any related materials for which you do not plan to renew the arrangements upon expiration of its term.
- 4. In the last 2 years, have you or your board of education given serious consideration (more than a fleeting thought) to entering into a contract or other formal or informal arrangement with another (local) district board of education, other public entity, or private entity to engage in shared services, contractual services, interlocal agreements, or other collaboration, but decided against it? YIN If so, for each such contract or arrangement, please check all that apply.

	Textbooks		Facilities maintenance	Health services
	Transportation		Custodial services	Security
	Child study team services		PT, OT, speech therapy	Professional Development
	Special education classes		School business services	Food services
	Insurance		IT Support	
Other Administration/Supplies/Instruction				

- 5. For each item checked in #4 above, please describe or attach related materials for the reason, if known, why the board of education or district administration decided against entering into shared services, contractual services, interlocal agreements, or other collaboration.
- 6. Other comments regarding shared services, contractual services, interlocal agreements, or other collaboration with other boards of education, other public entities or private entities:

Appendix B





OFFICE OF THE STATE AUDITOR STACEY E. PICKERING, AUDITOR

Additional Documentation: Survey of School Districts use of Shared Services, Contractual Services and Interlocal Agreements

	Some Terms			
	<u>used in Survey</u>			
Shared Services	Shared cost/financial responsibility and decision-making for a			
	function among two or more school districts			
Contractual Services	A specific function contracted out to a third-party provider			
	to complete a service to the school district			
Interlocal Agreements	A contract between two or more governmental units that			
	work together to provide services to the public by sharing			
	their budgets to reach a common goal that they might not be			
	able to reach separately or at a lower cost.			

School District Name:

- 1. Were all the contracts discussed in the recently completed survey applicable in 2012-2013 school year?
- 2. If a contract discussed was <u>not</u> applicable in the 2012- 2013 school year please list the contract below.

3. If a contract that <u>was not</u> previously discussed was applicable in the 2012-2013 school year, please attach the agreements or contracts and any other related materials for each. (This does not include District Employee Contracts)





For more information about this issue, contact

The Office of the State Auditor Post Office Box 956 Jackson, MS 39205-0956 Phone: 601-576-2800 in the Jackson area or 800-321-1275 Statewide Fax: 601-576-2687 Website: http://www.osa.state.ms.us

The Performance Audit Division of the Office of the State Auditor assesses the performance of organizations, programs, activities, and functions of government in order to provide information to improve accountability, effectiveness, and to facilitate decision-making. All reports, documents, and supporting materials obtained and utilized by the Performance Audit Division will be considered public information, unless otherwise prohibited by law.

The Office of the State Auditor does not discriminate on the basis of race, religion, national origin, sex, age, or disability.