



AMERICAN INSTITUTES FOR RESEARCH®

The Ohio High School Transformation Initiative: A Study of Financial Sustainability

Prepared for:
The KnowledgeWorks Foundation

Prepared by:
American Institutes for Research
1000 Thomas Jefferson Street NW
Washington, DC 20007

December 15, 2009

“American Institutes for Research” is a registered trademark. All other brand, product, or company names are trademarks or registered trademarks of their respective owners.

Table of Contents

EXECUTIVE SUMMARY	1
CHAPTER 1: BACKGROUND.....	4
THE OHIO HIGH SCHOOL TRANSFORMATION INITIATIVE (OHSTI)	5
THE OHSTI MODEL.....	5
THE OHSTI CONTRIBUTION.....	6
THE CONTEXT FOR THIS RESEARCH	8
CHAPTER 2: AN OVERVIEW OF PROFILED OHSTI CAMPUSES	10
EXPENDITURES OF OHSTI CAMPUSES WITHIN PROFILED SCHOOL DISTRICTS	11
OUTCOMES OF OHSTI CAMPUSES WITHIN PROFILED SCHOOL DISTRICTS	13
CHAPTER 3: AN ECONOMIC ANALYSIS OF OHSTI CAMPUS COSTS AND OUTCOMES	16
COST ANALYSES: THE METHODOLOGICAL OVERVIEW.....	16
THE COST ANALYSES	20
SUMMARY OF ANALYSIS OF COSTS AND STUDENT OUTCOMES.....	23
CHAPTER 4: PERSPECTIVES ON THE SMALL SCHOOL CONVERSION EXPERIENCE FROM CASE STUDY DISTRICT ADMINISTRATORS.....	24
SMALL SCHOOL IMPLEMENTATION AND MODELS	24
PHYSICAL ARRANGEMENT AND LEADERSHIP STRUCTURE OF SMALL SCHOOLS	27
COST PERSPECTIVES	30
OUTCOMES	31
ADVICE TO OTHER DISTRICTS CONSIDERING REFORM	34
FUTURE PLANS FOR SMALL SCHOOLS IN THE CASE STUDY DISTRICTS.....	35
CHAPTER 5: SUMMARY OF FINDINGS AND DISCUSSION.....	37
SUMMARY OF FINDINGS.....	38
DISCUSSION OF FINDINGS.....	38
SUGGESTIONS FOR FUTURE RESEARCH	40
REFERENCES	41
APPENDIX A. A DETAILED OVERVIEW OF THE PROFILED OHSTI DISTRICTS AND CAMPUSES	43
APPENDIX B. TECHNICAL APPENDIX	70

List of Exhibits and Tables

EXHIBIT 1.	OHSTI CAMPUSES AS OF 2007-08	10
EXHIBIT 2.	TOTAL EXPENDITURES PER PUPIL AMONG PROFILED OHSTI DISTRICTS.....	11
EXHIBIT 3.	INSTRUCTIONAL EXPENDITURES PER PUPIL AS A PERCENT OF TOTAL EXPENDITURES IN PROFILED OHSTI DISTRICTS.....	12
EXHIBIT 4.	GRADUATION RATES OVER TIME, PROFILED OHSTI DISTRICTS.....	13
EXHIBIT 5.	PERFORMANCE INDEX OVER TIME, PROFILED OHSTI CAMPUSES.....	14
EXHIBIT 6.	DESCRIPTIVE STATISTICS FOR OHSTI AND NON-OHSTI SCHOOLS, 2007-08.....	17
EXHIBIT 7.	BASELINE ESTIMATES OF THE RELATIVE COST DIFFERENTIAL BETWEEN OHSTI AND NON-OHSTI CAMPUSES – OLS REGRESSION	21
EXHIBIT 8.	EFFICIENCY-ADJUSTED, ESTIMATES OF THE RELATIVE COST AT OHSTI CAMPUSES – STOCHASTIC FRONTIER ANALYSIS.....	22
EXHIBIT 9.	TECHNICAL INEFFICIENCY ESTIMATES FOR THE COST FUNCTION.....	23
EXHIBIT A-1.	TOTAL EXPENDITURES PER PUPIL, CLEVELAND HEIGHTS HIGH SCHOOL	45
EXHIBIT A-2.	INSTRUCTIONAL EXPENDITURES AS A PERCENTAGE OF TOTAL EXPENDITURES, CLEVELAND HEIGHTS HIGH SCHOOL.....	46
EXHIBIT A-3.	GRADUATION RATES OVER TIME, CLEVELAND HEIGHTS HIGH SCHOOL.....	47
EXHIBIT A-4.	PERCENTAGE OF APPLICABLE STATE INDICATORS MET, CLEVELAND HEIGHTS HIGH SCHOOL.....	48
EXHIBIT A-5.	TOTAL EXPENDITURES PER PUPIL, CANTON CITY SCHOOL DISTRICT	51
EXHIBIT A-6.	INSTRUCTIONAL EXPENDITURES AS A PERCENTAGE OF TOTAL EXPENDITURES, CANTON CITY SCHOOL DISTRICT.....	52
EXHIBIT A-7.	GRADUATION RATES OVER TIME, CANTON CITY SCHOOL DISTRICT	53
EXHIBIT A-8.	PERCENTAGE OF APPLICABLE STATE INDICATORS MET, CANTON CITY SCHOOL DISTRICT	54
EXHIBIT A-9.	TOTAL EXPENDITURES PER PUPIL, LIMA CITY SCHOOL DISTRICT	56
EXHIBIT A-10.	INSTRUCTIONAL EXPENDITURES AS A PERCENTAGE OF TOTAL EXPENDITURES, LIMA CITY SCHOOL DISTRICT.....	57
EXHIBIT A-11.	GRADUATION RATES OVER TIME, LIMA CITY SCHOOL DISTRICT	58
EXHIBIT A-12.	PERCENTAGE OF APPLICABLE STATE INDICATORS MET, LIMA CITY SCHOOL DISTRICT	59
EXHIBIT A-13.	TOTAL EXPENDITURES PER PUPIL, TOLEDO PUBLIC SCHOOLS.....	61
EXHIBIT A-14.	INSTRUCTIONAL EXPENDITURES AS A PERCENTAGE OF TOTAL EXPENDITURES, TOLEDO PUBLIC SCHOOLS	62
EXHIBIT A-15.	GRADUATION RATES OVER TIME, TOLEDO PUBLIC SCHOOLS	63
EXHIBIT A-16.	PERCENTAGE OF APPLICABLE STATE INDICATORS MET, TOLEDO CITY SCHOOL DISTRICT	64
TABLE A-1:	THE VARIABLES USED IN THE COST AND PRODUCTION FUNCTION ANALYSES.....	65
EXHIBIT A-17.	TECHNICAL INEFFICIENCY SCORES FOR OHSTI AND NON-OHSTI CAMPUSES.....	69
TABLE A-2:	COST FUNCTION ESTIMATES FOR URBAN SCHOOLS	70
TABLE A-2B:	COST FUNCTION ESTIMATES FOR URBAN SCHOOLS WITH TEST SCORES DISAGGREGATED BY ECONOMICALLY DISADVANTAGED STUDENTS.....	72
TABLE A-2C:	COST FUNCTION, TECHNICAL INEFFICIENCY SECOND STAGE ESTIMATES.....	73
TABLE A-3:	COST FUNCTION ESTIMATES FOR URBAN SCHOOLS EXCLUDING CLEVELAND HEIGHTS FROM THE SAMPLE	74

Executive Summary

The small school movement continues to receive national attention as educators, school reform advocates, and support organizations have joined forces to re-conceptualize traditional, large comprehensive high schools. For example, over the past decade, the Bill & Melinda Gates Foundation has been a major leader in this effort, investing millions to help create hundreds of high schools across the vast majority of the states. The Ohio High School Transformation Initiative (OHSTI) is one mechanism through which the Foundation has channeled this support. Established in 2002, OHSTI is supported through the KnowledgeWorks Foundation, the Bill and Melinda Gates Foundation, the Ford Foundation, the Ohio Department of Education, the U.S. Department of Education, and local community-based foundations. The initiative aims to address low student achievement and graduation rates, school violence and truancy, and a lack of engagement in Ohio's urban high schools.

OHSTI worked with a community Stakeholder Advisory Group to convert large, comprehensive urban high schools into smaller schools that are operationally autonomous but share a common campus. Through funding and technical assistance, OHSTI has supported the development of small high schools designed to emphasize academic rigor, a relevant curriculum, and strong interpersonal relationships between students and faculty. Beginning in June of 2002 and continuing through 2003, select high schools participated in a year-long exploration process during which school leaders were introduced to high school reform models across the country. These models exposed staff to effective instructional strategies, school organization/scheduling, and facility design. The 2003-04 planning year also included intensive leadership development and a focus on school organization for personalization and teacher professional support. In the 2004-05 school year, 14 high school campuses within 10 districts began instituting OHSTI small schools.¹ As of 2007-08, 10 campuses within eight school districts remained in operation.

As the OHSTI schools move from initial implementation to greater permanence and continuation, it has become possible and increasingly important to examine several key questions regarding these small schools. These include their relative costs over time, changes in student outcomes observed in relation to other schools, and the cost and outcome implications that may be associated with alternative implementation strategies.

This study used a mixed-methods design to examine costs over time, changes in student outcomes, and cost and outcome implications. Using extant data on school expenditures and student outcomes available from the Ohio Department of Education (ODE), we first conducted descriptive analyses of each of the four case study districts profiled in the study. We then used ODE data to apply econometric models to explore variations in costs as they relate to input prices and student needs. These included analyses of the differences between all 10 of the OHSTI campuses and the rest of the urban high schools in Ohio. Finally, AIR conducted interviews with district personnel in the four case study districts to discuss their experiences with high school transformation. These

¹ Some campuses phased in additional small schools in subsequent years.

quantitative and qualitative analyses informed a comparison of the cost of OHSTI small schools to large, comprehensive high schools in Ohio.

The study addressed four research questions, which are presented here along with the project’s findings.

1. What are the per pupil costs of small high schools over time (including transformation costs), and how do they compare to those of traditional high schools across the state?

The study found no statistically significant differences in cost associated with the implementation of the OHSTI program. This general finding holds during the period of start-up as well as during subsequent years of implementation. Findings from the qualitative analyses at the case study sites largely corroborate this finding.

2. What trends regarding student outcomes are observed across participating sites over time?

The qualitative data generally seem to indicate that while fully measurable changes in student outcomes such as academic achievement, attendance, graduation, and behavior have been somewhat slow in coming, there are indications that more measurable differences are starting to be realized. All study site respondents indicated that outcome gains have been sufficiently promising that their districts are committed to maintaining this program.

3. Based on these data and qualitative information obtained through this study, do there appear to be cost implications associated with alternative implementation strategies that may be used to inform future small school transformation efforts?

Interview respondents indicated that the major factor driving higher or lower costs in association with small schools was the degree of “purity” in implementation—the degree to which students and teachers remain in their respective small schools, as opposed to splitting their time across schools. This may affect such factors as a school’s ability to hire a single teacher, as opposed to multiple teachers, for more specialized course offerings. However, respondents also indicated that they also associated important outcome gains with the degree of implementation purity.

Respondents from all four of the case study districts felt that the conversion had been worth the effort and cost. All expressed a clear commitment to remaining converted, despite the fact that supplemental KWF support was no longer available.

In sum, once fully implemented, the cost differentials across the OHSTI schools do not appear to be statistically different from like non-OHSTI schools and were generally not perceived as operationally significant, at least in the four case study OHSTI districts profiled in this study.

Respondents from all four of these districts felt that the conversion had been worth the effort and cost, and all expressed a clear commitment to remaining “converted” despite the fact that supplemental KWF support was no longer available.

In addition, several respondents pointed out that realizing the full benefits of conversion would take additional time. They perceived their schools to be in the earlier stages of conversion and some indicated that they were beginning to see clear, positive changes in their most current data.

However, respondents from several districts pointed out that it is one thing to enable a greater sense

of community, but another to fully realize it. Respondents shared that it was taking time for the stronger bonds and greater sense of unity felt across smaller school faculties to fully form, for teachers to get to know the students in their small schools as well as intended, and for these improved relations to start to reveal themselves in improved student outcome data. All respondents, to varying degrees, expressed the conviction that the majority of their teachers, students, parents and community members had concluded that smaller high schools were cost-effective and should be continued.

The findings from this study suggest that the progress of these OHSTI sites should continue to be tracked over time. We recommend that in the future, all 10 of the sites be considered for further qualitative analysis that includes case studies. With the use of ODE data to track and compare costs and results in OHSTI schools against like schools statewide, the burdens of ongoing participation in the quantitative component of a study like this are small.

Extension of the qualitative analysis across the full range of OHSTI sites over time would also be informative. The burden for this component could be as small as several one-hour interviews with research staff, or greater depth could be allowed through case study visits to these sites, which would allow a research team to observe the varying ways that the small school concept has been implemented across these sites, and to gather a broader range of perspectives on the effectiveness of this intervention. For example, expanding interviews and focus groups beyond district administrators to include site administrators, teachers, students, parents, and school board and community members would provide a much broader perspective on the relative small school experiences and outcomes across the varying implementation sites.

Another recommendation is that all future participating sites be encouraged to establish goals in regard to their small school conversion at the onset; the sites could establish what goals they hope to accomplish in making this change and how progress toward these objectives could be measured. Of the four case study sites for this study, staff from the Cleveland Heights campus set out such goals and measured the schools' progress in relation to them over time, and saw benefits from this process. This type of exercise can provide clarity of purpose, support formative assessment, and allow districts (and others) to assess progress in regard to small school implementation over time.

Chapter 1: Background

The small school movement continues to receive national attention as educators, school reform advocates, and support organizations have joined forces to re-conceptualize traditional, large comprehensive high schools. For example, over the past decade, the Bill & Melinda Gates Foundation has been a major leader in this effort, investing more than \$745 million to help create more than 1,900 high schools in 45 states. The Ohio High School Transformation Initiative (OHSTI) is one mechanism through which the Foundation has channeled this support. Established in 2002, OHSTI is supported through the KnowledgeWorks Foundation, the Bill and Melinda Gates Foundation, the Ford Foundation, the Ohio Department of Education, the U.S. Department of Education, and local community-based foundations. The initiative aims to address low student achievement and graduation rates, school violence and truancy, and a lack of engagement in Ohio's urban high schools.

OHSTI worked with a community Stakeholder Advisory Group to convert large, comprehensive urban high schools into smaller schools that are operationally autonomous but share a common campus. Through funding and technical assistance, OHSTI has supported the development of small high schools designed to emphasize academic rigor, a relevant curriculum, and strong interpersonal relationships between students and faculty. Beginning in June of 2002 and continuing through 2003, select high schools participated in a year-long exploration process during which school leaders were introduced to high school reform models across the country. These models exposed staff to effective instructional strategies, school organization/scheduling, and facility design. The 2003-04 planning year also included intensive leadership development and a focus on school organization for personalization and teacher professional support. In the 2004-05 school year, 14 high school campuses within 10 districts began instituting OHSTI small schools.² As of 2007-08, 10 campuses within eight school districts remained in operation.

As the OHSTI schools move from initial implementation to greater permanence and continuation, it has become possible and increasingly important to examine several key questions regarding these small schools. These include their relative costs over time, changes in student outcomes observed in relation to other schools, and the cost and outcome implications that may be associated with alternative implementation strategies. Specifically, this study addresses the following questions:

1. What are the per pupil costs of small high schools over time (including transformation costs), and how do they compare to traditional high schools across the state?
2. What trends regarding student outcome measures are observed across participating sites over time, and how do they compare to other high schools across the state?
3. How do variations in cost align with measures of student outcomes? How do changes in cost appear related to changes in student outcomes in the participating sites over time, and how do they compare to other high schools across the state during this time period?

² Some campuses phased in additional small schools in subsequent years.

4. Based on these data and qualitative information obtained through this study, do there appear to be cost implications associated with alternative implementation strategies that may be used to inform future small school transformation efforts?

In this report, the American Institutes for Research (AIR), under contract with the KnowledgeWorks Foundation, presents analyses of expenditure and educational outcome data comparing OSHTI conversion campuses in eight school districts to the full range of Ohio high schools. We also present descriptive analyses and a summary of findings from interviews of district personnel from the four districts included in the study's qualitative case study sample of OSHTI schools. This report presents findings and an explanation of the methodology, and concludes with a brief discussion of policy implications.

The Ohio High School Transformation Initiative (OHSTI)

OHSTI seeks to enhance the economic and social climate in Ohio through improved student achievement, as well as high school graduation and college matriculation rates. To achieve this, OHSTI is working to establish the conditions that allow improved learning connections to emerge and grow within the state's most challenged urban high schools. OHSTI's Stakeholder Advisory Group includes representatives from the Ohio Governor's Office, the Ohio Department of Education, the Ohio Education Association, the Ohio Federation of Teachers, the Buckeye Association of School Administrators, the Ohio Association for Secondary School Administrators, the Ohio Association for Elementary School Administrators, and the Ohio School Boards Association.

The OHSTI Model

The OHSTI Model is a response to concerns in Ohio about issues such as a culture of low expectations in urban schools, low postsecondary enrollment and completion among urban high school graduates, and significant achievement gaps in urban communities relative to non-urban communities as well as across racial and socioeconomic groups. These issues are gaining greater attention within a national and state policy context that places increasingly high student performance and reporting demands on schools and school systems (e.g., No Child Left Behind [NCLB] and the Ohio Graduation Test [OGT]). To improve student participation, engagement, and achievement, the OHSTI model promotes an innovative and non-traditional learning environment that prioritizes administrative and operational autonomy and flexibility, is attuned to individual student needs and interests, emphasizes rigorous academic coursework, demands a relevant curriculum and authentic learning experiences, encourages community engagement, assumes collaboration and collegiality between district and school staff, and stresses supportive relationships between students and faculty.

In this project, 10 participating schools in eight districts remain committed to redesigning the traditional high school experience according to a set of 15 Non-Negotiable Attributes (NNAs) as integral components of their OHSTI grant agreements with KWF. To ensure community buy-in and support, these grant agreements were signed by each participating district's superintendent, school board president, and president of the teachers' union. Based on the effective school research, the

NNAs clarified expectations and delineated performance standards. They specified that each school district provide for or enable:

1. Autonomous governance, budgets, structures, and staffing; flexible use of resources;
2. Distributed leadership;
3. Open access and choice for students;
4. Identification of and release time for principals in first year of implementation;
5. Professional development that clearly links changes in teaching practice to improved student achievement;
6. A clearly defined system of central office support of small school design and implementation;
7. A curriculum clearly aligned with state standards and focused on helping students use their minds well;
8. Nontraditional scheduling that promotes deep student learning and meaningful relationships with teachers;
9. Clear demonstrated use of technology and advanced communication resources;
10. Clearly stated benchmarks for improved student achievement;
11. Performance assessment for students;
12. Authentic community engagement as defined by substantive community conversations that engage a broad array of stakeholders, and connect with and influences official decisions;
13. Clear community involvement in the daily life of the school;
14. Individual teacher advisors for each student; and
15. A target maximum population of 400 students.

To realize these NNAs, the OHSTI model features a variety of programmatic supports at the campus and district levels. Some of these supports include the establishment of local “Centers of Strength,”³ which are community-based organizations designed to facilitate community engagement in the schools; annual leadership institutes to support professional development for small school leaders; work with teachers’ unions; a portfolio process to support school planning; and tools to enable data-driven decision making linked to continuous school improvement and transformation.

The OHSTI Contribution

KnowledgeWorks began identifying schools that might undergo transformation in the spring of 2002. Staff began by targeting 20⁴ of Ohio’s “Urban 21” districts, which are the 21 largest urban districts in the state. These districts included 101 high schools, 88 of which were in districts classified as being in “Academic Emergency,” the state’s lowest ranking. KnowledgeWorks used an

³ The Centers of Strength were funded through the 2005-06 school year.

⁴ OHSTI considered 20 of Ohio’s Urban 21 districts because Cincinnati already had a grant from the Bill and Melinda Gates Foundation to convert to small high schools.

application and vetting process to select school districts and individual high schools for inclusion in the program.

OHSTI has provided approximately \$80 million in cash grants, reimbursed services, in-kind donations, and technical assistance to participating districts and schools. In 2002, 17 urban school districts in Ohio—amounting to 42 schools and approximately 55,000 students—received funding to learn from model small schools, network with researchers and other educators on small school transformation and sustainability, and develop detailed plans for re-conceptualizing effective teaching and learning. Planning grants ranged roughly from \$140,000 to \$210,000 or approximately \$100 per pupil.

In 2003, 20 of these schools across 11 districts received funding for the implementation phase of OHSTI. Cash grants and in-kind contributions ranged from approximately \$1.5 million to \$2.7 million, or \$1,200 per pupil. In fall 2004, autonomous small schools opened on 14 large high school campuses in 10 urban districts.⁵ During the transformation phase and later implementation years, in-kind contributions have included on-site coaching, literacy and math workshops, professional development in the area of curriculum development, leadership institutes, summer teacher institutes, and district central office consulting services provided by AIR.

Beginning in the fall of 2006, cash grants ranging from approximately \$400,000 to \$1.1 million were administered annually to each participating district to support professional development and associated release time (\$7,500 per small school), a stipend for collecting data that would be submitted to KnowledgeWorks (\$1,000 per small school per year for timely and complete data), support for a campus OHSTI project manager (\$20,000), and a bonus for convening a campus summer academy (\$19,000). Reimbursed services have included, but not been limited to, a campus-level Ohio Graduation Test (OGT) Boot Camp (\$19,724) to prepare students for the exam, a campus-level Student Summer Bridge Program (\$40,384), costs associated with taking and administering college entrance exams (e.g., AP, SAT, ACT), and piloting iWalkthrough handheld technology that collects instructional data and tracks improvements over time. OHSTI has also provided funds to support Measures of Academic Progress (MAP) professional development and testing. MAP is an OGT-aligned computerized adaptive assessment program that can produce classroom, building, and district-level reports to evaluate individual student growth, diagnose instructional needs, track program effectiveness overtime, and guide staff development planning.

KnowledgeWorks also provided an array of additional services to the OHSTI campuses. These services included 1) a Leadership Institute, which included such activities as Virtual Leadership Institutes and targeted workshops and camps; 2) a Principals' Leadership Network, which included retreats, face-to-face sessions, internships, and mentoring opportunities; 3) "School Change Coaches," who worked with school design teams and provided professional development; and 4) Community Engagement Activities, which involved quarterly meetings and school community gatherings.

⁵ A total of 58 small schools opened as part of the Initiative. Although the majority of the 58 small schools opened in the fall of 2004, some campuses phased in their small schools over subsequent years. For example, Cleveland Heights opened three small schools in 2004 and two more small schools in 2005.

The Context for this Research

According to a recent literature review (Miles et al., 2007), few research studies have measured school expenditures. Moreover, this literature tends to focus on a specific subset of small schools, which they defined as “autonomous, with an independent faculty, led by its own principal, and serving its own distinct group of students.” Miles et al. point out that much of the traditional research on school size and cost was conducted in a different era (largely in the 1960s) when the “concept of small schools and the challenges facing educators were significantly different.”

The current era of creating smaller high schools specifically as an intervention for improved student outcomes is fairly new. Miles et al. comment on the current research on this new era of small school reform as follows: “the young literature on contemporary small high school costs and results has not produced much criticism. Therefore, much of the literature is written from the perspective of those who support or have opened small schools and is couched in a positive and supportive light.” We also found little research on the cost of the conversion of comprehensive high schools into small schools, which typically have much less flexibility in regard to staff and resource allocation.

In addition, very little research has focused on the relationship between the cost of transforming comprehensive high schools into small schools and student outcomes. For example, when Nathan (2008) argued that the creation of small schools within comprehensive high schools was one of the key factors contributing to increased graduation rates (from 51 percent in 2000 to 79 percent in 2007) in the Cincinnati Public School District, these findings were not linked to cost.

The aforementioned literature review (Miles et al., 2007) found only one research study that sought to relate cost to any measure of student output. It examined budget data for 121 New York City schools and found that although the small high schools had higher per pupil operating costs, their graduation rates were somewhat higher and therefore their costs per graduate were similar to those of traditional high schools (Stiefel et al., 2000).

Miles et al. (2007) summarize their literature review on how much small high schools spend, and how this spending compares with large high schools, with the following:

The limited research on the cost of small high schools points to three key findings:

1. *Small high schools typically spend more per pupil to operate than large schools.*
2. *Per pupil high school spending varies widely across schools regardless of size.*
3. *Accurate spending comparisons must go beyond simplistic calculations based on school reported budgets.*

A more recent study (Stiefel et al., 2008) focused on comprehensive schools that had been converted to small schools. This analysis based on data from New York City concludes “...our findings show that small *comprehensive* high schools are expensive. If policymakers were to decrease school size and split comprehensive high schools into smaller schools, all they would accomplish is an increase in costs. The key to making small schools effective is to make them themed.”⁶ They find that themed schools, of an optimal size with a narrowed curriculum, have potential for lower costs relative to

⁶ Themed schools are small schools that offer narrowly focused curricula and course offerings that address specific academic interests of students. Examples include schools that concentrate on health care, science and technology, or business.

comprehensive high schools that offer an extensive list of courses, and have the potential to enhance outcomes, thereby lowering costs per unit of output.

In summary, while the traditional research on school size and expenditures concludes that on average small schools cost more on a per pupil basis, much of this work was conducted in an earlier era, and generally failed to link observed expenditure differences to outcomes. This analysis attempts to respond to the relative research gap in regard to small high school conversion costs and associated changes in student outcomes.

This study attempts to address the gap in the literature using a mixed-methods design. Using extant data on school expenditures and student outcomes available from the Ohio Department of Education (ODE), we first conducted descriptive analyses of each of the four case study districts profiled in the study. We then used ODE data to apply econometric models to explore variations in costs as they relate to input prices, student outcomes, and needs. The econometric study broadened the scope of comparisons and analyzed the differences between all 10 of the OHSTI campuses (See Exhibit 1 in Chapter Two) and the rest of the urban high schools in Ohio. Finally, AIR conducted interviews with district personnel in the four case study districts to discuss their experiences with high school transformation. These quantitative and qualitative analyses informed a comparison of the cost of OHSTI small schools—given the outcomes they produce—to other large, comprehensive high schools in Ohio.

Chapter 2: An Overview of Profiled OHSTI Campuses

This chapter provides a brief descriptive overview of the OHSTI campuses in the four school districts profiled in this study⁷ using data on expenditures and outcomes from the Ohio Department of Education (ODE) database. For each of the four profiled districts, we present expenditure data (e.g., total expenditures per pupil between 2000 and 2007; instructional expenditures per pupil between 2000 and 2007) as well as data on outcomes (e.g., graduation rates, performance index over time) to show changes over time.

The following table details the campuses and schools that are part of the OSHTI initiative, beginning with the profiled school districts (these districts are shaded in Exhibit 1 below).

Exhibit 1. OHSTI Campuses as of 2007-08

District	Campus	Small Schools on Campus
Canton City Schools	McKinley Senior High School	<ul style="list-style-type: none"> • ALIVE • Impact • Freshman Academy • McK STARS
Cleveland Heights - University Heights School District	Cleveland Heights High School (Heights High)	<ul style="list-style-type: none"> • Legacy • Mosaic • P.R.I.D.E. • The Renaissance School • R.E.A.L.
Lima City Schools	Lima Senior High	<ul style="list-style-type: none"> • Performance-Based School • Progressive Academy • School of Multiple Intelligences
Toledo Public Schools	Libbey High School	<ul style="list-style-type: none"> • Academy for the Humanities and the Arts • Cowboy Academy of Business Technology • Science, Math and Related Technologies
	Scott High School	<ul style="list-style-type: none"> • Business, Technology and Industry • The Center for the Arts and Media • The School of Allied Health • World Opportunity School of Human Services
Cleveland Metropolitan School District	East High School	<ul style="list-style-type: none"> • Academy of Creative Expressions • Institute of Business, Law, and Technology • School of Applied Science, Design and Technology
Columbus City Schools	Brookhaven High School	<ul style="list-style-type: none"> • The Leadership Institute for Student Development • Legacy • North Star
East Cleveland School District	Shaw High School	<ul style="list-style-type: none"> • Global Communications and Creative Arts High School • Shaw Academy • Shaw High School of Medicine, Science, and Technology • Shaw Leadership Academy
	Chaney High School	<ul style="list-style-type: none"> • Center for Excellence: Academics, Athletics, and the Arts • Class Academy: A Center for Discovery • The Center for interactive Exploration
Youngstown City Schools	East High School	<ul style="list-style-type: none"> • Center for Excellence • Center for Interactive Exploration • CLASS

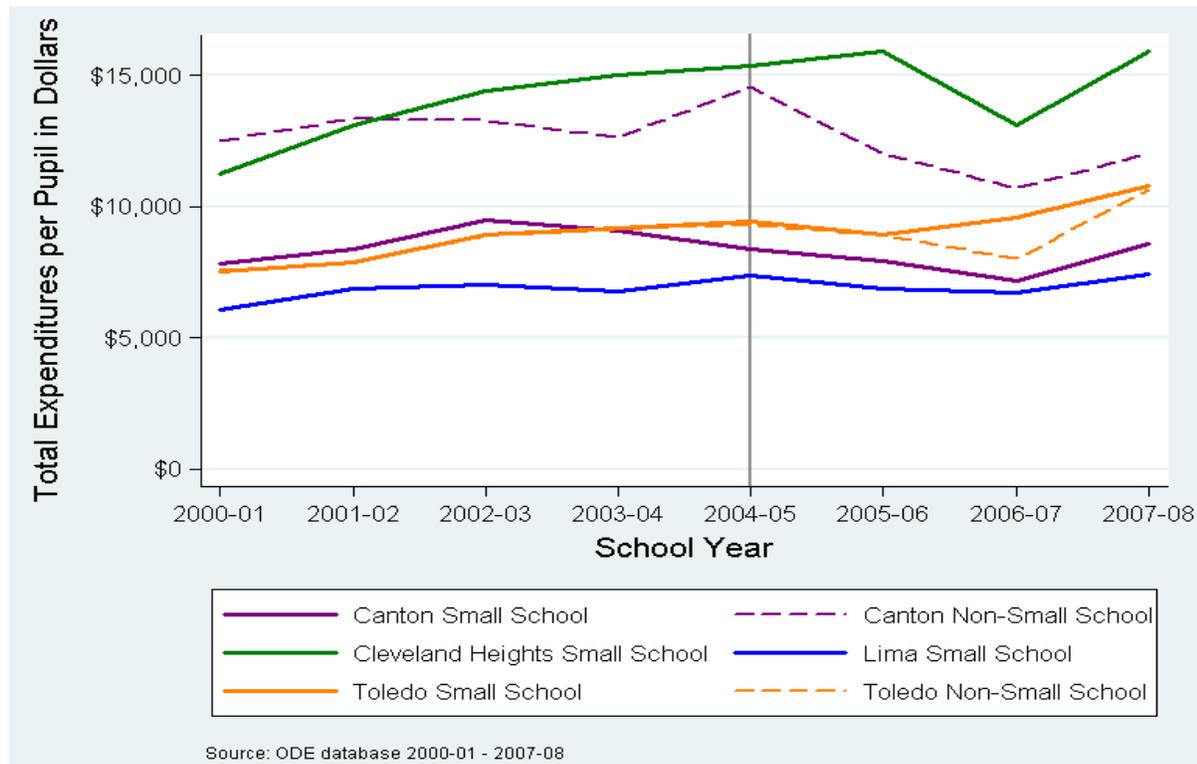
⁷ See Appendix A for a detailed overview of the profiled school districts and campuses and their small schools.

This descriptive overview provides context for the quantitative and qualitative (interview) analyses presented in the following chapters.

Expenditures of OHSTI Campuses within Profiled School Districts

Exhibit 2 shows total expenditures per pupil⁸ on high school campuses in profiled school districts between 2000-01 and 2007-08.⁹ As shown in the exhibit, per pupil expenditures on the OHSTI campuses in three of the four profiled districts¹⁰ increased somewhat between the planning year (2003-04) and the year of implementation (2004-05). Per pupil expenditures for two of the profiled campuses dipped considerably between 2005-06 and 2006-07, and increased again in 2007-08. In contrast, expenditures per pupil on Canton’s small school campus decreased steadily between 2003-04 and 2006-07, then increased in 2007-08.¹¹ Per pupil expenditures remained fairly even across the years on the Lima campus. Among the two districts with small and non-small (not converted) campuses, the two types of schools show parallel spending in Toledo through the period of conversion and initial implementation, with a divergence in spending only in 2006-07. In Canton, the non-small campus consistently shows higher spending, but this is somewhat misleading as this school is more technically/vocationally oriented, which likely accounts for the greater expenditures.

Exhibit 2. Total Expenditures per Pupil Among Profiled OHSTI Districts



⁸ Data on expenditures per pupil is from the ODE database; the category includes instruction, pupil support, staff support, building operations, and administration expenditures.

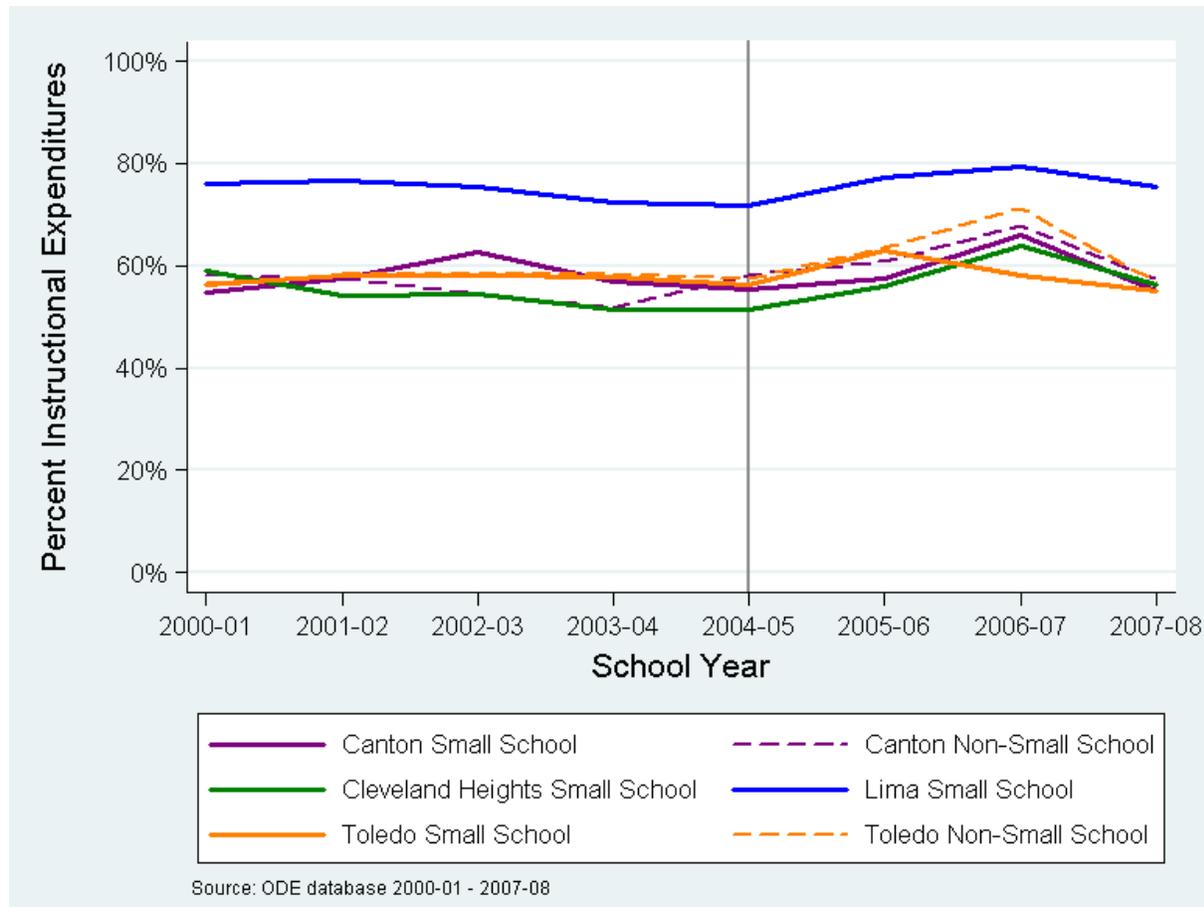
⁹ The solid orange line represents the two OHSTI campuses within Toledo Public Schools.

¹⁰ OHSTI transformed campuses are indicated by bold lines in the exhibits.

¹¹ The Canton campus also hosts an Early College High School as an additional learning community, which may impact costs.

Exhibit 3 shows instructional expenditures per pupil¹² as a percentage of total expenditures on high school campuses within profiled districts between 2000-01 and 2007-08. As shown in the exhibit, the percentage of instructional expenditures per pupil as a percentage of total expenditures on most of the OHSTI campuses within the profiled districts did not change markedly between 2003-04 and 2004-05. In contrast, most of the profiled districts showed notable increases in 2006-07, followed by subsequent decreases in 2007-08. The OHSTI campuses in Toledo Public Schools were the exception to this trend; the percentage of instructional expenditures increased in 2005-06, then started to decrease in 2006-07. While Lima shows a higher percentage of spending on instruction than the other three districts featured, this occurred both before and after small school implementation.

Exhibit 3. Instructional Expenditures per Pupil as a Percent of Total Expenditures in Profiled OHSTI Districts

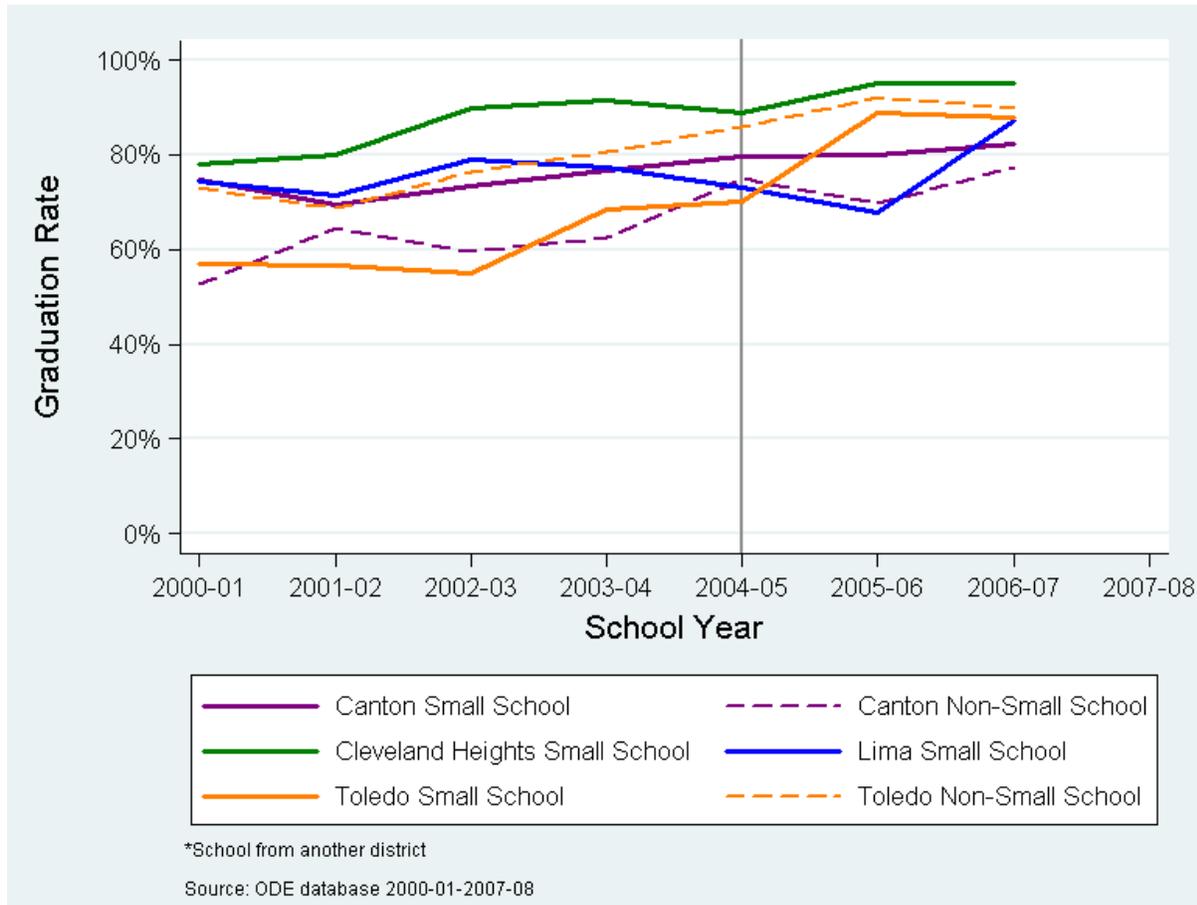


¹² Instructional expenditures include teacher and education professional salaries and classroom materials.

Outcomes of OHSTI Campuses within Profiled School Districts

Exhibit 4 shows graduation rates¹³ over time for the high school campuses in the profiled school districts. The graduation rates on two of the profiled OHSTI campuses [Cleveland Heights and McKinley Senior High (Canton’s converted campus)] remained fairly constant or increased slightly between 2004-05 and 2006-07. On the two OHSTI campuses in Toledo Public Schools, graduation rates increased markedly between 2004-05 and 2005-06, while rates decreased on the Lima campus during this same year.

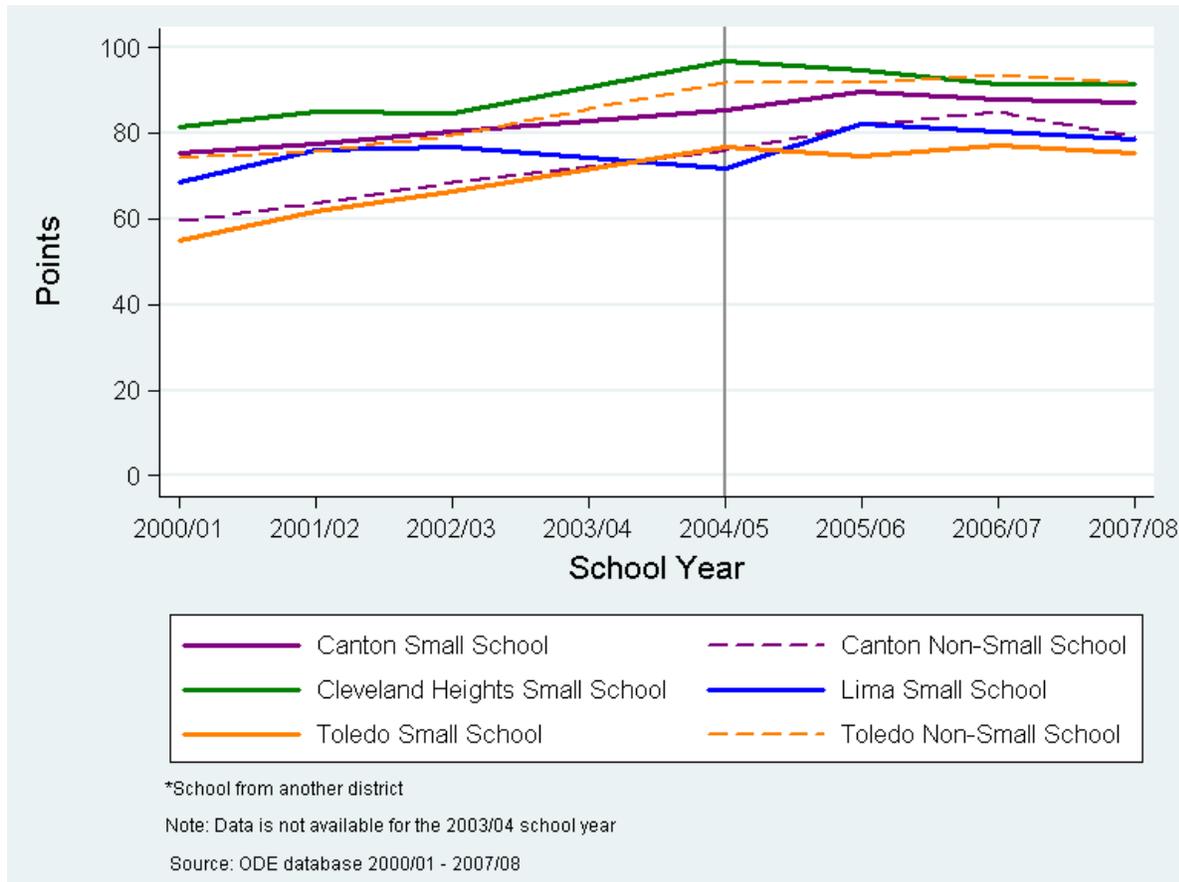
Exhibit 4. Graduation Rates Over Time, Profiled OHSTI Districts



¹³ Graduation Rate: The on-time graduation rate.

Exhibit 5 shows Ohio’s performance index over time¹⁴ for the high school campuses in the profiled districts. The performance index rates for two of the OHSTI campuses (Lima and Canton’s McKinley Senior High) within the profiled school districts increased between 2004-05 and 2005-06, while the rates on the OHSTI campuses in Cleveland Heights and Toledo Public Schools decreased in that same timeframe. Rates remained fairly stable or decreased slightly across profiled districts between 2006-07 and 2007-08.

Exhibit 5. Performance Index Over Time, Profiled OHSTI Campuses



The graphs in this chapter provide a descriptive overview of the data on expenditures and outcomes available from the ODE database. However, such a presentation of these data in isolation on such a small sample of schools cannot really inform the primary question of this study, which is the extent to which the costs of small schools compare to traditional high schools. For this, much more extensive analyses are needed that control for the differences among the profiled campuses as

¹⁴ Performance Index: A weighted average of all tested grades and subjects, with more weight given to higher performance level. The performance index is calculated by adding all performance index “points” earned in each proficiency level (below basic, basic, proficient, accelerated, advanced). Performance index points are calculated by multiplying the percentage of test results in a proficiency level by a constant point weight assigned to that proficiency level:

$$\text{Performance Index}_i = (\% \text{ Below Basic}_i * 0.3) + (\% \text{ Basic}_i * 0.6) + (\% \text{ Proficient}_i * 1.0) + (\% \text{ Accelerated}_i * 1.1) + (\% \text{ Advanced}_i * 1.2), i = \text{All tested grades and all subjects for each school}$$

compared to traditional high schools throughout the state over time. The methodology and findings for these analyses are presented in the following chapter.

Chapter 3: An Economic Analysis of OHSTI Campus Costs and Outcomes

In their review of the literature on the cost of small schools, Miles et al. (2007) argue that “accurate spending comparisons must go beyond simplistic calculations based on school reported budgets.” So while Chapter 2 provides some descriptive information about expenditures and student and teacher outcomes on the four OHSTI campuses profiled in our case study, this chapter presents a more rigorous and comprehensive economic analysis of the costs for all of the OHSTI campuses (as listed in the first chapter of this report) also using data from the Ohio Department of Education (ODE).

Cost Analyses: the Methodological Overview

One of the overarching goals of this study was to ascertain whether small high schools cost more to operate than large high schools. But implicit in this question is the degree to which variations in spending may be tied to differential learning outcomes for students. Moving beyond simple measures of *spending* to determining variations in *cost* begs the question, “cost of what?” It is only by describing, or controlling for, the set of outcomes produced that we can define the concept of cost.

To analyze the data on educational costs, we use regression methodology to show the relationship between total per pupil expenditures at a school and the outcomes produced (e.g., test proficiency rates and student attendance rates), while controlling for other factors such as student needs, labor costs, and enrollment levels that affect level of cost of those outcomes. We also control for the variations in the prices paid for school inputs in the local labor markets. Pupil needs are measured by the proportions of students who are economically disadvantaged, English language learners, and receiving special education services. This analysis is carried out across a large sample of high schools included in our statistical models. This approach allows us to compare costs at the OHSTI versus the non-OHSTI schools, while at the same time taking into account other identifiable factors that affect educational costs. However, all of the results presented in this section must be considered with caution due to the small number of OHSTI schools.

Data and the Sample

The cost analyses were conducted on urban high schools in Ohio designated as “regular” by the National Center for Education Statistics (NCES) Common Core of Data (CCD). Thus, we excluded charter, vocational, alternative, and special education schools from the analysis. We also excluded three OHSTI campuses (Euclid, Linden McKinley, and Lorain) that had been in the OHSTI initiative, but did not remain for the full implementation cycle.¹⁵ Nearly 400 regular urban high

¹⁵ Euclid, which opted out of OHSTI in 2006, continued as a small school. Linden McKinley reverted to a comprehensive high school in 2006. The two Lorain campuses reverted to comprehensive schools in January 2008.

schools and 10 OHSTI schools are included in this analysis. Exhibit 1 (see Chapter 2) lists the 10 campuses and constituent schools included in this analysis.

The data for these analyses were largely drawn from the data available from the ODE on outcomes and student demographics for the eight school years 2000-01 through 2007-08.¹⁶ Where appropriate, we supplemented the ODE data with additional data from NCES,¹⁷ the U.S. Census of Population and Housing, and the Bureau of Labor Statistics (BLS).¹⁸ Descriptive statistics from 2007-08 for all of the variables included in the statistical analyses are presented in Exhibit 6.

Exhibit 6. Descriptive Statistics for OHSTI and Non-OHSTI Schools, 2007-08

		Non-OHSTI Schools			OHSTI Schools		
		OBS	MEAN	STD. DEV	OBS	MEAN	STD. DEV
Expenditures							
	Total Expenditures Per Pupil, Including Central Expenditures Allocated by Dollars	386	10,243	(2,267)	10	12,365	(2,550)
	Total Expenditures Per Pupil, Including Central Expenditures Allocated per Capita	386	10,236	(2,349)	10	12,336	(2,750)
School Outcomes							
	Test Proficiency Composite Index (10 th grade)	386	0.81	(0.11)	10	0.57	(0.12)
	Student Attendance Rate	386	0.93	(0.03)	10	0.91	(0.02)
	Graduation Rate (2006-07) ¹⁹	381	0.89	(0.11)	10	0.75	(0.18)
	Expulsions per 100 Students	386	0.77	(2.32)	10	3.09	(1.81)
	Suspensions per 100 Students	386	21.87	(30.06)	10	85.51	(49.38)
	Change in Test Proficiency Index	386	-0.05	(0.58)	10	-0.22	(1.29)
	Change in Student Attendance Rate	386	0.00	(0.01)	10	0.01	(0.04)
	Change in Graduation Rate	381	0.01	(0.06)	10	0.05	(0.08)
	Change in Expulsion Rate	386	0.03	(0.73)	10	0.33	(1.58)
	Change in Suspension Rate	386	1.52	(15.80)	10	6.58	(28.05)
Input Prices							
	Comparable Wage Index Professional Workers	386	1.26	(0.09)	10	1.27	(0.05)
	Comparable Wage Index Non-Professional Workers	386	1.24	(0.08)	10	1.25	(0.05)
Input Quantities (per pupil)							
	Instruction Expenditures	386	4,290	(949)	10	4,700	(1192)

¹⁶ The datasets were obtained, on April 2009, from the following location on the Ohio Department of Education website:

<http://ilrc.ode.state.oh.us/PublicDW/asp/Main.aspx?server=mstris2&project=ILRC&evt=3002&uid=guest&pwd=&persist-mode=%228%22>

¹⁷ The Common Core Data was downloaded, on April 2009, from the Public Elementary/Secondary School Universe Survey Data webpage: <http://nces.ed.gov/ccd/pubschuniv.asp>.

¹⁸ The NCES' CCD had no information for 2007, so we imputed those values using the available 2006 data. The main variables that we imputed were school location and number of students per grade. We also presumed that if a school was a high school in 2006, it was still a high school in 2007. The data from the Census and the BLS were used to update the NCES comparable wage index, which measures the prevailing wage for college graduates in each local labor market. We also used Census and BLS data to generate a similar index for non-professional staff. See Taylor (2008) for a description of the methodology.

¹⁹ Graduation rates were not available for Toledo Public Schools for 2007-08.

		Non-OHSTI Schools			OHSTI Schools		
		OBS	MEAN	STD. DEV	OBS	MEAN	STD. DEV
	Support Expenditures	386	1,035	(383)	10	1,107	(434)
	Building Expenditures	386	1,321	(568)	10	1,569	(1739)
	Administration Expenditures	386	458	(149)	10	561	(173)
	Central Office Expenditures	386	1,020	(611)	10	1,345	(616)
Environmental Factors							
	Campus Enrollment	386	933	(524)	10	1,135	(373)
	District Enrollment	386	9,504	(14,254)	10	19,538	(18,769)
	English Language Learners (proportion)	386	0.02	(0.03)	10	0.03	(0.03)
	Economically Disadvantaged Students (proportion)	386	0.33	(0.25)	10	0.69	(0.16)
	Special Education Students (proportion)	386	0.15	(0.05)	10	0.19	(0.03)

Looking only at nominal differences, the OHSTI schools on average are higher-spending, and have lower levels of student performance as measured by test scores, attendance rates, lower graduation rates, and higher rates of disciplinary problems than non-OHSTI schools. However, the composition of students served in OHSTI schools is also quite different, with twice the rate of economically disadvantaged students as non-OHSTI schools and higher rates of students eligible for special education. To move beyond these nominal differences to examine differences in cost, it is essential to use a regression analysis approach in which environmental factors and outcome measures are taken into consideration.

Treatment of Data on OHSTI Schools

The OHSTI campuses in our sample operate anywhere from three to five small high schools, and the way these schools are organized differs across campuses. Some of the OHSTI campuses share some portion of their administrative and instructional resources across schools, while others strive to operate as independently from one another as possible. Unfortunately, the ODE school-level data do not consistently and uniquely include individual OHSTI small schools that are located on a single campus. In some cases, there are unique data for each small school located on the campus, while in other cases the data are aggregated to the campus level in the ODE database.²⁰ This complicates the consistent use of ODE data for analyzing individual small schools operating on the same campus.

We address this in our analysis by consistently using aggregate campus-level data in the statistical analyses, pulling together data across schools operating on the same campus. These aggregations of data represent the campus as if it were a single school. This aggregation results in the loss of some school-level information. However, the use of aggregate data allowed us to fully and consistently capture any aggregate cost savings or increases resulting from breaking these high schools into smaller units. Also, the use of aggregate data precluded the need to attempt to accurately divide shared costs among individual schools within a campus.²¹ Thus, this aggregated approach provides

²⁰ Only three of the 10 OHSTI campuses in our study (Lima, Toledo-Libbey, and Toledo-Scott) established separate Internal Retrieval Numbers (IRNs) for their small schools. Additionally, the information for 2006-07 for Libbey represents district averages. Therefore, where we lacked data from the small schools for Libbey and Scott, we imputed the values reported on the ODE for Libbey.

²¹ While the issue of dividing costs among small schools is an interesting question in and of itself, it was beyond the scope of the current study.

consistent measures for capturing whatever benefits and costs may accrue from the smaller schools at a given site.

Treatment of Central Expenditures

Beyond aggregation of school level-expenditures, another important component of these analyses is allocating estimates of district-level spending to individual schools. We used these estimates to augment the expenditures allocated by ODE to the school site/campus to include a pro rata share of district expenditures for central administration and support services.

We used two alternative methods of apportioning these central expenditures: by spending at the school-level and by school enrollment. The first option assumes that for every dollar spent at a school, an equal share of central office dollars will be required to support the program at the school. In other words, if a campus accounted for 10 percent of the ODE school-level expenditures for a district, it was assigned 10 percent of the unallocated central office expenditures. This approach assumes that schools with higher expenditures required proportionately more administrative oversight and support services to maintain the program operations.

Using the second approach to allocating central office expenditures, it is assumed that each child generates equal need for administrative oversight and support services from the central office. In other words, if a campus served 10 percent of the students, it was assigned 10 percent of the unallocated expenditures.

To ensure that our findings would not be affected by the selection of one method over another, we tested both and found that our conclusions about the impact of the OHSTI program are the same regardless of the cost allocation strategy used. Therefore, we present only the estimates for the second approach, central office expenditures allocated per capita.

Treatment of Student Outcomes Data

Because of the strong and persistent negative relationship observed between the percentage of students from economically advantaged backgrounds and school-level student performance, most education policy researchers favor analyses based on some measure of the value added by schools. Value-added measures are typically designed to reflect the change in student performance that can be attributed to the school. Ideally, such measures are constructed or estimated from data on the performance of individual students over the course of several years.

Unfortunately, individual data are not available for this study. Instead, we generate an approximate measure of value added by calculating the change in student performance from one year to the next at the school level. This approach is consistent with the definition of Adequate Yearly Progress (AYP) used to measure student gains under the No Child Left Behind Act of 2001. Our test proficiency index summarizes the percentage of 10th-grade students who scored proficient (or better) in math, reading, writing, social studies, and science on the Ohio Graduation Test. We limit these analyses to 10th grade because this is the only grade for which scores are reported every year from 2000-01 through 2007-08.

For schools with very high levels of student performance, change indicators can be problematic. For example, a school where all the students are proficient cannot register improvement. In the ODE

data, many student performance measures are capped at 95 percent. That is, a school with an attendance rate above 95 percent is reported as simply 95 percent. Capping variables in this fashion limits our ability to measure changes in outcomes. To differentiate between schools that do not improve because they have no room for improvement and schools that do not improve for other reasons, we have included control variables in our analysis that account for these capped observations, i.e., noting schools where the prior year's performance level was 95 percent or above and no improvement was possible.

The Cost Analyses

We used cost function analysis to examine the relationship between school expenditures and school outcomes, controlling for input prices, student need, the scale of campus operations, and some classroom context variables (e.g., the share of campus enrollment in each grade level). The outcomes used in the cost function analysis were the annual change in the test proficiency index and the annual change in the student attendance rate using data from the years 2000-01 through 2007-08.²² The technical appendix provides a formal description of the specification and estimation procedures.

To estimate cost differences associated with the OHSTI schools, we included two indicator variables in our statistical equations. One indicator was included for each of the OHSTI schools for each year after implementation of the program – that is, for the period after the 2004-05 school year. We refer to this indicator as *OHSTI after implementation* in our tables below (the indicator has a value of 1 if the school in our sample implemented the small school initiative in the 2004-05 school year, 0 otherwise).

In addition, to test the proposition that the OHSTI schools might have some unobservable attributes that would be associated with the higher costs we were observing in the post-implementation period, we included an indicator variable to show that a school was eventually going to become an OHSTI school. This indicator had a value of 1 for these schools for each sample year from 2000-01 through 2007-08. Thus, the final analytical approach included two indicators: one that designated the school as an OHSTI school over the period 2000-01 through 2007-08, and another that just designated the OHSTI school during the post-implementation years from 2004-05 on.

The first analyses we conducted are ordinary least squares regressions (OLS), which are our baseline analyses. These baseline analyses control for key variables known to be associated with differences in spending, such as need variables (English language learners, students identified as economically disadvantaged, and students eligible for special education services) and school context (school size and district size).

Exhibit 7 provides information on the relative costs of OHSTI versus non-OHSTI schools from these baseline analyses. Line 1 of this table compares OHSTI to all of the other schools included in this analysis for the academic years of 2000-01 to 2007-08, which include the pre- and post-implementation periods. This line reveals that OHSTI high schools appear to have higher costs

²² In the course of our analysis, we also included graduation and the rates of disciplinary actions as other outcome variables. But this made the estimates somewhat less precise (with higher standard errors) because of collinearity and graduation rates were not available for 2007-08, so including this indicator reduced the number of years under analysis.

(about 11 percent) per pupil than other schools in Ohio, controlling for the mentioned contextual and need variables. This is not a surprising or particularly meaningful finding, as OHSTI schools were not selected randomly. The key finding is shown in line 2, which compares pre- and post-implementation costs. Line 2 indicates that while the data show a slight increase (1.4 percent) in costs between OSHTI and non-OHSTI schools post-implementation, it is not statistically significant.²³

Exhibit 7. Baseline Estimates of the Relative Cost Differential between OHSTI and non-OHSTI Campuses – OLS Regression

	Including Cleveland Heights	Excluding Cleveland Heights
OHSTI versus non-OHSTI, Pre- and Post-implementation Period (2000/01–2007/08)	11.0%***	6.0%
Change in OHSTI and Non-OHSTI Schools' Cost Differential, Post-implementation (2004/05–2007/08)	1.4%	1.5%
Observations	2,714	2,707

Note: These baseline estimates are based on ordinary least squares regression. Both models also include school outcomes (the change in proficiency rate, the change in student attendance rates and indicators for capped proficiency rates, and capped attendance rates), input prices (comparable wage indices for college graduates and high school graduates), student needs (economically disadvantaged index, limited English proficiency index, special education index, and an interaction between the economically disadvantaged and LEP indices), school enrollment (and its square), the share of students in the 10th, 11th and 12th grades, indicators for small and midsized school districts, and school year fixed effects. Asterisks indicate an estimate that is statistically significant at the *** 1-percent, ** 5-percent, and * 10-percent levels.

The second column of Exhibit 7 present the OLS estimates excluding Cleveland Heights campus. We decided to estimate the baseline model without Cleveland Heights because their expenditure per pupil is much higher than for the average OHSTI campus. For example, during the three years prior to implementation, per pupil expenditures in Cleveland Heights averaged \$14,706, while per pupil expenditures in other OHSTI campuses averaged \$12,365, and per pupil expenditures in non-OHSTI campuses averaged \$8,717. (All of these estimates include allocated central administration expenditures.) If Cleveland Heights is excluded from the cost function analysis, then the estimated cost between OHSTI and non-OHSTI campuses declines from 11 percent to 6 percent and is no longer a statistically significant difference.

Most importantly, as mentioned, we find no statistically significant difference in the cost of operating these OHSTI schools after the implementation of the small schools initiative. This is portrayed in the second line of Exhibit 7. This finding holds whether or not we include Cleveland Heights in the analysis.

To supplement this baseline cost analysis, we also conducted analyses that explicitly allowed for differences in efficiency across campuses, implementing a stochastic frontier analysis (SFA) approach. The SFA analysis is designed to measure the “technical efficiency” of each school in our analysis—OHSTI and non-OHSTI. In this context, the concept of efficiency refers to the way a

²³ While the post-implementation parameter estimate amounts to about a 1.4 percent cost differential, the standard error of this estimate is too large, which means that for all intents and purposes, we cannot distinguish it from zero, and this result could be due to chance. That said, it is difficult with such a small sample of schools to detect statistically significant results.

high school allocates and organizes its inputs for the purpose of improving student outcomes—e.g., attendance rates and test proficiency. According to economists (Stiefel et al., 2005, page 2),

“...measures of technical efficiency seek to identify those schools getting the most ‘bang from their buck,’ where ‘bang’ is typically a series of test score measures (or changes in test score measures) and ‘buck’ includes a variety of inputs such as resources, organizational characteristics, and student attributes.”

Technical inefficiency, in the language of economics, reflects the extent to which schools spent more than was needed to achieve the observed outcomes—that is, the amount above what they would have spent if operating at perfect efficiency.

Exhibit 8 presents these *efficiency-adjusted* cost estimates based on the SFA approach. The first row of this exhibit reveals that adjusting for school efficiency slightly lowers the average cost differential between OHSTI and non-OHSTI schools throughout the analysis period. This row shows a 10 percent cost differential between OHSTI campuses and non-OHSTI schools over this period.

Exhibit 8. Efficiency-Adjusted, Estimates of the Relative Cost at OHSTI Campuses – Stochastic Frontier Analysis

	Including Cleveland Heights	Excluding Cleveland Heights
OHSTI versus Non-OHSTI, Pre- and Post-implementation Period (2000/01–2007/08)	10.4%***	6.1%
Change in OHSTI and Non-OHSTI Schools' Cost Differential, Post-implementation (2004/05–2007/08)	2.1%	2.0%
Observations	2,714	2,707

Note: Both models were estimated using stochastic frontier regression model. Both models also include school outcomes (the change in proficiency rate, the change in student attendance rates and indicators for capped proficiency rates, and capped attendance rates), input prices (comparable wage indices for college graduates and high school graduates), student needs (economically disadvantaged index, limited English proficiency index, special education index, and an interaction between the economically disadvantaged and LEP indices), school enrollment (and its square), the share of students in the 10th, 11th and 12th grades, indicators for small and mid-sized school districts, and school year fixed effects. Asterisks indicate an estimate that is statistically significant at the *** 1-percent, ** 5-percent, and * 10-percent levels.

Similar to the OLS baseline analyses, the SFA analyses also reveal no statistically significant differences in the cost of OHSTI schools post-implementation, as shown in the second row of Exhibit 8. Also, as in the baseline OLS analysis presented in Exhibit 7, once we exclude Cleveland Heights, there are no statistically significant cost differences between OHSTI and non-OHSTI schools throughout the period of implementation, nor between OHSTI campuses pre- and post-implementation.

The Stochastic frontier analyses also allow us to go one step further in assessing the relative efficiency of the schools in our sample. Exhibit 9 presents the degree of technical inefficiency of the average non-OHSTI school as compared to the average OHSTI school for the overall period and after implementation of the initiative.²⁴ As shown, none of these four measures (including or excluding Cleveland Heights) show statistically significant differences.

²⁴ In the appendix we include the histograms of the technical inefficiency by non-OHSTI schools, OHSTI schools before implementation, and OHSTI schools after implementation. The histograms shows the extent to which costs in

Exhibit 9. Technical Inefficiency Estimates for the Cost Function

	Inefficiency Scores	Inefficiency Scores without Cleveland Heights
OHSTI versus Non-OHSTI, Pre- and Post-implementation Period (2000/01–2007/08)	0.1%	-0.8%
Change in OHSTI and Non-OHSTI Schools' Inefficiency Differential, Post-implementation (2004/05–2007/08)	-0.3%	-0.2%
Observations	2,714	2,707

Note: The technical efficiency scores were estimated using the efficiency estimated in the stochastic frontier regression. This second stage estimation also includes the size of the district. Asterisks indicate an estimate that is statistically significant at the *** 1-percent, ** 5-percent, and * 10-percent levels.

In addition to the baseline and efficiency-adjusted analyses, AIR also examined a number of alternative models of educational cost among urban high schools in Ohio. One alternative model incorporated an indicator for the degree of implementation fidelity of the KnowledgeWorks model. The measure of implementation was based on the non-negotiable points defined by KnowledgeWorks Foundation. Another allowed for the possibility that it costs more to achieve proficiency among economically disadvantaged students than it does to achieve proficiency among economically advantaged students. As illustrated in the technical appendix, all of these alternative specifications led to the same conclusion: when academic outcomes, labor costs, student need, and campus size are held constant, there is no evidence that small school transformation altered the cost or efficiency of OHSTI schools.

Summary of Analysis of Costs and Student Outcomes

After conducting detailed analyses of education costs, we find no statistically significant differences in costs attributable to the implementation of the OHSTI program. However, it is important to point out that the sample of schools included in the program was very small (only 10 campuses out of a total of roughly 400 urban high schools), and that it is very difficult to tease out effects in such a small sample. Moreover, school cultures can be very slow to change and it requires significant amounts of time for such changes to translate into readily measurable outcomes. The next chapter provides more information on the perspectives of district-level administrators included in our case study to help sort out some of the effects that the program may be having on school operations.

each of these three types of schools exceed the estimated minimum achievable per pupil cost of producing the student outcomes specified in the model to provide a clearer picture of the distribution.

Chapter 4: Perspectives on the Small School Conversion Experience from Case Study District Administrators

We conducted interviews with district administrative staff from the four profiled OHSTI districts to discuss their experiences and perspectives regarding high school transformation. In separate interviews, district academic administrators and business officers were asked to describe the physical arrangement, administrative structure, and focus of the small schools in their districts; their perspectives on the start-up and implementation costs of small schools; and the outcomes they believed were associated with small school transformation. Interviewed staff members were also asked to describe the funding used to both implement and sustain the small school initiative, any advice they wished to offer to other districts considering small high school conversion, and the future of small schools in their districts. These perspectives are also supplemented by other data found in regard to the small high schools in each of these four case study districts.

This chapter includes a synthesis of these interviews with district staff on the following subjects: small school implementation and models; the physical arrangement and leadership structure of small schools; cost perspectives; student, teacher, community, and school outcomes; funding of small schools; advice to other districts considering reform; and future plans for small schools in the profiled districts.

Small School Implementation and Models

The profiled OHSTI districts²⁵ adopted different implementation plans and models for their small schools. For example, on one of the OHSTI sites, the campus elected to serve 9th and 10th graders in each of its planned small schools in the initial year of transformation, while another campus began by serving 9th and 10th graders within a subset of its planned small schools and phased in additional grades and small schools in subsequent years. Another difference is that some districts decided to retain one unique identifier or Internal Retrieval Numbers (IRNs) for their transformed campus, while others adopted a separate IRN for each of the small schools on a campus. IRNs are used as unique identifiers of various types of school-related entities within Ohio, and the establishment of separate IRNs allows the campus to track data and compare performance for each individual small school.

Small Schools at McKinley Senior High School in Canton

McKinley Senior High School opened five small schools in SY 2004-05 as part of OSHTI. Freshman Academy served ninth graders, while four other schools [A.L.I.V.E. (Active Learning and

²⁵ Exhibit 1 in Chapter 2 provides a list of profiled OHSTI campuses and their small schools.

Inquiry Based Valued Education), Impact, McK STARS (Students and Teachers Are on the Road to Success), and McKinley School of Diversity] enrolled 10th, 11th, and 12th graders. McKinley School of Diversity closed at the end of the 2005-2006 school year. McKinley Senior High has one IRN for its entire campus.

Each of the small schools has a unique career path and vision. One of McKinley Senior High's small schools is devoted solely to incoming freshmen, while the other three schools are devoted to differing academic themes (e.g., math, science, and physical education; liberal arts; and international studies). The school devoted to freshmen provides wraparound services to improve integration of new students and an opportunity for students to decide which of the other small schools they would like to attend. Canton's academic officer emphasized that the district encourages students in as early as eighth grade to begin thinking about career possibilities and learn about what each small school has to offer.

According to their websites, the different teaching models of the four small schools are as follows:

Freshman Academy: The vision of this small school is a "Culture of Success." Freshman Academy's mission is "to meet the academic and social emotional needs of all students."

ALIVE: ALIVE is an Active Learning and Inquiry-Based, Valued Education School, with a focus on math, science, and physiology. According to its website, this small school uses "diverse methods of instruction [to] accommodate all learning styles."

Impact: According to its website, this is a "school of visual and performing arts that creates a culture where diverse opportunities generate success." Its students have been a part of many award-winning productions and performances throughout the city, the state, and the nation.

McK STARS: According to its website, this small school for international studies "offers rigorous and challenging classes and prepares students to be successful in a global economy."

Small Schools at Cleveland Heights High School

In SY 2004-05, as part of OSHTI, Cleveland Heights High School (Heights High) opened three small schools with 9th and 10th grades: Producing Responsible Individuals Dedicated to Excellence (PRIDE) School, The School of Relevant Experiential Active Learning (REAL), and Renaissance School. In 2005-06, these three schools added 11th graders, and the campus added two more small schools (Legacy School and Mosaic Experience) with 9th, 10th, and 11th grades. By 2006-07, each of the five small schools served all four grade levels. Like McKinley Senior High, Heights High has one IRN for the entire campus.

According to Heights High's website, each of the five schools on the campus was designed to reflect a different instructional model (e.g., Socratic Method, project-based learning). This type of focus is unique among the profiled districts, which otherwise designed their small schools around differing curricular (rather than learning) models. The *Heights High Quick Profile Sheet*, a document available from the Heights High website, describes the different teaching models of the five small schools as follows:

Legacy: “The Legacy School will prepare students to use their minds well and to become active problem solvers. Students will learn from both their teachers and their peers. They will also learn to effectively evaluate themselves as learners and be able to express themselves using a variety of media emphasizing both written and oral communication. This model will integrate high standards across the disciplines. Teachers will be diagnosticians, prescribing the best instruction for each student learner.”

Mosaic Experience: “The Mosaic Experience’s mission is to engage the [students] in learning and self development through integrating technology and the arts with a rigorous curriculum. Participants in the Mosaic Experience are unique, atypical, different, exceptional, extraordinary, unconventional in their thinking, learning and teaching styles. The goal is for everyone’s problem solving skills and creativity to evolve to their greatest potential.”

PRIDE: “A student commits to PRIDE with the knowledge that his/her teachers uphold a professional practice dedicated to each and every student. PRIDE students work to achieve mastery of academic goals knowing that their teachers embrace a teaching philosophy that very specifically nurtures their process. The college bound and the career bound students in PRIDE have the advantage of a setting that considers their intellectual, personal, and social interests and strengths. Through its Individualized Learning Plans, PRIDE’s academic program will evolve as the student grows and changes.”

REAL: “REAL School combines experiential learning with meaningful, relevant learning experiences in the classroom and in the community. Students in REAL enjoy working on projects that are located in our community. They are conscientious and concerned about problems that affect our community. REAL students enjoy working ‘together’ with adults in our community to solve ‘actual’ challenges and concerns in our communities. ‘Where education meets the REAL world.’”

Renaissance School: “The focus of *The Renaissance School* is on learning through cooperation and collaboration. The teacher acts as the coach, encouraging the students to discover the answers. In groups, students find 70 percent more answers than those working alone; in Socratic seminars, students share ideas and delve deeply into the subject matter, finding creative ways of solving problems or new ways of looking at issues. This collaboration also creates a more democratic atmosphere where students can join lunchtime student-led discussion groups or participate in leadership training in an Outward Bound setting.”

Small Schools at Libbey and Scott High Schools in Toledo

Toledo is the only district among the profiled sites with two high schools converted into small schools as a part of OHSTI.²⁶ In school year 2004–05, Libbey High School was transformed into four small schools. All these schools were designed to serve 9th through 12th graders and were developed around a unique curriculum: The Cowboy Academy of Business Technology (CAB), which was named after the school’s mascot (the Cowboys); the Humanities Academy; Science, Math and Related Technologies (SMART) School; and the Gateway School of Health Technology. Although Gateway closed at the end of 2006–2007, the three other small schools remain in

²⁶ According to Toledo’s academic officer, two additional high school campuses in the district had submitted strong proposals to the KnowledgeWorks Foundation, but were not selected as OHSTI sites because the schools lacked the 80 percent faculty vote required by the district’s teacher’s union.

operation. Unlike the small schools on the Heights or McKinley campuses, each of the small schools at Libbey has its own IRN.

Also in 2004-05, Scott High School in Toledo was transformed into four small schools as part of the OSHTI Initiative. All of these schools were designed to serve 9th through 12th graders and were developed around different themes: the Arts and Media Academy, the Allied Health Academy, the Business Technology and Industry Academy, and the World of Opportunity/School of Human Services. As with Libbey, each school on the Scott campus has its own IRN.

Small Schools at Lima Senior High

In the fall of 2004, the Lima Senior High comprehensive high school campus was divided into three small schools. All schools were designed to serve 9th through 12th graders and were developed around different themes: Performance-Based School; the Progressive Academy, and the School of Multiple Intelligences. Representatives from each of the campus's small schools visit the district's middle schools to give a presentation about their school's offerings and focus. Incoming students subsequently rank each small school in order of preference, and according to Lima's business officer, are typically assigned their first choice. As with the OHSTI campuses within Toledo Public Schools, each of the small schools at Lima Senior High has its own IRN.

Physical Arrangement and Leadership Structure of Small Schools

The physical arrangement and administrative structure of the profiled OHSTI campuses vary by district. The campuses also vary in their degree of "purity," or the degree of crossover in students and teachers across the small schools. So, for example, a "pure" school is characterized by its ability to keep students and teachers together in their respective small schools throughout the school day.

Physical Arrangement of Small Schools

In Toledo Public Schools, each of the two OHSTI high school campuses (Scott High School and Libbey High School) were transformed into four small schools and, in both cases, remain housed in their original buildings after conversion. Similarly, on the Heights High campus, the five small schools are housed in one building; however, during transformation staff and teachers were relocated as necessary so that each wing of the building could be dedicated to a small school. Each small school shares the campus cafeteria, gymnasium, and media center, but has its own main office, science laboratory, computer laboratory, art room, and collaborative work space.

The four small schools on the McKinley Senior High campus are also housed in a single building; however, only four of the five small schools were initially housed in the campus's main building. Freshman Academy was located in a nearby facility until the 2007-08 school year, when it was moved to the main campus so that it could be integrated with the other small schools, thereby reducing facility costs. In the spring of 2008, the McKinley Senior High campus underwent a restructuring of its building to better define the physical space of each of its small schools, which included creating open areas that serve as lobbies for each small school.

As with the other profiled campuses, Lima's three small schools are housed in a single building; however, the Lima campus opened its small schools in a new building (as opposed to using the

building occupied by the former comprehensive school). The district academic officer explained that they designed their new building with the idea that students would know “where they belonged and where they didn’t belong.” She also noted, however, that this “double transition” (i.e., both to a new building and to the novel concept of small schools) made it difficult for students to adapt initially.

School Leadership

Prior to its transformation into small schools, the Lima Senior High School campus had one principal, four assistant principals, and a counselor for each grade level. Each of the three small schools now has one principal, one assistant principal, and one counselor. The Heights High campus has a similar structure: each small school has its own principal, teacher leader, and counselor.

McKinley Senior High has a campus principal who is responsible for the supervision of the small school leadership, communication between the small schools and the district, master scheduling, and discipline. Each of the small schools also has its own principal and counselor.

Similarly, as part of the transformation process, Toledo Public Schools created a new position called “campus director” for both of its OHSTI campuses to provide needed accountability and compliance oversight. Each of the small schools at Libbey and Scott also has two leaders, one of whom serves as an administrative leader and the second as a teacher leader.

School “Purity” and Crossover

In the context of small school transformation, the term “purity” refers to the extent to which small schools on a single campus share students, staff, and resources (e.g., science laboratories, gymnasiums, art rooms). For example, an entirely “pure” transformed campus would consist of small schools that had their own administrative staff (e.g., “teacher leaders,” small school principals, assistant principals), teaching staff, and students—with no crossover of these individuals between the small schools—and their own physical space. Although the campuses differed in the extent of shared resources, none of the schools were entirely “pure,” as teachers and students participated in classes with varying degrees of autonomy across small schools (e.g., one calculus class for all students on a campus, regardless of their small school affiliation). They also shared athletics teams, a gymnasium, and a cafeteria at a minimum.

When asked to discuss the extent of crossover between small schools on their campuses, the four profiled districts described varying degrees of purity and philosophies about small school autonomy. Some of the campuses had fairly autonomous small schools. For example, the academic officer from Lima emphasized the district’s efforts to “[stay] true to the original intent of the small schools concept.” She stated that each small school is held individually accountable and as such, assigned a separate IRN for tracking its data and comparing performance. The Lima business officer described each small school as operating independently and without much “teacher crossover,” with the exception of the arts department and the choir, band, and orchestra. Their small schools share the science and laboratory facilities, but not science teachers. Lima’s academic officer stated that the schools were even allowed the freedom to design their own bell schedules. She added, however, that the fact that each of the three small schools were on different schedules made it difficult to provide all students with access to community classes such as arts and music.

In spite of Lima's strong commitment to autonomy, the academic officer felt that "there was still a need to preserve the tradition of Lima Senior High School." As a result, the majority of extracurricular activities (e.g., the yearbook, the school newspaper, student government, the football team, the band) were shared by all three schools.

On other campuses, the small schools shared more resources. For example, the business officer from Canton said that there has been "a fair amount of crossover" on the McKinley campus. He explained that while some courses are offered by small school, others are composed of students from all four schools (e.g., only one advanced physics class is offered and is composed of students from all four small schools). Canton's academic officer stated that the campus has a renewed focus on limiting or eliminating teacher crossover. For example, he shared that in school year 2009-2010, the curriculum associated with each school has been better defined and more options have been added for students within the small schools. He added that the campus will be attempting to provide students with a better idea of how their curriculum "connects to the outside [world]."

The model in the two OHSTI campuses within Toledo Public Schools is similar to that described on the McKinley Senior High campus. The students in the small schools on the Libbey and Scott campuses also attend some classes that are offered campus-wide (e.g., band, orchestra, calculus) and are typically taught by the most qualified teacher on the campus, regardless of the teacher's small school affiliation. The academic officer estimated that approximately 25 percent of a student's curriculum is unique to the student's small school on the Libbey and Scott campuses.

On the Heights High campus, the extent of small school purity differed by grade. The academic officer from Cleveland Heights stated that while Heights High has committed to small school purity in the 9th and 10th grades, it allows for "some crossover" in the upper grades. Eleventh and 12th graders have a certain amount of freedom to take Advanced Placement (AP) courses that are attended by students from all of the small schools. Purity on the Cleveland Heights campus was also affected by the comprehensive school's phase-out process, during which its incoming freshman classes were pure, but students in the upper grades were allowed to remain together and complete their high school education as they had started. Despite this phase-out process, the academic officer noted that students enrolled in the small schools now identify with their individual schools.

Campus-Wide Goals

Each of the OHSTI districts has established goals for their small schools to achieve. For example, while all districts voiced a common goal to focus on academic rigor and improvement, the districts expressed different priorities and approaches to obtaining that goal, along with additional, unique objectives.

Canton's academic officer stated that in its first year of implementation, the McKinley campus had focused on creating a more rigorous, structured, and content-driven instructional environment for students. He explained that now that the faculty has started to feel satisfied with their progress in the academic realm, the campus has begun to focus more on developing relationships between staff and students. He explained that one indication of improved relationships would be that each enrolled student would be known well by at least 10 staff members, which would mean each student felt recognized and acknowledged. He explained, "I think McKinley is beginning to understand that the relationship piece is as important as the rigor." He added that he felt McKinley Senior High was "well on its way" to having this goal integrated into the small schools.

The academic officer from Lima City Schools stated that in addition to the campus's initial goal of successfully integrating students into the new building, the campus has become much more vigilant about strengthening disciplinary measures, setting high expectations, and developing relationships. Lima City Schools also instituted a district-wide uniform policy two years after small school implementation. Although the uniform policy was unrelated to the small schools initiative, the academic officer stated that, in keeping with "rigor, relevance, and relationships," the district felt that the small schools needed to present themselves in a professional manner. She added, "Small schools brought us the support for being able to do that. The community embraced it."

The academic officer from Cleveland Heights noted that while Heights High's initial focus had also been on academics, the focus of the current academic school year has evolved to also include an emphasis on improving student life and ensuring that each student has a voice.

Toledo's academic officer stated that its initial focus for Libbey and Scott's small schools was on leadership and structure; however, in the past school year, the campuses have focused more attention on getting to know students as individuals. She added that the campuses have placed greater emphasis on improving instruction, adding, "Teachers are now focusing more on *learning* than on teaching."

Cost Perspectives

Some staff felt that the OHSTI transformation had not significantly impacted administrative and instructional costs. For example, Canton's district business officers said that implementation had had little impact on costs, adding that "the [campus] gained a little due to less bureaucracy, which meant more efficiency." He added, "The smaller [the administrative staff] the better, in terms of efficiency." The business officers explained that "administration across the [comprehensive] school was greater than [that] across the four small schools. The [campus] used to have six principals; now they have a campus principal and four small school principals."²⁷ Similarly, Canton's academic officer stated that he did not believe that the cost of funding the small schools was an ongoing issue and said that, in conversations about funding the schools, there had not been any major concerns about the costs.

In contrast, the other three districts did experience increases in administrative costs after transformation, although these increases varied in degree. Lima and Cleveland Heights, for example, both reported some inflated costs, although they were not entirely related to small school transformation. However, in all three districts, the increased costs were attributed in some degree to the additional staff required by the administrative structure of the small schools.

For example, in Lima, prior to transformation, the comprehensive high school campus had one principal, four assistant principals, and four counselors (one for each grade level). Each of Lima's small schools now has a principal, an assistant principal, and a counselor, and the business officer from Lima noted that this restructuring of administrative staff had resulted in increased administrative expenditures. He felt that their small schools also cost more than a comprehensive high school because of the low teacher crossover and unique course offerings. Lima's academic

²⁷ However, he noted that this decrease in administrative staff also coincided with a drop in student enrollment.

officer similarly expressed that maintaining autonomy between the small schools seemed to result in higher costs. She stated that despite those additional costs, the district had been able to maintain per pupil expenditures because they had reduced the number of staff at the district level and the remaining staff were willing to take on more work. She added, “We pick up a lot more things with fewer people in the central office.”

The academic officer in Cleveland Heights expressed a similar opinion about increased staff requirements in small schools and the financial impact of these requirements: “I think [the cost is] slightly more because you continue to offer support for certain positions that did not exist in a comprehensive high school—like giving teacher leaders time away from their normal, regular responsibilities to facilitate activities.” She added that small schools require more individuals to be involved in activities than a comprehensive high school. Overall, however, she felt that the increase in cost was slight, and that the district had been able to maintain costs by “monitor[ing] very closely...what it costs to do business” and “consciously [trying] not to exceed the costs of a regular school in the district.”

While the academic officer in Toledo also felt that the district was able to reduce some costs by decreasing staff, she felt that the increased number of teachers needed in small schools nevertheless resulted in higher costs for the district. As she explained, “We’re still working on figuring out what works best and phasing that in.”

Most officers noted that the greatest impact on costs occurred during the early years of transformation. For example, the academic officer of Cleveland Heights noted that during the start-up years, principals and teacher leaders were “given time to thoughtfully plan,” which impacted costs, as their planning time had to be covered by other staff. This academic officer also noted some additional operational expenditures, such as the cost of furniture and resources needed to create collaborative spaces and work environments for each of the small schools. The business officer from Canton noted that professional development constituted the greatest expense during the start-up years; in particular, paying for substitute teachers when teaching staff attended offsite opportunities.

Toledo’s academic officer also reported increased costs in its first year when staff positions were added. She explained that as some of this was accommodated through restructuring positions, individuals needed more training as well as support from other personnel to do their new jobs. Additional administrators and other staff (e.g., counselors) were also hired and required time and support to train. Toledo’s academic officer noted that all of this resulted in increased start-up costs that would not have existed had the campuses not converted to small schools. She also cited the somewhat higher costs associated with small schools as one reason why Toledo would not consider converting its other high schools to small schools.

Outcomes

District personnel were asked whether the small school transformation had affected such student, teacher, community, and school outcomes as school ratings, relationships between teachers and students, and teacher and community engagement. Some district personnel felt that changes are often not immediately realized after transformation, as students, teachers, and administrative staff

must first adapt to the transition; however, they felt that these changes do tend to increase over time.

School Ratings

When asked if the transformation had affected Local Report Card school ratings, which are based on measures such as test scores and state indicators, responses varied.

Cleveland Heights noted that they have been able to narrow the achievement gap with an overall increase in numbers of students performing beyond the proficient level. Given that the number of economically disadvantaged students in their school has increased by approximately 20 percent, Cleveland Heights' academic officers felt that this was a great accomplishment. However, the academic officers noted that it was not until teachers "really settled in" to their jobs well in these smaller school settings that they saw a "direct correlation to improvement" in scores.

Some district personnel noted that the statewide test changed during the years of this study, from a ninth-grade proficiency test to a new Ohio Graduation Test (OGT) that sophomores were required to take for the first time in March 2005 and, according to one external source (Fisher et al., 2004), was considered to be about "two grade levels more difficult than the previous exit exam."²⁸

Personnel noted that although statistically significant gains may not have been evident up to the 2007-2008 schools year (the last year available at the time of the statistical analysis shown in Chapter 3), their schools have experienced an upward trajectory in the 2008-2009 Local Report Card. The academic officer at Lima noted that their schools had been performing poorly for many years, but three of their small schools have since moved out of "academic watch" or "academic emergency" status. She added that this improvement provides evidence that "the small schools concept is really paying off." The academic officer from Canton also commented that all the factors that contribute to a school's evaluation are improving for McKinley Senior High School, as the school's most recent rating was "effective." Similarly, the Toledo academic officer noted that the Scott and Libbey campuses were in "academic emergency" or "academic watch" before the small schools transformation. They have since reported better outcomes; three of their four small schools were recently reclassified with the "continuous improvement" rating.

All interviewed district personnel discussed the relationship between the school's commitment to the small school concept and the school's performance. Lima's academic officer noted that one particular small school "worked hard at developing the small schools concept" and saw a higher increase in their scores. An academic officer from Toledo explained that the variation in each small school's performance is affected by the focus of the small school. One of Toledo's small schools has a specific curriculum focus and that school has had the greatest success. Similarly, Heights High

²⁸ Another source provides more detail on the change (Wender, 2007): "Through the Class of 2006, the required tests included the ninth-grade proficiency tests in math, reading, writing, citizenship, and, starting with the Class of 2001, science. If a student had completed the curriculum requirement for a diploma but failed to attain the necessary score on one or more of the required proficiency tests before the end of 12th grade, the student could request to repeat the tests in the future. If the student passed the tests at a later date, the student then could receive a diploma from the school at which the student completed the curriculum. But there [was] a deadline of September 15, 2008, for students through the Class of 2006 to pass the ninth-grade tests to qualify for a diploma. Students who have yet to pass one or more of the ninth-grade tests by that date must pass the new Ohio Graduation Test (OGT) in the same subject to receive a diploma."

experienced a decrease in the percentage of applicable state indicators met in the two years after transformation. The academic officer felt that this decrease had to do with the school's emphasis on purity in those two academic years. She explained that the campus had to adjust to the change, and once they adapted and started to work better together, this was reflected in the percentage increase witnessed in 2007.

Relationships

Several of the district personnel felt that the transformation had strengthened relationships among staff and between teachers and students. Officers noted that the smaller settings meant that staff had begun to get to know their students as individuals. As the academic officer from Canton explained, "They [the students] think, 'There are adults in this school who know things about me other than my face and name. They know my likes and dislikes.'" Similarly, the academic officer from Cleveland Heights noted that the teachers know students better since the transformation and use this information to help them build targeted plans. The business officer from Lima explained that their teachers "get to know students in small learning environments and have a general knowledge of where [students] should be." An academic officer at Lima also stated that "you can't mention a name of a kid and they [teachers] not know who the child is." She added, "It is much more of an adult advocate type of setting that you can feel and see." The Toledo academic officer stated that their school has become more "personalized" and there is a greater sense of community.

Engagement and Attitudes

Several district officers expressed that the small schools concept has promoted school engagement and positive attitudes from staff and the community. District officers noted that their small schools have fostered the community playing a larger part in the school's development. The academic officer from Cleveland Heights commented that the small school transformation forced them to "rethink communication patterns" to include the community's feedback and beliefs regarding teaching and learning. An academic officer from Lima noted the overwhelming parent and community attendance at "Exhibitions of Learning," an event that each small school hosts to display student projects. The Lima campus has also partnered with the community to assist with making senior projects relevant to life after high school graduation.

District officers also reported positive changes in attitude, engagement, and collaboration among school staff. An academic officer from Lima stated that teachers "are not working in isolation" and that the schools are "not departmentalized." More staff members from the Lima campus are attending conferences and pursuing professional development, and more teachers are observing classrooms and providing each other with feedback. Similarly, the academic officer from Canton noted that the small schools concept resulted in a renewed faculty spirit and staff had begun to embrace professional development. In addition, McKinley Senior High's small school principals have begun to demonstrate pride in their small schools, including a "healthy" competition in which students and staff have started to pay attention to which small schools are excelling academically and are represented on the campus athletic teams.

Officers from Cleveland Heights and Canton also noted growing competition among their small schools, indicating that students identified with and felt proud of their schools. For example, the academic officer in Cleveland Heights said that each school has its own colors and logos, that they compete amongst the schools in academics, and that students and staff keep track of which schools

are represented on their joint athletic teams. The academic officer from Cleveland Heights also noted that the campus has seen an increase in the number of students participating in extracurricular activities, and that the school has begun requiring incoming freshman to participate in at least one extracurricular activity per year.

Funding

Virtually all district respondents noted how important the KnowledgeWorks funding was to the OHSTI planning and implementation process. As the academic officer from Cleveland Heights explained, “We couldn’t have done it without the KnowledgeWorks funding. We needed to spend time building capacities in people. It was fundamental for the conversion.”

One of the district officers from Lima noted that while the funding from KnowledgeWorks was important, it was not the determining factor for small school implementation. The officer explained that the district was not among the initial grant recipients, but their subsequent acceptance as an OSHTI district allowed them to obtain professional development and coaching, which was vital in assisting them to reach sustainability. But, this district officer said that they still would have converted, even without the KnowledgeWorks funding.

Respondents generally noted that they had planned and used KnowledgeWorks funding with the full realization that it would eventually end. As the academic officer from Cleveland Heights explained, “We always viewed it as time-limited support.” Cleveland Heights’ academic officer stated that they will not reconsider the small school structure due to financial resources because “it is just being effective and efficient with [one’s] resources.” The academic officer from Canton noted that he did not have any major fiscal concerns once KnowledgeWorks funding ended, as the district had structured its budget to support small schools.

In the absence of continued funding from KnowledgeWorks, the district officers noted that they are using alternative funding sources to sustain the small schools. For example, Cleveland Heights will use funding from a federal small learning community grant and local district funds that have prioritized high schools as grant recipients. The academic officer from Canton noted that they were looking to the district to pay for professional development coaches previously funded by KnowledgeWorks. Lima’s academic officer explained that their small schools have been maintained because the district’s central office has reduced the number of central office administrators from four to just one. Lima’s decision has increased the workload for administrators, but according to Lima’s academic officer, “That is how much we believe in it [small schools].” Academic officers from Lima also credit college access grants to help support student programs.

Advice to Other Districts Considering Reform

When asked what advice they might give to other districts or campuses that were considering small school transformation, the most common feedback was that the planning process had to be deliberate and thoughtful. The business officers from Lima said they would tell other interested districts to take their time with the process, and “not rush in.” They added that prior to small school implementation, districts should run their plan by staff from campuses that had already converted to solicit advice. Similarly, the academic officer from Canton said, “You have to be cautious. You can’t just go through the motions.” The academic officer from Cleveland Heights noted that districts

considering conversion should look to prior implementation sites that had diligently recorded their transformation process as a source of guidance, rather than attempting to figure out conversion on their own.

District staff also noted that any transformation efforts should reflect the culture and unique needs of the existing campus and community. For example, an academic officer in Canton described how small schools in another district were organized by instructional models (e.g., Socratic Method, project-based learning), and added that although that approach seemed to be working in the other district, he was “not sure it would have worked in Canton.”

One academic officer from Canton noted that while small school transformation may not result in immediate quantifiable changes in student or teacher outcomes, a district can learn from the process itself. As he explained, “It is not the virtue of having small schools, per se, but the *process* that is most important.” He shared that at their campus, this has meant that staff members are more thoughtful, and have worked to “rethink their ways.” The school has a renewed spirit and a renewed focus on rigor. As he explained, “The framework [adopted by the campus] has allowed its people to flourish.”

The academic officer from Cleveland Heights advised monitoring progress and outcomes from the onset of the process. She explained how their district identified indicators of success during the planning period and monitored the progress of each indicator in subsequent years.

Another piece of advice had to do with managing the increased administration that can result from instituting small schools. For example, the Lima academic officer shared that the most difficult aspect of small schools for their community to understand was the administrative piece, as their three small high schools have just as many administrative staff persons as the district’s three middle schools. She added, “Because they are under one roof, [it] takes a lot of communication with the community to bring them on board to understand that.”

District officers also suggested trying to place an equal emphasis on rigor, relevance, and relationships from the very beginning of the process, although several simultaneous changes could potentially be overwhelming. For example, as noted previously, Lima’s academic officer noted that their “double transition” (i.e., both to a new building as well as a new school concept) made adapting to the change more difficult for the students and staff. The academic officer from Canton also mentioned the need to focus during initial implementation and to not try to do too many things at once.

Finally, several district officers noted that small school transformation takes commitment, strong leadership, and order. As the academic officer from Cleveland Heights explained, it takes a commitment to student achievement and staff professional development, and a fiscal commitment to match funding. She added that one cannot institute small schools in a chaotic system.

Future Plans for Small Schools in the Case Study Districts

When asked about the future of their small schools, officers from Canton and Cleveland Heights noted that their early years of implementation had focused on the academic aspects of small school reform (e.g., content, rigor, and relevance), and would be moving toward a greater emphasis on

building and strengthening relationships. One academic officer from Canton explained that while it would have been difficult to have too many foci in the initial stages, in the coming year they would be increasing the emphasis on relationships at their small schools.

The academic officer from Canton also noted an increasing focus on autonomy, adding, “We are stressing less ‘crossover’ to increase fidelity to the school theme.” He added, “We feel really good this year [about the small schools]. We know more than ever before about what our small schools mean.”

District respondents indicated plans to retain their small schools. As the academic officer from Canton explained, “It feels like the [staff and community] have really bought in [to the small school model]. There is no question that there will be any turning back.” Similarly, the academic officer from Cleveland Heights said that there is no pressure from the district or community to convert back to a comprehensive campus. She added, “This is the way we do business now.” One academic officer from Lima said that the small schools conversion “is one thing that we will preserve forever” and it has been “the single most significant change that’s been made to the Lima City School system.” Lima’s academic officers reported also considering small schools for their middle school campuses.

Respondents were generally clear that with hindsight, they would again choose the small school transformation path. For example, the academic officer from Cleveland Heights said, “Absolutely. The transformation forces the system to actively engage all of the teachers.” She added that the process enabled the district to know more about the skills and capacities of its staff, created a culture that fosters teaching and learning, and helped rethink faulty communication patterns.

Chapter 5: Summary of Findings and Discussion

The question of whether small schools cost more than large ones has been long considered in the school finance literature. For example, the relationship between school size and cost was fairly extensively studied in the 1960s, with emphasis on what school size would maximize benefits associated with efficiencies of scale. Overall, schools below a certain size were determined to be higher cost and therefore less “efficient” than larger ones.

However, the primary issues and questions in regard to small schools in the current era are substantially different, although they are sometimes intertwined with this earlier work and the questions driving them (i.e., optimum comprehensive school size for maximum efficiency and/or the creation of alternative schools). As Stiefel et al. (2008) point out, reducing the size of high schools is now seen as a strategy for improving outcomes for *all* students.

In regard to more contemporary reform in the creation of theme-oriented small high schools, Stiefel et al. conclude that having a distinct theme to the school is the key (e.g., schools that offer narrowly focused curricula and course offerings that address specific academic interests of students, such as a focus on the sciences or the arts). Based on data from the New York City Schools, they conclude that “decreasing school size ... is not enough—small *comprehensive* high schools are expensive.” When “policymakers ... split comprehensive high schools into smaller schools, all they ... accomplish is an increase in costs.” They suggest that the key to making small schools effective is to have themed schools with a narrow curriculum.

However, splitting comprehensive high schools into smaller schools may be the most viable option for many districts. Not all districts have the scale, density of population, community resources, and mass transit infrastructure to allow a broad array of schools with distinctive themes across a city, and these theme schools may not be envisioned as a wholesale replacement for their current system of secondary education, but more as a supplement to the majority of high schools remaining in their traditional form.

Thus, the OHSTI project can be informed by prior work that generally finds that smaller schools cost more (Miles et al.). All of the case study sites included in this study are former comprehensive high schools that were transformed into multiple small schools that are located on the same campus, have many of the same faculty, and generally offer the same mix of courses.

Creating small high schools in this way may be the most viable option for attempting district-wide secondary reform. It has the potential of providing what may be the most reasonable trade-off between the desire for a greater sense of community and academic focus—as is possible in small schools—and the ability of larger schools to offer specialized offerings such as AP courses as well as

high-level music, arts, and athletic teams. In this sense, the research presented in the current study is unique.

Summary of Findings

This section lists the research questions for this study followed by a brief summary of the finding for each. This is followed by a discussion of the findings for this study.

1. What are the per pupil costs of small high schools over time (including transformation costs), and how do they compare to those of traditional high schools across the state?

The study found no statistically significant differences in cost associated with the implementation of the OHSTI program. This general finding holds during the period of start-up as well as during subsequent years of implementation. Findings from the qualitative analyses at the case study sites largely corroborate this finding.

2. What trends regarding student outcomes are observed across participating sites over time?

The qualitative data generally seem to indicate that while fully measurable changes in student outcomes such as academic achievement, attendance, graduation, and behavior have been somewhat slow in coming, there are indications that more measurable differences are starting to be realized. All study site respondents indicated that outcome gains have been sufficiently promising that their districts are committed to maintaining this program.

3. Based on these data and qualitative information obtained through this study, do there appear to be cost implications associated with alternative implementation strategies that may be used to inform future small school transformation efforts?

Interview respondents indicated that the major factor driving higher or lower costs in association with small schools was the degree of “purity” in implementation—the degree to which students and teachers remain in their respective small schools, as opposed to splitting their time across schools. This may affect such factors as a school’s ability to hire a single teacher, as opposed to multiple teachers, for more specialized course offerings. However, respondents also indicated that they also associated important outcome gains with the degree of implementation purity.

Discussion of Findings

Despite the strength of analyses afforded through the use of ODE data for these analyses, the number of schools included in this program was very small (only 10 campuses), making it difficult to discern statistically significant effects. However, these analyses did not find OHSTI schools to be of significantly higher cost. The qualitative component to the study provides greater depth of understanding to the quantitative analyses.

To a large degree, the findings from these qualitative analyses conformed to the quantitative results. Respondents generally did not perceive appreciably higher costs to be associated with small school conversion. Some respondents perceived virtually no differences in cost, while others reported increased costs associated with smaller schools, but not of sufficient magnitude to cause them to rethink the decision to convert. Lima administrators reported somewhat higher costs as a result of

conversion, but reported that they were able to offset these with commensurate cuts in district administration. They also acknowledged that they had knowingly accepted these as the cost of greater “purity” in small school implementation (i.e., attempting to maximize small school identification by minimizing the amount of teacher and student crossover in their small schools). Toledo reported somewhat higher costs associated with their converted schools, but this was largely the result of an additional administrator to provide oversight of the entire campus; this position was added later in the implementation cycle in an attempt to gain some added stability on these campuses across the individual small schools.

Nearly all respondents indicated the generally held belief in their districts that small school conversion had enhanced the outcomes associated with their students’ high school experiences. Some of these may not lend themselves to direct measurement or be fully reflected in the ODE data, but they generally seemed to believe that these improvements had started to show up in the latest year of data (for 2008-09). While these data had been released to districts at the time of our interviews, they were not available on a statewide basis in time to be included in the quantitative analysis for this report.

As direct evidence that the benefits were associated with the OHSTI conversion, all respondents indicated a clear future for the small schools in their district. No one seemed to anticipate that these schools would revert back into comprehensive high schools, even though the funds used to initially support the conversion (largely provided through KWF) were no longer available. The two districts that had fully converted to small schools seemed most clearly convinced, indicating that “this is now the way we do business.”

In summary, the ODE data did not show significant start-up costs associated with the OHSTI conversion or with ongoing implementation. Respondents generally agreed with this, but also indicated that implementation would have been very difficult (and perhaps impossible) for them without KWF support. (Although one district respondent indicated that they were committed to conversion regardless and would have found a way to do it without supplemental support had this been necessary.) This seems to suggest that there were differences in expenditures during the initial years of conversion, which were largely offset by KWF contributions. The cash contributions, however, seem not to have been sufficiently large to appear as statistically different in the data. In-kind contributions (e.g., the direct provision of training), would not show up in these data.

Once fully implemented, the cost differentials across the OHSTI schools appear not to be statistically different from like non-OHSTI schools and were generally not perceived as operationally significant, at least in the four case study OHSTI districts profiled in this study. Respondents from all four of these districts indicated a clear conviction that the conversion had been worth the effort and cost, and all expressed clear commitment to remain converted despite the fact that supplemental KWF support was no longer available.

In regard to student outcomes, several respondents pointed out that realizing the full benefits of conversion would take additional time. They perceived their schools to be in the earlier stages of conversion and some indicated that they were beginning to see distinct, positive changes in their most current data. However, respondents from several districts pointed out that it is one thing to enable a greater sense of community, but another to fully realize it. Respondents shared that it was taking time for the stronger bonds and greater sense of unity felt across smaller school faculties to fully form, for teachers to get to know the students in their small schools as well as intended, and for

these improved relations to start to reveal themselves in improved student outcome data. All respondents, to varying degrees, expressed the conviction that the majority of their teachers, students, parents and community members had concluded that smaller high schools were cost-effective and should be continued.

Suggestions for Future Research

It is recommended that the progress of these OHSTI sites continue to be tracked over time. As perhaps the most promising approach to the large-scale conversion of comprehensive schools across many school districts across the country, it will be important to continue to track the cost and outcome trajectory with ongoing implementation in these OHSTI schools. We recommend that in the future, all 10 of the sites be considered for further qualitative analysis that includes case studies. With the reliance on ODE data to track and compare costs and results in OHSTI schools against like schools statewide, the burdens of ongoing participation in the quantitative component of a study like this are small.

This would allow extension of the qualitative analysis across the full range of OHSTI sites. The burden for this could be as small as several one-hour interviews with research staff, or greater depth could be allowed through case study visits to these sites, which would allow a research team to observe the varying ways that the small school concept has been implemented across these sites, and allow the gathering of a broader range of perspectives in regard to the effectiveness of this intervention. For example, in addition to district administrators, interviews and focus groups with site administrators, teachers, students, parents, and school board and community members would provide a much broader perspective on the relative small school experiences and outcomes across the varying implementation sites.

Another recommendation is that all future participating sites be encouraged to establish goals in regard to their small school conversion at the onset. That is, the sites could establish what goals they hope to accomplish in making this change and how progress toward these objectives could be measured. Of the four case study sites for this study, staff from the Cleveland Heights campus set out such goals and measured the schools' progress in relation to them over time. This type of exercise can provide clarity of purpose, support formative assessment, and allow districts (and others) to assess progress in regard to small school implementation over time.

References

- Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6, 21-27. North Holland Publishing Company.
- Beken, J., Williams, J., Combs, J., & Slate, J. (2008). Traditional and academic alternative schools: pupil-teacher and per pupil expenditure differences for at-risk students. *Connexions*, November 7, 2008. Retrieved August 26, 2009, from <http://cnx.org/content/m18182/1.1/>
- Carnoy, M. (1995). The political economy of educational production. *The Second International Encyclopedia of Economics of Education*. M. Carnoy, Pergamon.
- Cleveland Heights-University Heights City School District. (n.d.). Cleveland Heights Small Schools Quick Profile Sheet. Retrieved August 26, 2009, from www.chuh.org/pdfs/hs/hs/SGT_Community_Appl.pdf
- Cleveland Heights-University Heights City School District. (n.d.). About Cleveland Heights High School. Retrieved August 26, 2009, from http://www.chuh.org/heights_high_about.shtml
- Fisher, M. & Elliott, S. (2004). *Changes planned: But will test problems be resolved?* Dayton Daily News. Retrieved August 26, 2009, from <http://www.daytondailynews.com/project/content/project/tests/0525ogt.html>
- Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research*, (66)3, pp. 361-396.
- Hanushek, E. (1986). The economics of schooling; production and efficiency in public schools. *Journal of Economic Literature*, 24, pp. 1121-1177.
- Harris, G. (2004, August). *KnowledgeWorks Foundation collaborates with districts across Ohio to open 53 new small schools*. [Press release]. Retrieved August 26, 2009 from http://www.kwfdn.org/press_room/press_releases/press_release.asp?prID=81
- Harris, G. (2005, September). *Additional small schools open across Ohio this fall*. [Press release]. Retrieved August 26, 2009 from http://www.kwfdn.org/press_room/press_releases/press_release.asp?prID=111
- Hoke, W. A. (2006). Building bridges to new heights. [Section in article]. In *Small moments, big dreams: Real-life stories from five redesigned urban high schools*. Cincinnati, OH: KnowledgeWorks Foundation. Available at http://www.kwfdn.org/resource_library/resource.aspx?intResourceID=496

- Joyce, J. (2008, December 9). Toledo Public Schools enrollment is down 1,649 students from last school year. *Toledo Blade*. Retrieved August 26, 2009 from <http://www.toledoblade.com/apps/pbcs.dll/article?AID=/20081209/NEWS04/812090313>
- KnowledgeWorks Foundation. (2009). National high school innovation: History and results. Retrieved August 5, 2009, from http://www.kwfdn.org/national_hs/nations_hs_his/
- McKinley Senior High School 2008-09 Profile (n.d.). Retrieved July 17, 2009 from <http://mckinley.ccsdistrict.org/profile>.
- Levin, H. M. (1980). Educational production theory and teacher inputs. In Bidwell, C. E., & Windham, D. M. (Eds.), *The analysis of educational productivity, Vol. II: Issues in macroanalysis*, (pp. 203-231). Cambridge, MA: Ballinger
- Miles, K. H., City, E. A., & Shields, R. (2007). *The cost of small high schools: A literature review*. Education Resource Strategies.
- Nathan, J. (2008, January). How Cincinnati turned its schools around. *Education Week*, 27(17), 24-25.
- Ohio Department of Education Power User Reports. (n.d.). [User-generated data file]. Available at http://ilrc.ode.state.oh.us/Power_Users.asp
- Stiefel, L., Iatarola, P., Fruchter, N., & Berne, R. (1998). *The effects of size on student body on school cost and performance in New York City high schools*. New York: Institute for Education and Social Policy.
- Stiefel, L., Schwartz, A. E., Iatarola, P., & Chellman, C. C. (2008). Mission matters: The cost of small high schools revisited (Working Paper #08-03). *IESP Working Paper Series*. NYU Steinhardt and Robert F. Wagner School of Graduate Service.
- Stiefel, L., Schwartz, A. E., Rubenstein, R., & Zabel, J. (2005). Measuring School Efficiency: What Have We Learned? In *Measuring school performance and efficiency: Implications for practice and research*. Larchmont, NY: American Education Finance Association.
- Tittle, Diana. (1995). *Welcome to Heights High: The crippling politics of restructuring America's public schools*. Columbus, OH: Ohio State University Press.
- The Ohio Scan 2007: A quick look at the state of education and the economy in the buckeye state. As cited by KnowledgeWorks (n.d.) *Fast Facts*. Retrieved August 26, 2009, from http://www.kwfdn.org/fast_facts/fastfact.aspx
- Wender, M. (2007). *Ohio Graduation Tests*. Members only: An informational brief prepared for members of the Ohio General Assembly by the Legislative Service Commission Staff. Columbus, OH: Ohio Legislative Service Commission Staff.

Appendix A. A Detailed Overview of the Profiled OHSTI Districts and Campuses

This appendix provides a detailed overview of the profiled OHSTI districts and campuses, as well as a summary of the foci and implementation of the small schools located on each of the campuses. Two of the school districts provided names of urban comprehensive high schools outside their school districts that serve similar demographics and which they believed could be used as viable comparisons for their campuses.²⁹

Cleveland Heights-University Heights City School District

The Community and District

According to the *2008-09 Cleveland Heights High School Profile*, “The Cleveland Heights-University Heights City School District (CH-UH School District) serves the two adjoining cities of Cleveland Heights and University Heights, and a portion of South Euclid in Northeastern Ohio. These multicultural communities, proud of their diverse racial and religious heritage, have maintained a small town, friendly atmosphere while being in close proximity to numerous medical, cultural, and academic institutions.”

As of 2008-09, the CH-UH School District served approximately 6,000 students in seven elementary schools, three middle schools, one high school, an early childhood learning center, and a school for students with emotional needs.

The Campus

Cleveland Heights High School (Heights High), the only traditional high school in the CH-UH School District, has been in operation over 75 years. In 2008-09, its 1,894 students were served by 161 certified staff.

Small Schools at Heights High

In SY 2004-05, as part of the OSHTI Initiative, Heights High opened three small schools with 9th and 10th grades: Producing Responsible Individuals Dedicated to Excellence (P.R.I.D.E.) School, The School of Relevant Experiential Active Learning (R.E.A.L.), and Renaissance School. In 2005-

²⁹ Canton McKinley has another traditional high school in the district, but because it shares resources with its campus, district personnel suggested we add another high school outside the district for comparative purposes. Lima Senior High has no other traditional high schools in its district and business officers suggested we add Mansfield High School, a high school in Mansfield, Ohio as a comparison because of its similar demographics. Cleveland Heights does not have another traditional high school in its district but did not volunteer a comparison.

06, these three schools added 11th graders, and the campus added two more small schools (Legacy School and Mosaic Experience) with 9th, 10th, and 11th grades. By 2006-07, each of the five small schools had all four grade levels. Heights High has one IRN (internal retrieval number) for the entire campus. IRNs are used as unique identifiers of various types of school-related entities within Ohio.

According to Heights High's website, the five small schools are "organized around several major elements, including instructional models. All small schools offer a rigorous curriculum designed to prepare students for advanced post secondary opportunities." According to the *Heights High Quick Profile Sheet*, the different teaching models of the five small schools are as follows:

Legacy: "The Legacy School will prepare students to use their minds well and to become active problem solvers. Students will learn from both their teachers and their peers. They will also learn to effectively evaluate themselves as learners and be able to express themselves using a variety of media emphasizing both written and oral communication. This model will integrate high standards across the disciplines. Teachers will be diagnosticians, prescribing the best instruction for each student learner."

Mosaic Experience: "The Mosaic Experience's mission is to engage the [students] in learning and self development through integrating technology and the arts with a rigorous curriculum. Participants in the Mosaic Experience are unique, atypical, different, exceptional, extraordinary, unconventional in their thinking, learning and teaching styles. The goal is for everyone's problem solving skills and creativity to evolve to their greatest potential."

PRIDE: "A student commits to PRIDE with the knowledge that his/her teachers uphold a professional practice dedicated to each and every student. PRIDE students work to achieve mastery of academic goals knowing that their teachers embrace a teaching philosophy that very specifically nurtures their process. The college bound and the career bound students in PRIDE have the advantage of a setting that considers their intellectual, personal, and social interests and strengths. Through its Individualized Learning Plans, PRIDE's academic program will evolve as the student grows and changes."

REAL: "REAL School combines Experiential Learning with meaningful, relevant learning experiences in the classroom and in the community. Students in REAL enjoy working on projects that are located in our community. They are conscientious and concerned about problems that affect our community. REAL students enjoy working 'together' with adults in our community to solve 'actual' challenges and concerns in our communities. *'Where education meets the REAL world.'*"

Renaissance School: "The focus of *The Renaissance School* is on learning through cooperation and collaboration. The teacher acts as the coach, encouraging the students to discover the answers. In groups, students find 70 percent more answers than those working alone; in Socratic seminars, students share ideas and delve deeply into the subject matter, finding creative ways of solving problems or new ways of looking at issues. This collaboration also creates a more democratic atmosphere where students can join lunchtime student-led discussion groups or participate in leadership training in an Outward Bound setting."

Expenditures and Student Outcome Data

Exhibit A-1 shows total expenditures per pupil on the Heights High campus between 2000-01 and 2007-08. As shown in the exhibit, expenditures rose steadily between 2000-01 and the year after OHSTI implementation (2005-06), decreased in 2006-07, and then peaked again in 2007-08.

Exhibit A-1. Total Expenditures per Pupil, Cleveland Heights High School

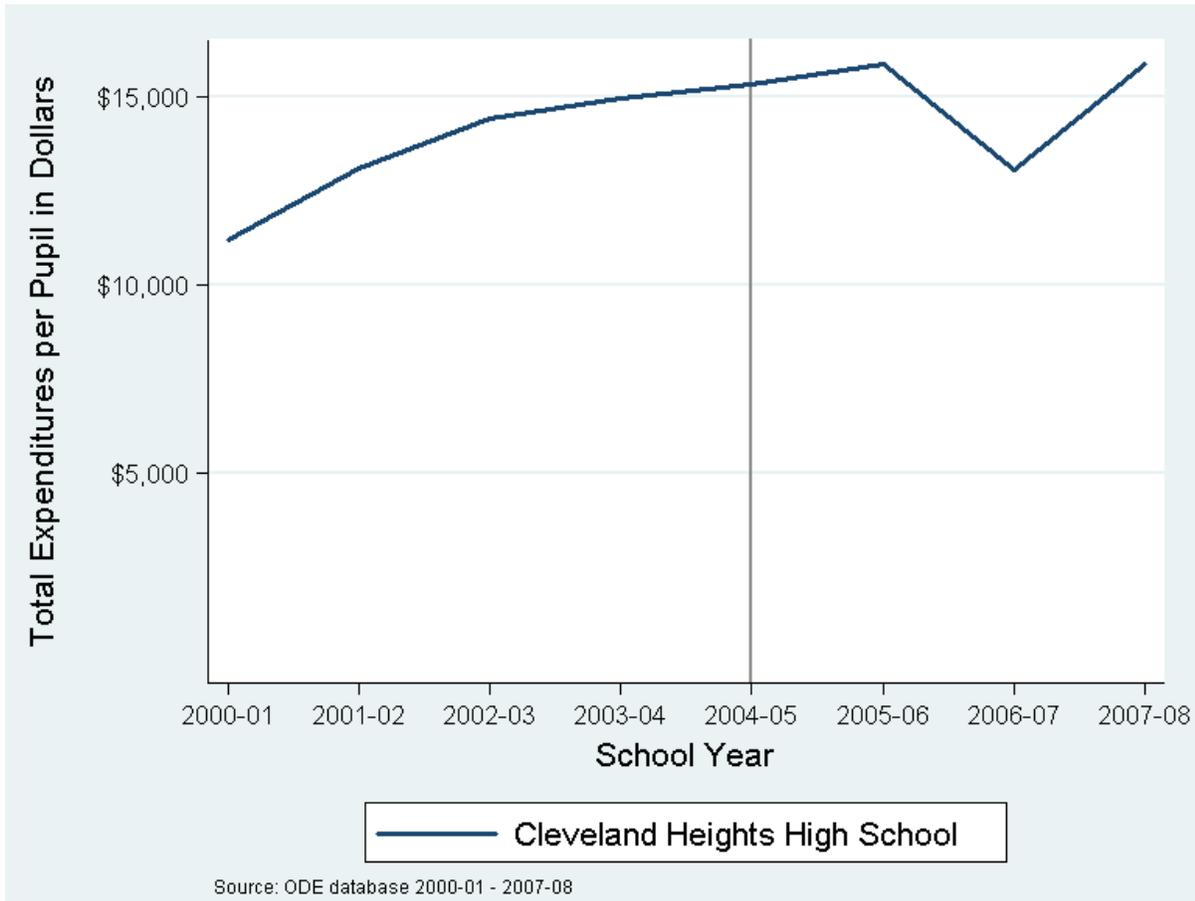


Exhibit A-2 shows instructional expenditures as a percentage of total expenditures on the Heights High campus between 2000-01 and 2007-08. As shown in the exhibit, expenditures rose steadily in the two years after OHSTI implementation and decreased in 2007-08.

Exhibit A-2. Instructional Expenditures as a Percentage of Total Expenditures, Cleveland Heights High School

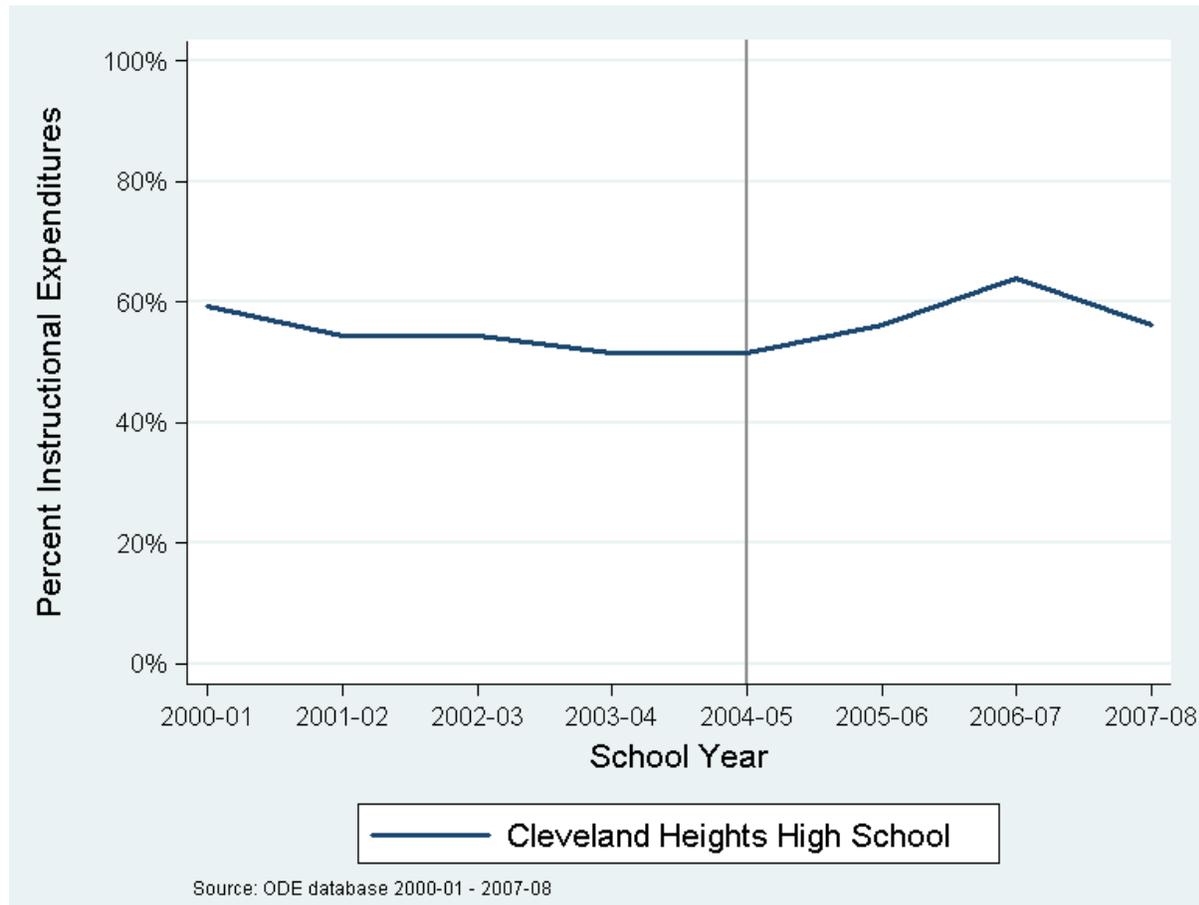
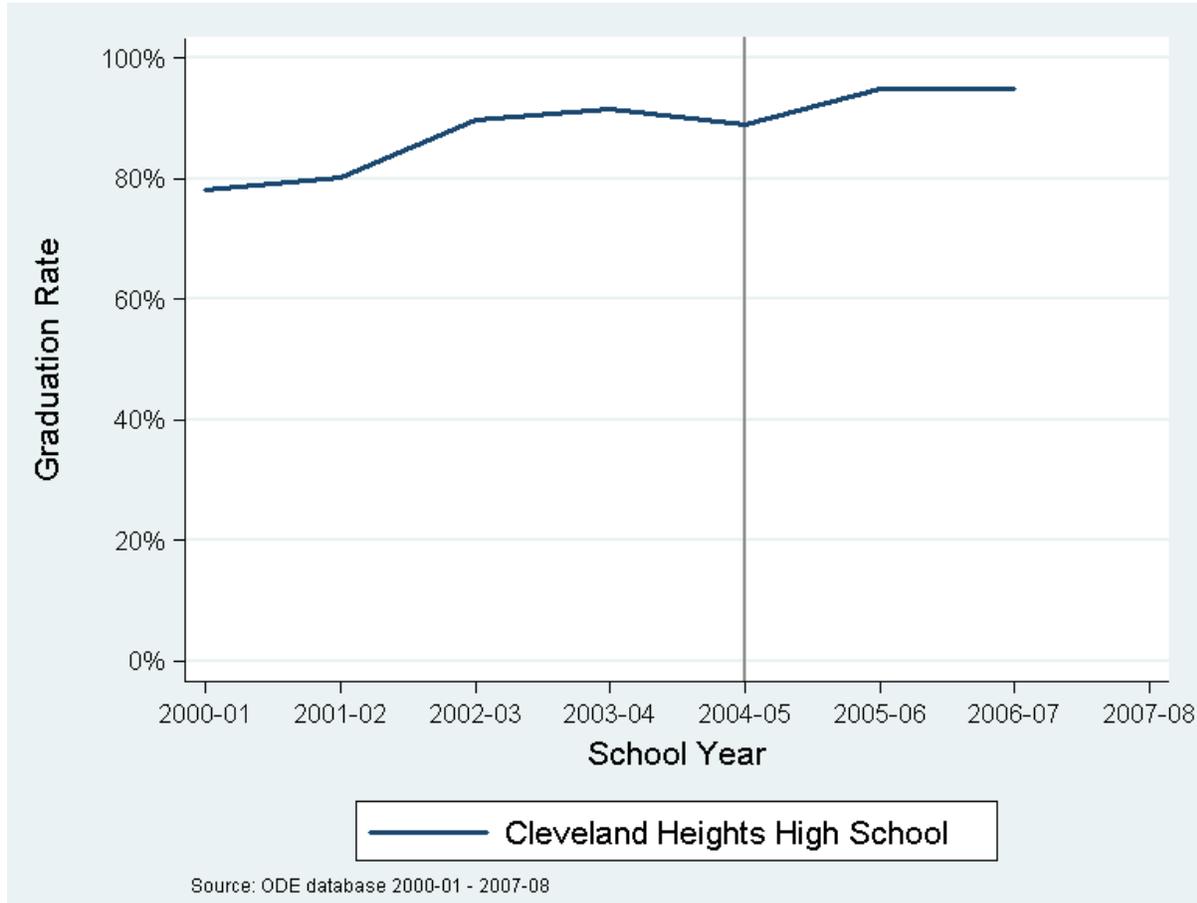


Exhibit A-3 shows graduation rates on the Heights High campus between 2000-01 and 2006-07. As shown in the exhibit, graduation rates rose in the year after OSHTI implementation, then remained constant between 2005-06 and 2006-07.

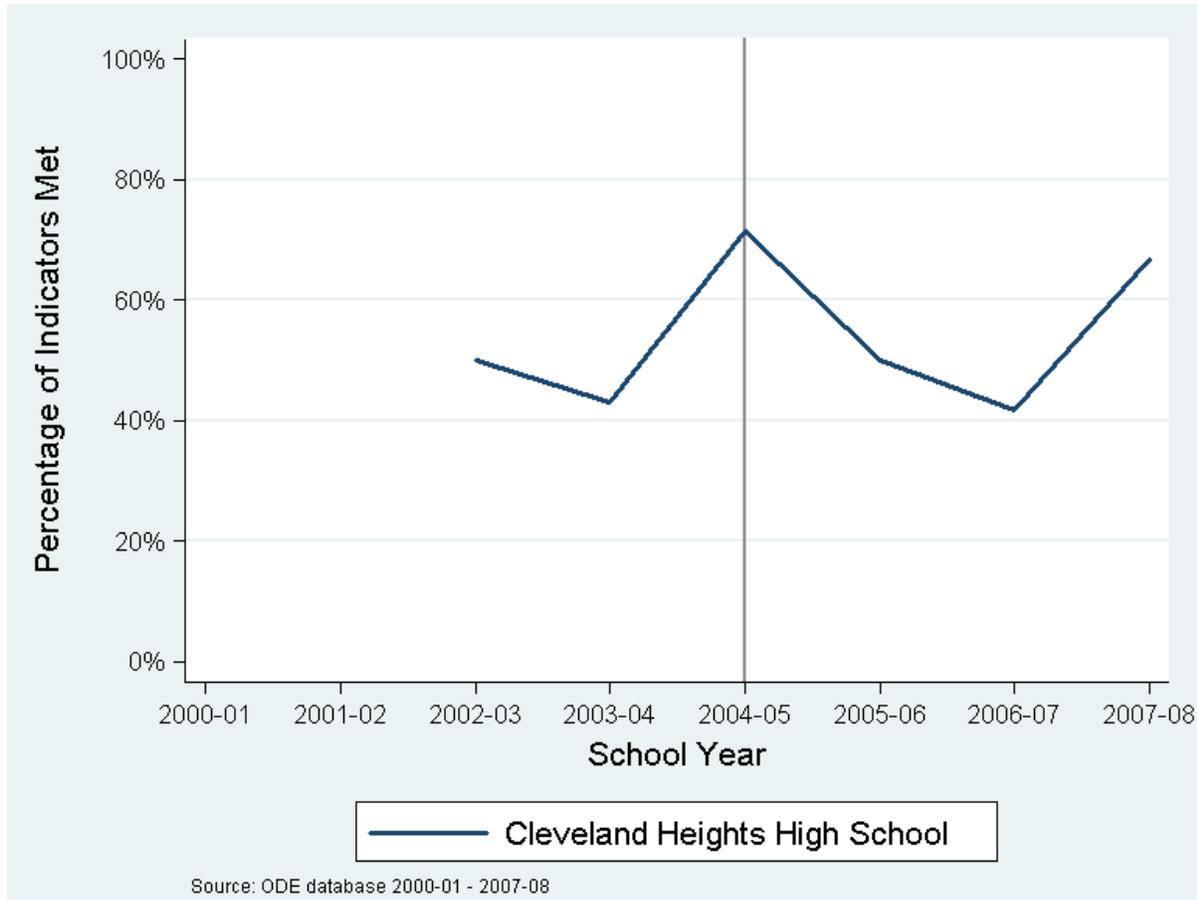
Exhibit A-3. Graduation Rates³⁰ over Time, Cleveland Heights High School



³⁰ Graduation Rate: The on-time graduation rate.

Exhibit A-4 shows the percentage of applicable state indicators met on the Heights High campus between 2002-03 and 2007-08. As shown in the exhibit, the percentage of applicable state indicators decreased markedly in the two years after OHSTI implementation and peaked again in 2007-08.

Exhibit A-4. Percentage of Applicable State Indicators Met, Cleveland Heights High School



Canton City School District

The Community and District

Canton City School District is one of the eight largest urban school systems in Ohio. As of school year 2008-09, the district served nearly 11,000 students in two high schools (each with a freshman academy), four middle schools, 16 elementary schools, one preschool, and an early childhood kindergarten center. The district also operates five alternative high schools, one alternative middle school and helps operate a Montessori school, a Digital Academy, an Arts Academy, and an educational facility inside a juvenile attention center.

The Campus

Built in 1915-1916, McKinley High School was named after President William McKinley and his sister, Anna McKinley, who taught in the Canton School System for thirty years. According to the profile on its website, “McKinley Senior is an urban comprehensive high school with a fall 2008 enrollment of 1,615 students in grades 9 through 12. McKinley is the larger of two high schools serving Canton City.”

Approximately 17 percent of McKinley’s students pursue a career and technical path. These students participate in the 15 Career and Technical programs at McKinley’s sister school, Timken Senior, which allows students to spend half the day at McKinley for academics and extracurricular activities, and the other half in their career and technology program. The Timken campus also hosts the Early College High School.

Small Schools at Canton McKinley

As part of the OSHTI Initiative, Canton opened five small schools in SY 2004-05. Freshman Academy served ninth graders, while four other schools [A.L.I.V.E. (Active Learning and Inquiry Based Valued Education), Impact, McK Stars (Students and Teachers Are on the Road to Success), and McKinley School of Diversity] enrolled 9th, 10th, 11th, and 12th graders. McKinley School of Diversity closed at the end of the 2005-2006 school year. Four of the five small schools were initially housed in the campus’s main building. Freshman Academy was located in a nearby facility until the 2007-08 school year, when it moved to the main campus to integrate it with the other small schools and reduce facility costs.

Canton McKinley has one IRN for the entire campus and a campus principal who is responsible for the supervision of the small school leadership, communication between the small schools and the district, master scheduling, and discipline. Each of the small schools has a unique career path and vision, with its own principal and counselor, and in the spring of 2008, the campus completed a restructuring of the building to better define the physical space of each of its small schools. According to their websites, the different teaching models of the four small schools are as follows:

Freshman Academy: The vision of this small school is a “Culture of Success.” Freshman Academy’s mission is “to meet the academic and social emotional needs of all students.”

ALIVE: ALIVE is an Active Learning and Inquiry-Based, Valued Education School with a focus on math, science, and physiology. According to its website, this small school uses “diverse methods of instruction [to] accommodate all learning styles.”

Impact: According to its website, this is a “school of visual and performing arts that creates a culture where diverse opportunities generate success.” Its students have been a part of many award-winning productions and performances throughout the city, the state, and the nation.

McK Stars: According to its website, this small school for international studies “offers rigorous and challenging classes and prepares students to be successful in a global economy.”

Expenditures and Student Outcome Data

Exhibit A-5 shows total expenditures per pupil in Canton City School District’s high schools between 2000-01 and 2007-08. Also shown are expenditures per pupil in Warren G. Harding High School, a high school in Warren, Ohio that Canton City School District staff use for comparative purposes because of its similar demographics. As shown in the exhibit, McKinley’s expenditures decreased steadily between 2002-03 and 2006-07, and peaked again in 2007-08. McKinley’s expenditures were consistently greater than Warren Harding, the comparison high school, and lower than those of Timken; however, as mentioned above, approximately 17 percent of McKinley students also attend classes at Timken High (which also hosts the Early College High School). These students are not counted in Timken’s enrollment and therefore contribute to what appear to be inflated expenditures per pupil at McKinley’s sister school.

As shown in the graph, total expenditures at McKinley decreased in the two years after implementation, then increased again in 2007-08.

Exhibit A-5. Total Expenditures per Pupil, Canton City School District

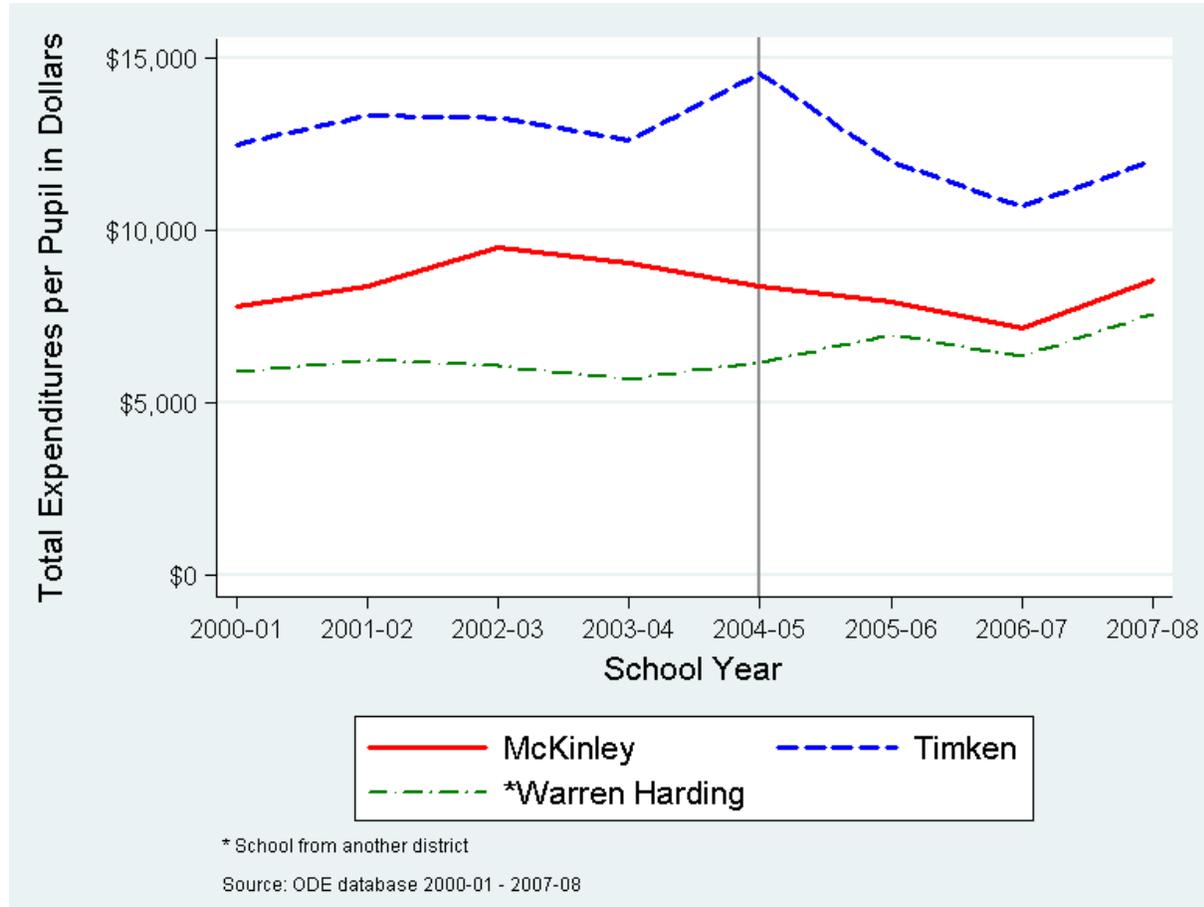


Exhibit A-6 shows instructional expenditures as a percentage of total expenditures in Canton City School District's high schools and Warren Harding High between 2000-01 and 2007-08. As shown in the exhibit, McKinley's instructional expenditures increased slightly between 2004-05 and 2005-06, peaked in 2006-07, and dipped again in 2007-08.

Exhibit A-6. Instructional Expenditures as a Percentage of Total Expenditures, Canton City School District

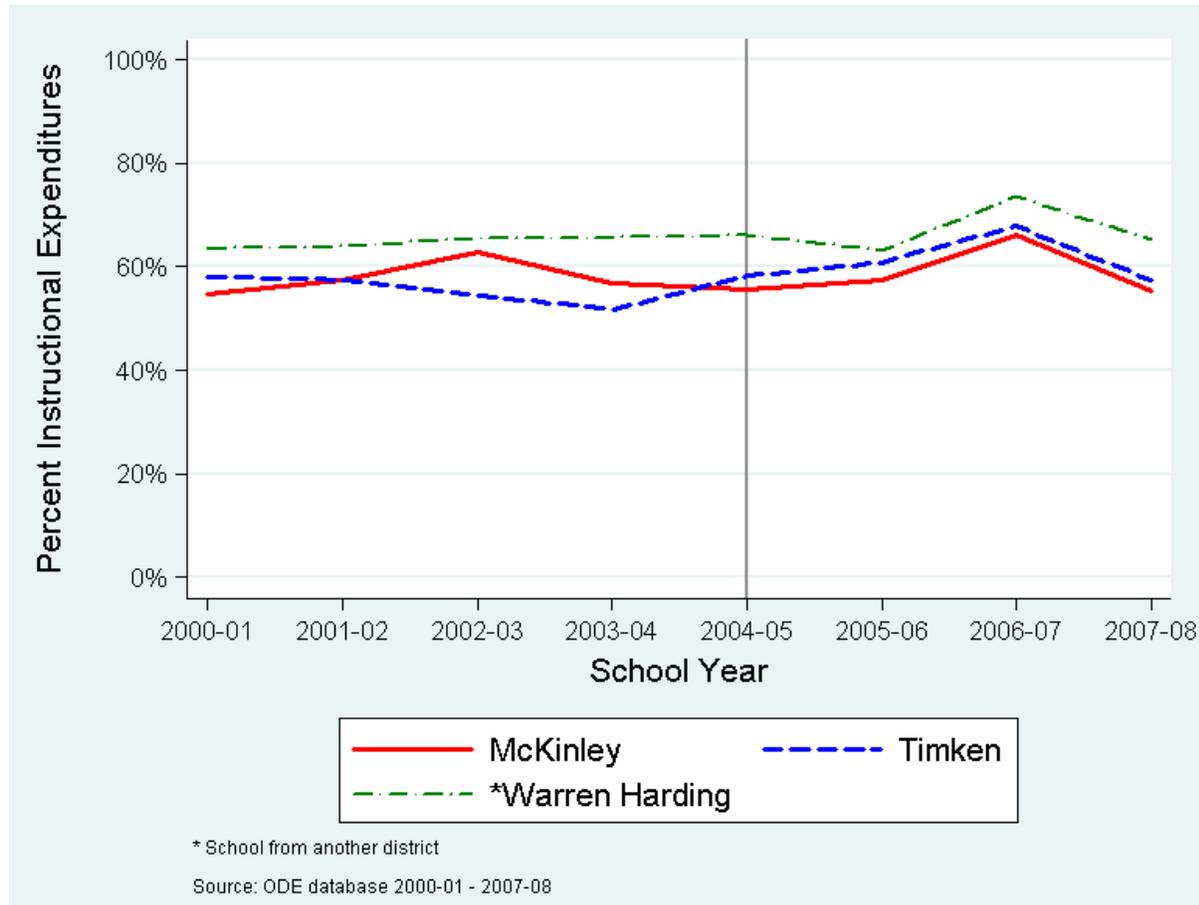


Exhibit A-7 shows graduation rates in Canton City School District's high schools and Warren Harding High School between 2000-01 and 2006-07. While expenditures per pupil were higher at Timken than those of McKinley between 2000-01 and 2006-07 (see Exhibit A-6 above), graduation rates at McKinley were consistently higher than those at Timken during those same years. McKinley's graduation rates increased slightly during the two years after small school implementation.

Exhibit A-7. Graduation Rates Over Time, Canton City School District

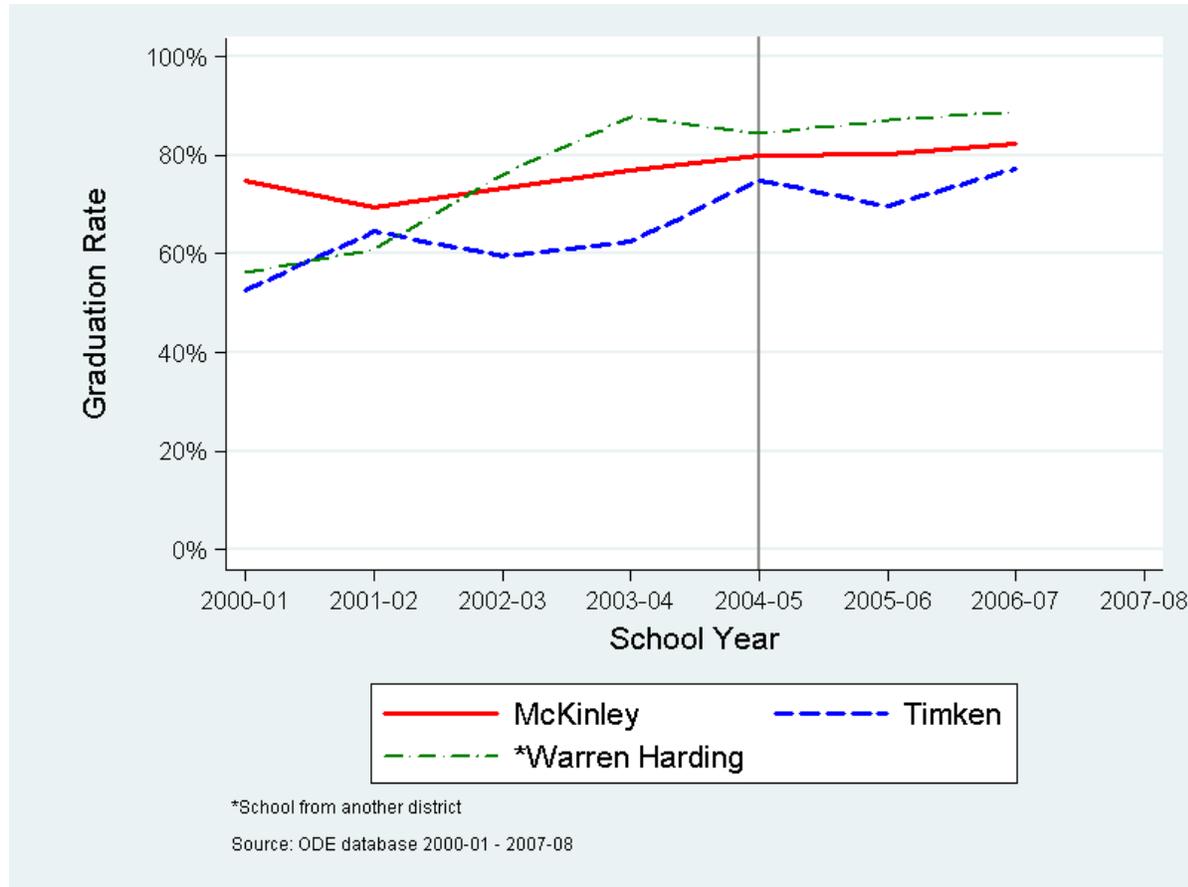
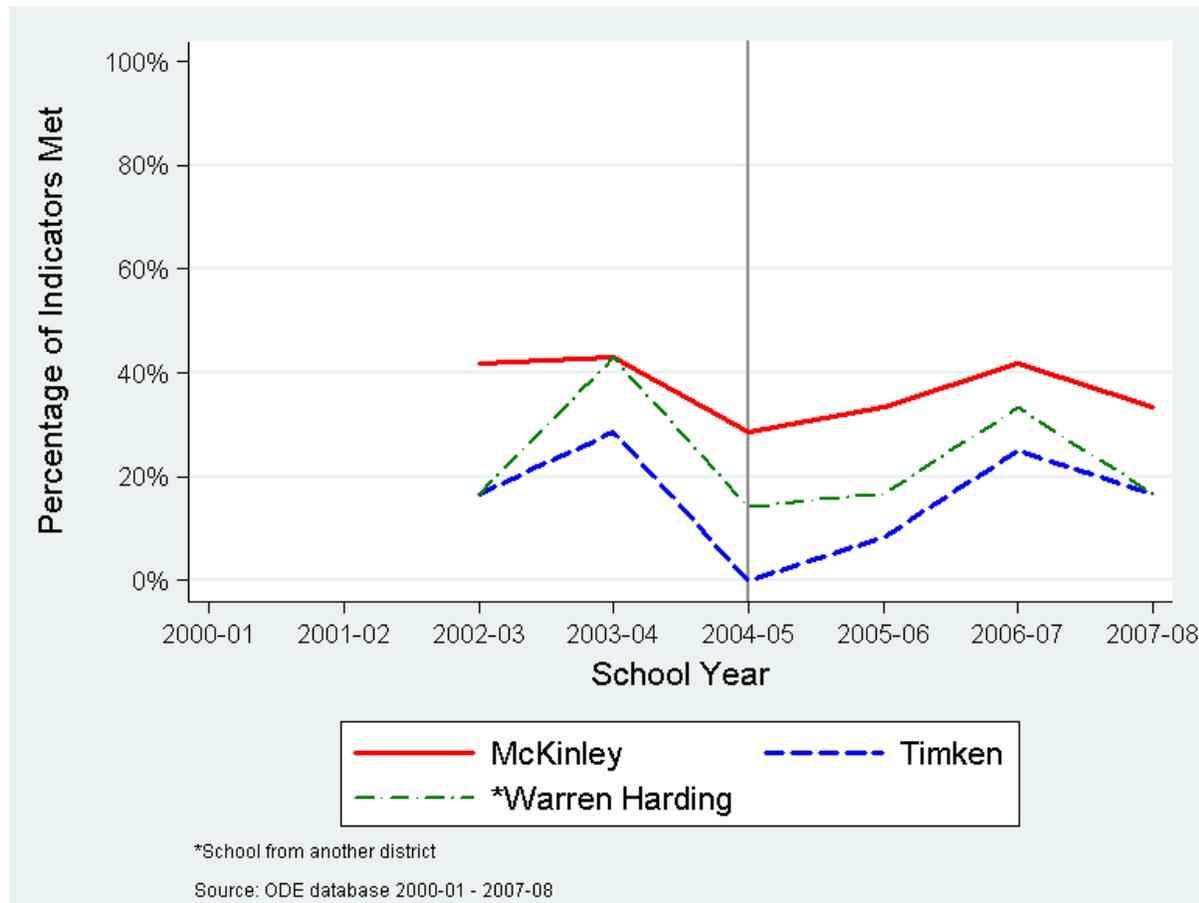


Exhibit A-8 shows the percentage of applicable state indicators met in Canton City School District's high schools and Warren Harding High between 2002-03 and 2007-08. As shown in the exhibit, McKinley had the highest percentages of applicable state indicators met in 2002-03 and between 2004-05 and 2007-08. In 2003-04, McKinley and Warren Harding met similar percentages of applicable state indicators.

Exhibit A-8. Percentage of Applicable State Indicators Met, Canton City School District



Lima City

The Community and District

The Lima City School District celebrated 150 years of public education during the 2006-2007 school year. The district serves nearly 5,000 students in five elementary schools, three middle schools, and the three small high schools on the Lima Senior High School Campus.

The Campus

Built in 1955, Lima Senior High is the only high school campus in the Lima City School district. Lima Senior occupied the same building for 49 years before moving to a new location in fall 2004. The new Lima Senior High School is 284,861 square feet, complete with a state-of-the-art auditorium, media center and gymnasium. The campus serves approximately 1,200 students.

Small Schools at Lima Senior High

In fall 2004, Lima Senior High's three small schools opened as part of the OHSTI Initiative. All schools were designed to serve 9th through 12th graders and were developed around different themes: Performance-Based School; the Progressive Academy, and the School of Multiple Intelligences. Each year, representatives from each of the small schools give presentations at the local middle schools. Incoming students rank their small school preferences and according to district personnel, "most students get their first choice."

Each of the small schools at Lima Senior High has its own IRN, or Internal Retrieval Number. The establishment of separate IRNs allows the campus to track data and compare performance for each of its small schools.

Expenditures and Student Outcome Data

Exhibit A-9 shows total expenditures per pupil at Lima Senior High between 2000-01 and 2007-08. Also shown are expenditures per pupil in Mansfield High School, a high school in Mansfield, Ohio that Lima City School District staff use as a comparison because of its similar demographics. As shown in the exhibit, Lima Senior's expenditures were consistently lower than that of its comparison school across all eight years. Lima Senior's expenditures decreased slightly in the two years after implementation and rose again in 2007-08.

Lima Senior's expenditures decreased slightly the year after OHSTI implementation. District staff explained that the campus had few start-up costs other than additional costs in administration and costs incurred from expanding technology across the site. Furthermore, staffing is reviewed and adjusted each year based on the declining student population.

The exhibit also shows a slight increase in expenditures between 2006-07 and 2007-08. District staff explained that prior to OHSTI transformation, the comprehensive high school had one campus principal, and four assistant principals and counselors for each grade level. Each small school now has its own principal, assistant principal and a counselor, which results in additional costs.

Exhibit A-9. Total Expenditures per Pupil, Lima City School District

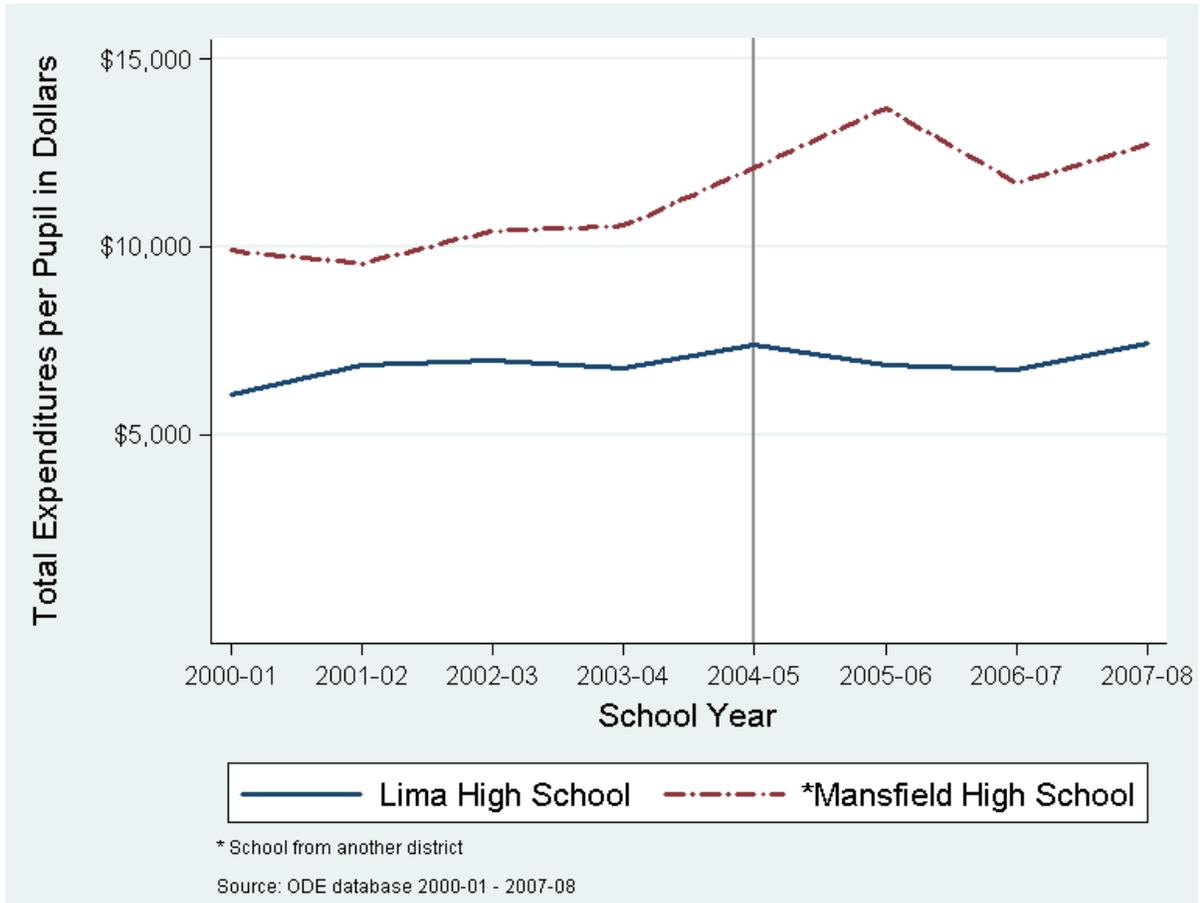


Exhibit A-10 shows instructional expenditures as a percentage of total expenditures at Lima Senior High and Mansfield High School between 2000-01 and 2007-08. As shown in the exhibit, Lima Senior's expenditures per pupil were consistently greater than that of its comparison school across all eight years. Lima Senior's per pupil expenditures increased in the two years after implementation and decreased in 2007-08.

Exhibit A-10. Instructional Expenditures as a Percentage of Total Expenditures, Lima City School District

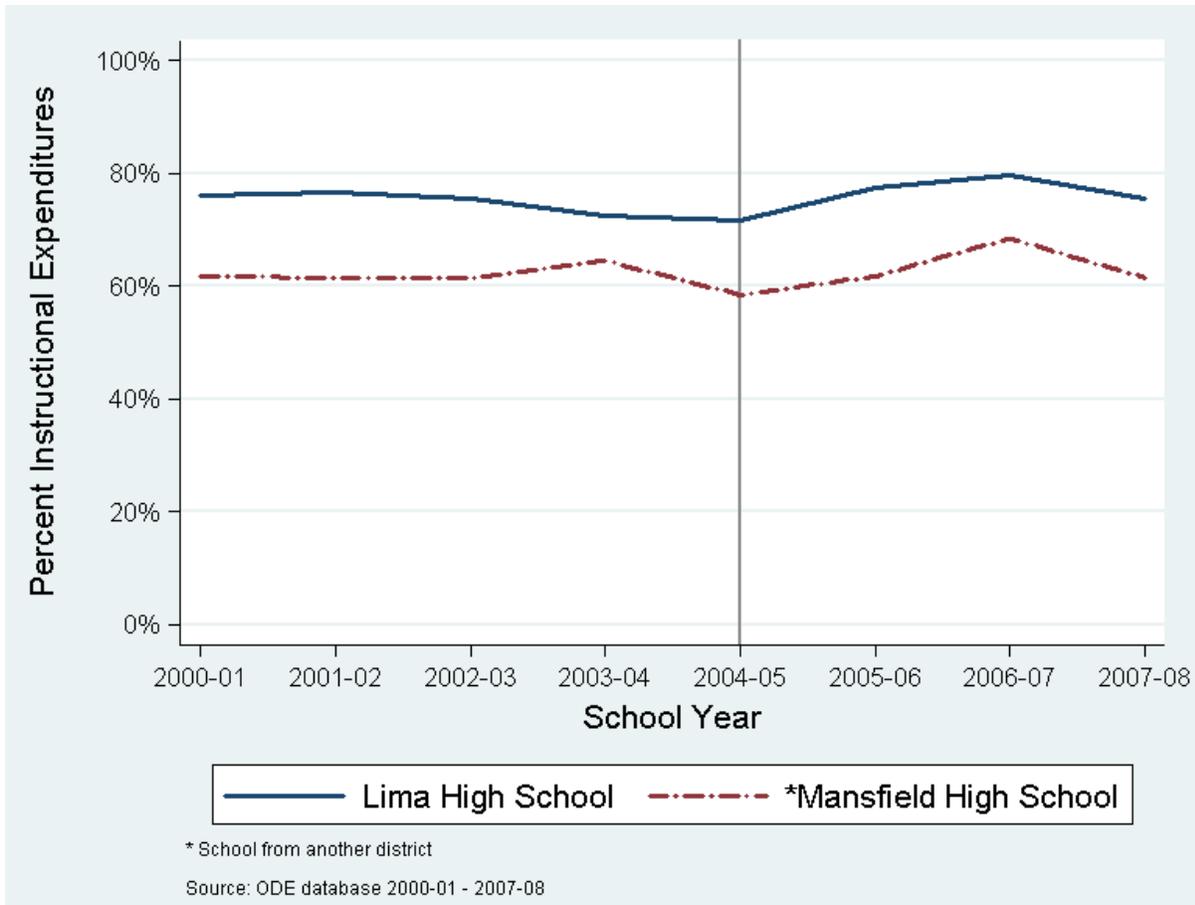


Exhibit A-11 shows graduation rates at Lima Senior High and Mansfield between 2000-01 and 2006-07. As shown in the exhibit, Lima Senior's graduation rates were consistently lower than that of its comparison school across all seven years. Interestingly enough, Lima Senior's graduation rates decreased sharply in the year after OHSTI implementation but peaked again in 2006-07. According to district staff, the dramatic increase in 2006-07 may have been related to the way students had previously been reported. Special education students are now allowed to take the alternative assessment of the Ohio Graduation Test (OGT), which has resulted in higher scores. The difference in graduation rates for special education students was unique to Lima.

Exhibit A-11. Graduation Rates Over Time, Lima City School District

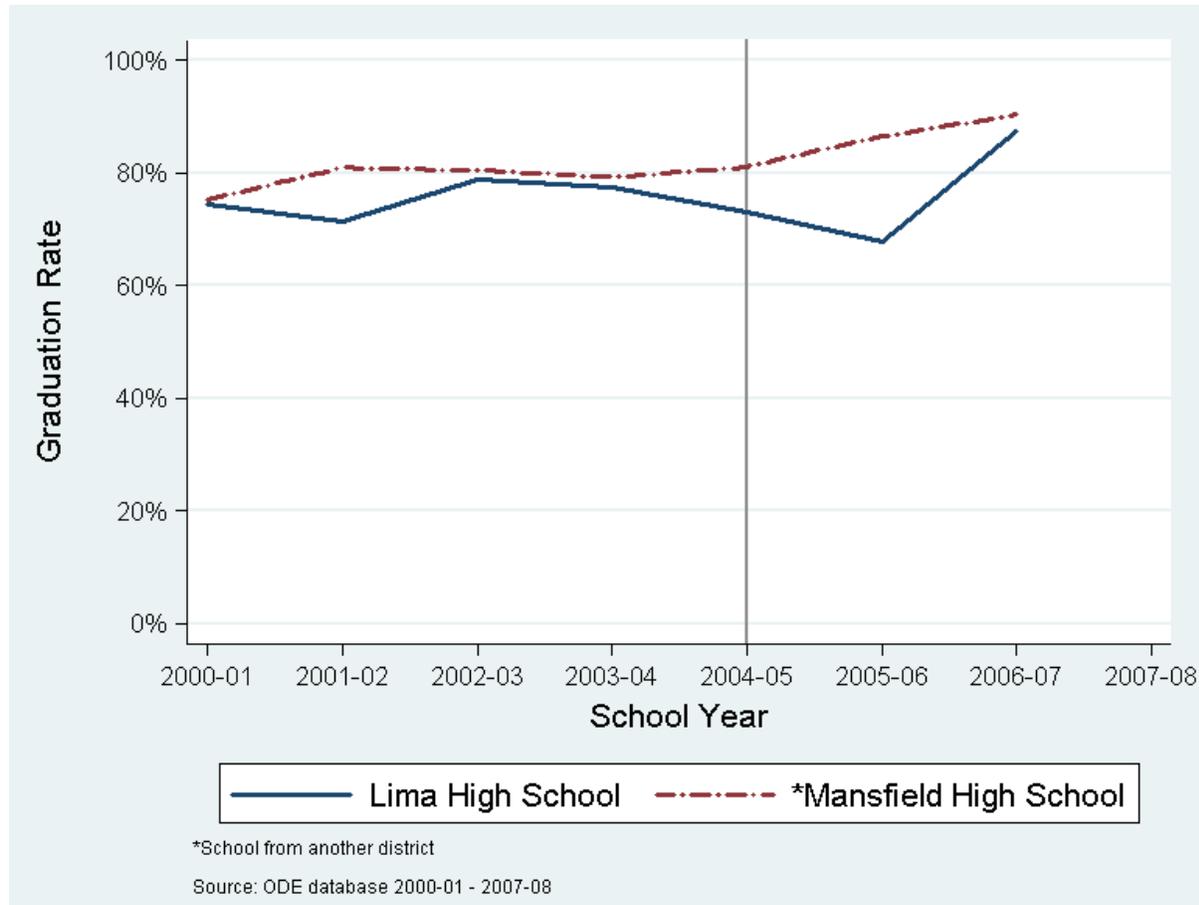
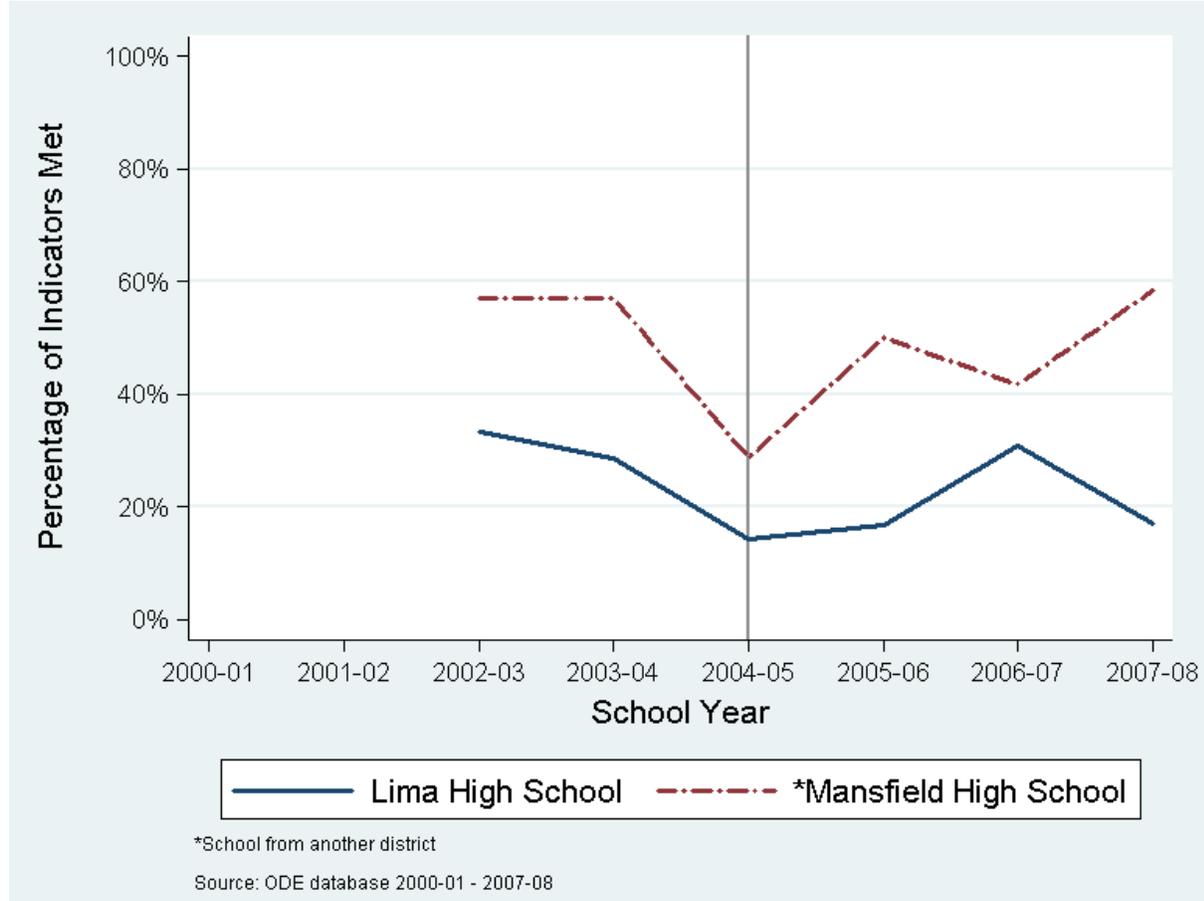


Exhibit A-12 shows the percentage of applicable state indicators met at Lima Senior High and Mansfield High between 2002-03 and 2007-08. As shown in the exhibit, Lima Senior had lower percentages of state indicators met than its comparison school across all six years.

Exhibit A-12. Percentage of Applicable State Indicators Met, Lima City School District



Toledo Public Schools

The Community and District

Toledo Public Schools (TPS) serves students of the city of Toledo and is the fourth largest public school system in the state of Ohio. As of 2008-09, the district served approximately 26,600 students in its 40 elementary schools, 7 middle schools, and 9 high school campuses (two of which have small schools). The district has witnessed a steady decline in enrollment over the past several years. For example, as of October 2008, the student enrollment in Toledo Public Schools had decreased by more than 1,600 students since school year 2007-08. Since the 1998-99 school year, upwards of 12,000 students have left the district, an average annual loss of more than 1,100 students (Joyce 2008). According to some estimates (Joyce 2008), this “latest annual decrease could translate into the district missing out on as much as \$9.4 million in state and local revenue [in 2008-09], given that school district budgets are mostly built based on student enrollment.” These decreases are partially due to migration out of the city into surrounding suburbs or other regions or states, and partially due to students opting to attend charter schools (Joyce 2008).

The Libbey Campus

Built in 1923, Libbey High School was named for Edward Drummond Libbey, the founder of the Toledo Museum of Art and the father of the glass industry in Toledo. As of 2007-08, the Libbey campus served approximately 662 students. The campus does not have an overall campus principal.

Small Schools at Libbey High School

In school year 2004-05, Libbey High School was transformed into four small schools as part of the OSHTI Initiative. All schools were designed to serve 9th through 12th graders and were developed around different themes: The Cowboy Academy of Business Technology (CAB), which was named after the school’s mascot (the Cowboys); the Humanities Academy; Science, Math and Related Technologies (SMART) School, and Gateway School of Health Technology. Although Gateway School of Health Technology closed at the end of the 2006-2007 school year, the three other small schools remain in operation. As with Lima Senior High, each of the small schools at Libbey High School has its own IRN. Each small school has two leaders, one of whom serves as an administrative leader and the second who serves as a teacher leader. The district compensates each leader the same salary.

The Scott Campus

As of 2007-08, the Scott campus served approximately 900 students. The campus does not have an overall campus principal.

Small Schools at Scott High School

In school year 2004-05, Scott High School was transformed into four small schools as part of the OSHTI Initiative. All schools were designed to serve 9th through 12th graders, and were developed around different themes: the Arts and Media Academy, the Allied Health Academy, the Business Technology and Industry Academy, and World of Opportunity/School of Human Services. As with Libbey High School, each of the small schools at Scott High School has its own IRN and two leaders, one of which serves as an administrative leader and the second who serves as a teacher leader, who receive the same salary.

Expenditures and Student Outcome Data

Exhibit A-13 shows total expenditures per pupil in Toledo Public Schools between 2000-01 and 2007-08. All of the high schools' expenditures were fairly similar between 2000-01 and 2005-06; however, expenditures per pupil at Scott High School and Libbey High School increased between 2005-06 and 2007-08, while those of the other high schools decreased in 2006-07 and rose again in 2007-08.

Exhibit A-13. Total Expenditures per Pupil, Toledo Public Schools

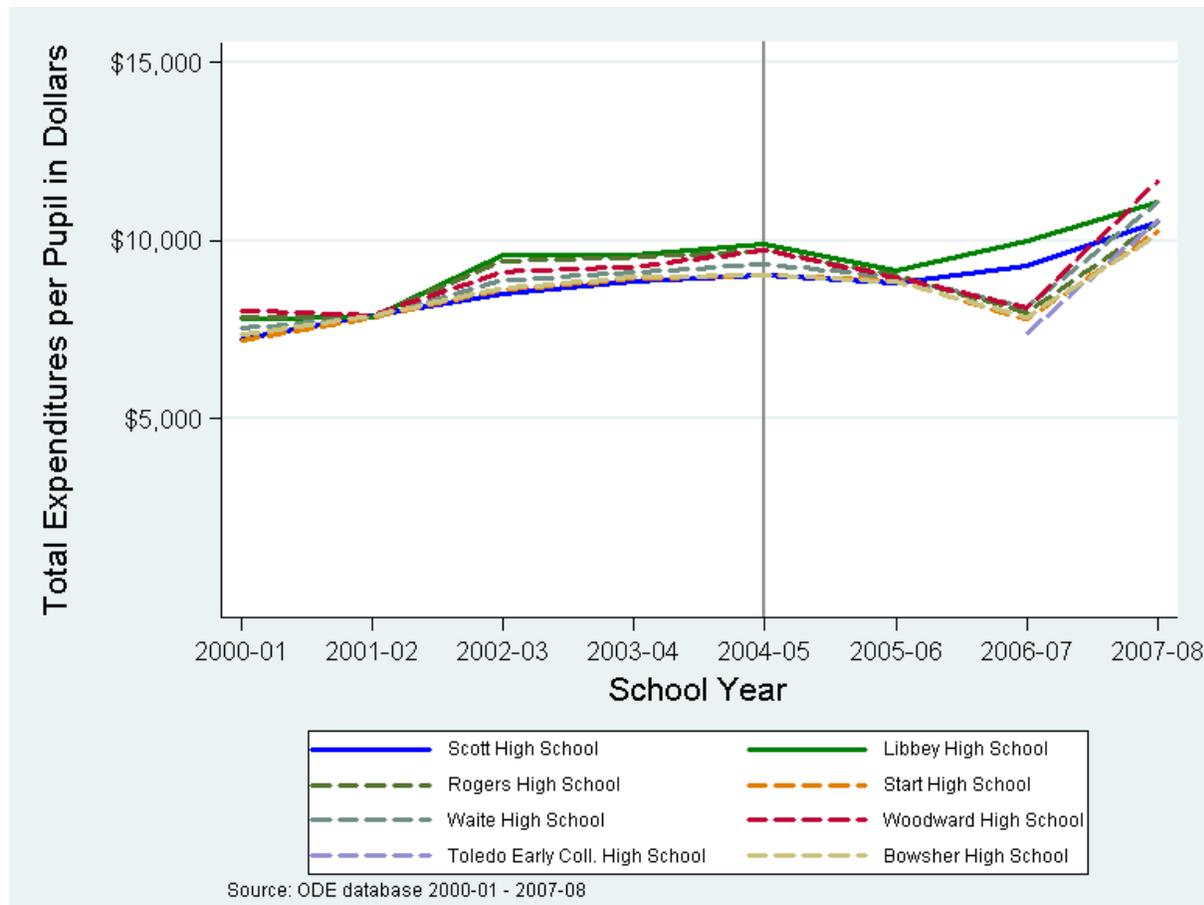


Exhibit A-14 shows instructional expenditures as a percentage of total expenditures in Toledo Public Schools between 2000-01 and 2007-08. As with total expenditures, all of the high schools' expenditures were fairly similar between 2000-01 and 2005-06. But in contrast to total expenditures per pupil (see Exhibit A-13 above), instructional expenditures at Scott High School and Libbey High School *decreased* between 2005-06 and 2007-08 while those of the other high schools peaked in 2006-07 and decreased again in 2007-08.

Exhibit A-14. Instructional Expenditures as a Percentage of Total Expenditures, Toledo Public Schools

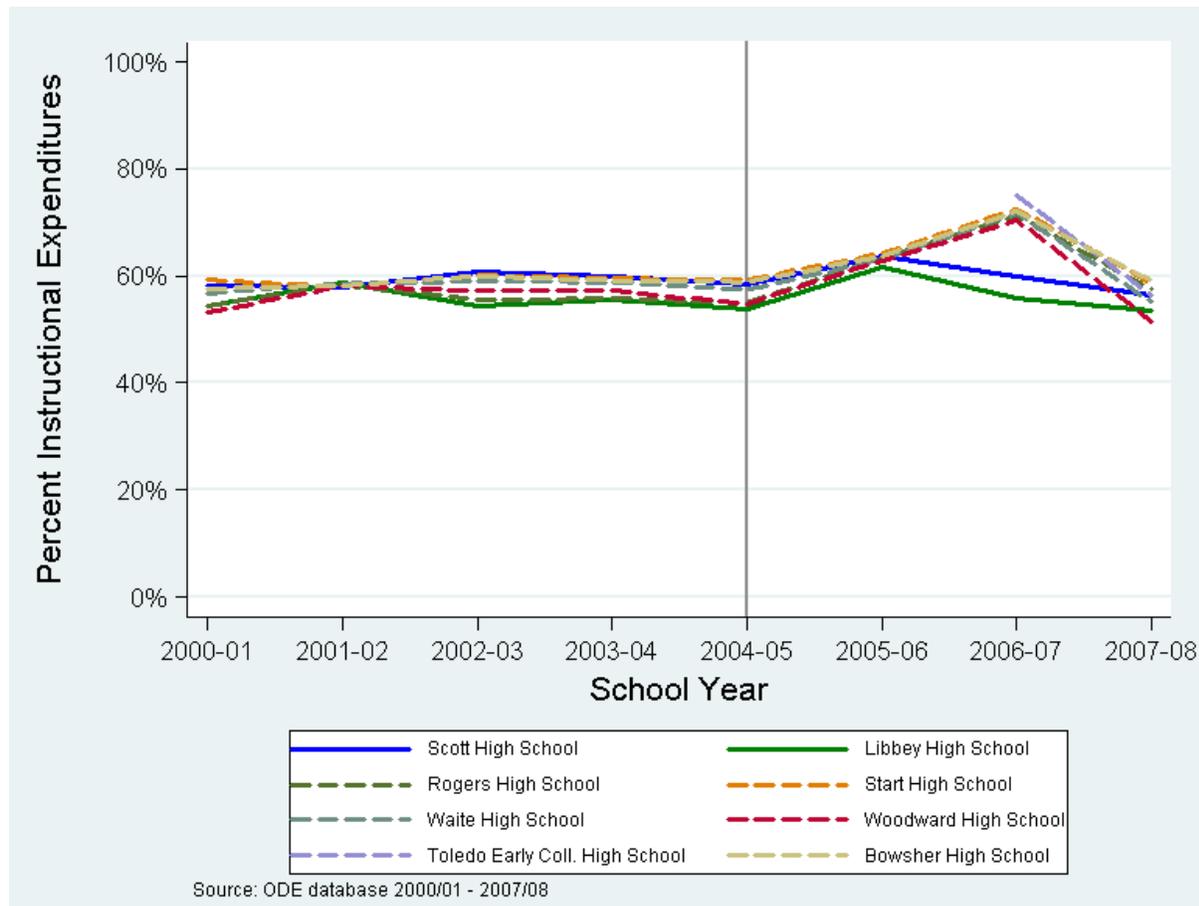


Exhibit A-15 shows graduation rates in Toledo Public Schools between 2000-01 and 2006-07. As shown in the table, graduation rates varied across the years; however, graduation rates increased in every high school between 2004-05 and 2005-06.

Exhibit A-15. Graduation Rates Over Time, Toledo Public Schools

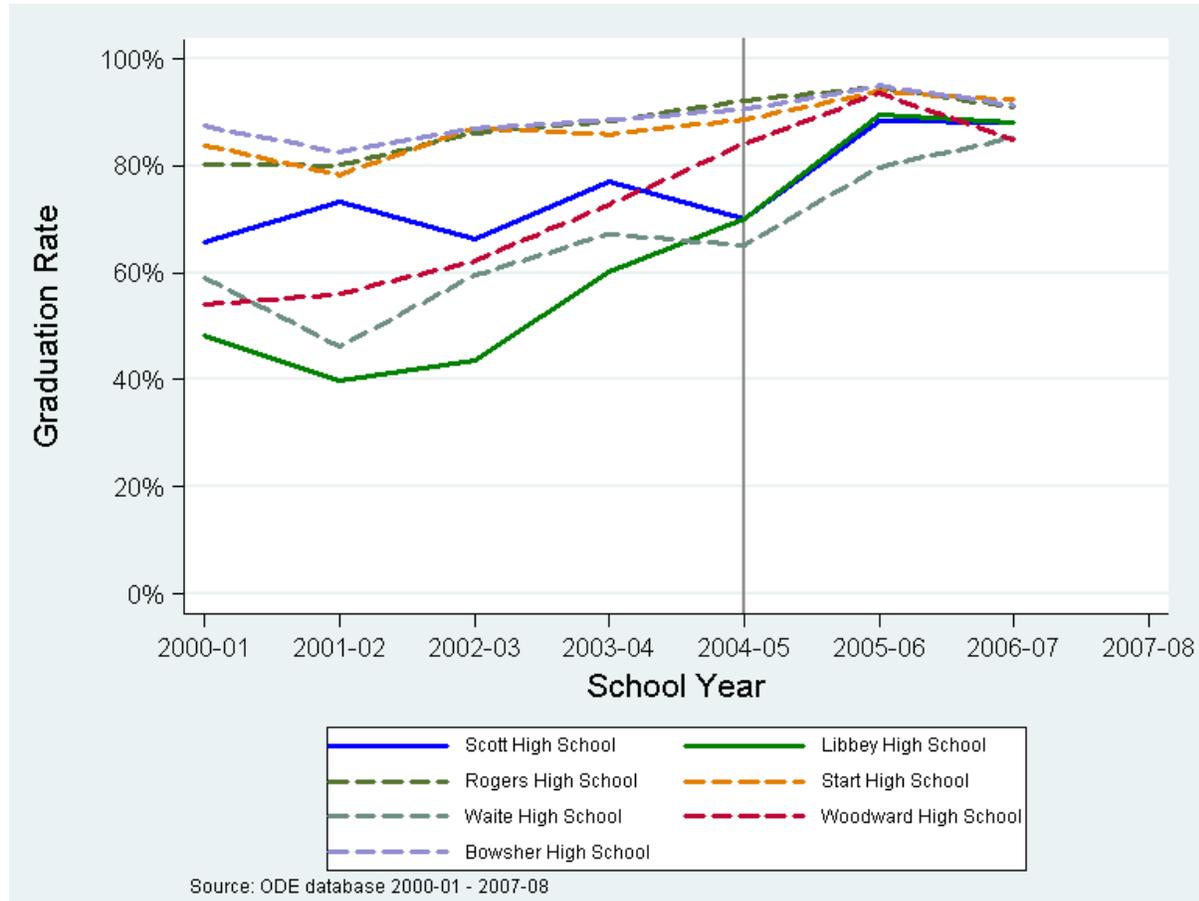
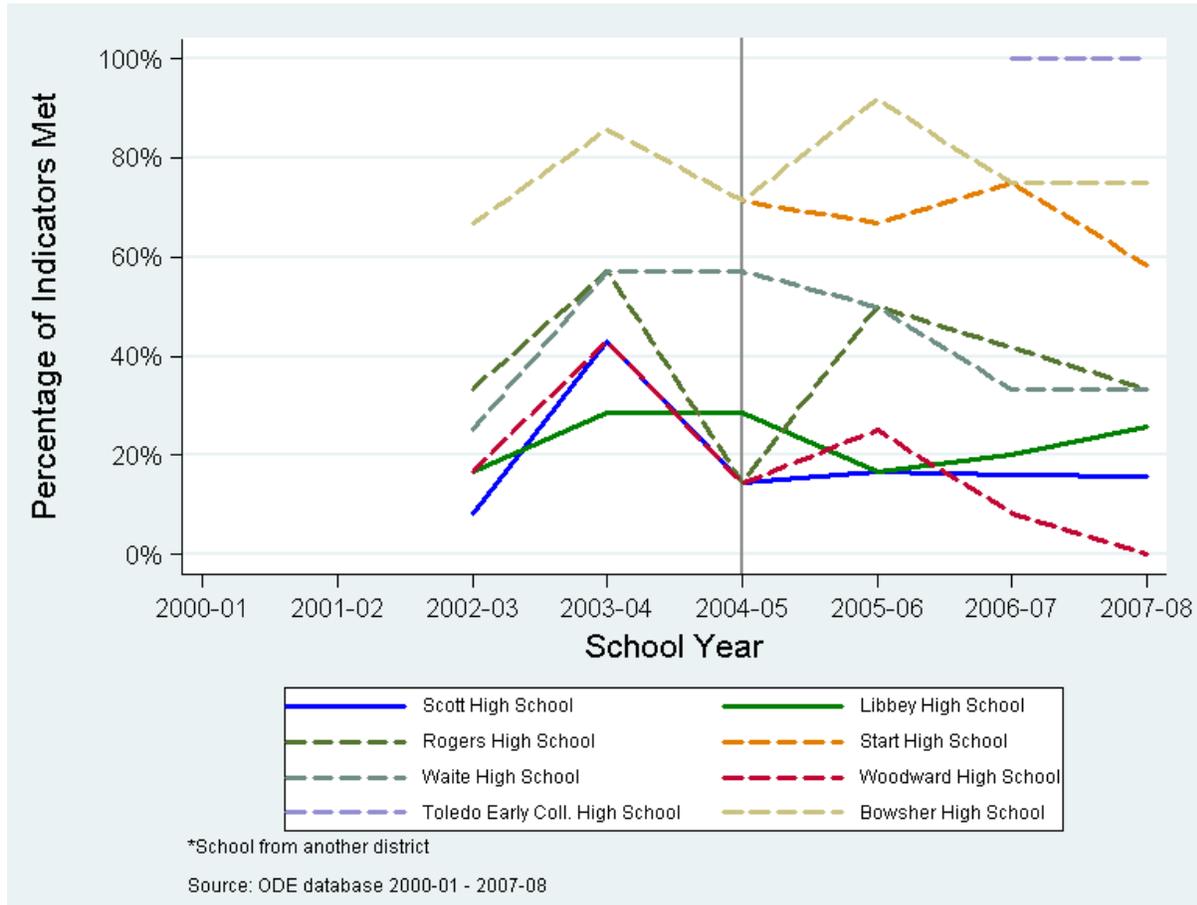


Exhibit A-16 shows the percentage of applicable state indicators met in Toledo Public Schools between 2002-03 and 2007-08. As shown in the exhibit, Scott High School, Libbey High School, and Woodward High School had the lowest percentages of state indicators for five of the six years. One exception was in 2004-05, when Rogers High School dipped below Libbey to become one of the three lowest schools alongside Scott High School and Woodward High School.

Exhibit A-16. Percentage of Applicable State Indicators Met, Toledo City School District



Note: The ODE only had data available for 2006-07 and 2007-08 for Toledo Early College.

Appendix B. Technical Appendix

Table A-1: The Variables Used in the Cost and Production Function Analyses

Variable type	Description
Expenditures	The total of campus level expenditures and an allocated share of central office expenditures (in logs). Central office expenditures are allocated to the campuses in a district on either a per capita or per dollar basis.
School Outcomes	<p>We generate approximate measures of campus value added by calculating the change in student performance from one year to the next. We calculate these change indicators for four distinct measures of student performance—attendance rates, graduation rate, discipline rates and an index of test proficiency. We first created indices of these variables by adding one and then taking the log. For example:</p> $\text{the change in the attendance rate index}_{2007} = \log(1 + \text{attendance rate})_{2007} - \log(1 + \text{attendance rate})_{2006}$ <p>Our test proficiency index is a composite of the share of 10th-grade students who scored proficient (or better) in math, reading, writing, social studies, and science. We focus on 10th grade because this is the only grade for which scores are reported every year during the study period. The composite is an unweighted average of the proficiency rates across the five subjects. As an alternative, we standardized the proficiency rates for each subject and year using a z-score transformation, and then averaged the z-scores. The correlation between the average of the z-scores and the unweighted average of the proficiency rates was 0.998. The value-added version of this test proficiency index is the change from one year to the next in the log of this composite index, plus one. Using the same technique, we also generated composite indexes for the change in proficiency rates among economically disadvantaged students, and among students who were not economically disadvantaged.</p> <p>In the publicly-available ODE data, the proficiency rates, attendance rates and graduation rates have been capped at 95 percent. To account for these censored observations, and differentiate between campuses that do not improve because they have no room for improvement, and campuses that do not improve but have room to do so, the analysis also includes indicator variables for each outcome measure to reflect campuses where the prior year's performance level was 95 percent.</p>

Variable type	Description
OHSTI Program Indicators	<p>To capture any unobserved differences between treated and untreated campuses, the analysis includes two OHSTI indicators: one that indicates campuses that are or would become participants in the OHSTI program (OHSTI) and the other that indicates OHSTI participants during the implementation period (OHSTIpost2004). We use this difference-in-difference approach because the process for determining which campuses would participate in the OHSTI program did not rely on random assignment, and preliminary analyses suggest that there were systematic differences between OHSTI campuses and all other urban high schools in Ohio.</p>
Input Prices	<p>A Comparable Wage Index (CWI) was included for each of two categories of personnel: one for professional and one for non-professional workers. The CWI reflects differential costs of “comparable” labor in the same labor market. The premise of the CWI is that teachers and other school personnel will demand higher salaries in labor markets that exhibit higher wages for individuals in other occupations requiring comparable preparation and training. Professionals include occupations requiring a college degree, while non-professionals include those with less than a college degree. For a more detailed description of the CWIs see Taylor (2008).</p>
Input Quantities	<p>We use data on school and district expenditures to measure educational resources in five key areas: instruction, pupil and staff support, building maintenance, school administration and central administration. Holding prices constant, expenditures in each of these categories represents a measure of the real resources devoted to each activity.</p> <p>These expenditures were deflated with the CWI. In particular, building expenditures were deflated with the non-professional CWI. The other expenditures were deflated using the professional CWI.</p> <p>Regarding the central administration expenditures, these were allocated in a per capita basis.</p> <p>To further refine our measure of instructional resources, we also include two measures of teacher quality: Teacher Absenteeism, which is the average percentage of teachers who are absent over the course of the school year, and Teacher Appropriate Certification, which is the proportion of courses taught by teachers with the appropriate certification.</p>

Variable type	Description
Environmental Factors	<p>We created indices of student need reflecting the proportion of students with the following characteristics: English Language Learners (ELL), students eligible for special education services, and students identified as economically disadvantaged in the ODE database. Where appropriate, the analysis also includes interactions among these indicators of student need.</p> <p>For example: the ELL index = $\log(1 + \text{proportion of ELL})$</p> <p>To reflect any differences in the educational technology that reflect differences in the mix of grade levels, we also include the proportion of students in each grade level at the high school.</p> <p>We include both a linear and quadratic (squared term) for campus enrollment to capture the common u-shaped curve that helps identify economies of small and large scale operations in campuses.</p> <p>To reflect potential economies of scale at the district level, we include indicators for school districts with 2000 or fewer students and school districts with between 2000 and 5000 students.</p>
School Year	All of the models include indicator variables for each school year.

The Cost Function Analyses

We used cost function analysis to examine the relationship between campus expenditures and campus outcomes, controlling for input prices, student need, the scale of campus operations, and some district context variables (i.e., a dichotomous indicator for small and one for medium-sized districts).

Formally, the cost function relationship may be specified as follows:

$$\ln(E) = \beta_0 + \beta_1 \cdot OHSTI + \beta_2 \cdot OHSTI_{post2004} + \sum \gamma_i y_i + \sum \delta_j p_j + \sum \eta_k x_k + \sum \tau_t + \varepsilon \quad (1)$$

where the y_i indicate campus outcomes measures, the p_j indicate the two price indices, the x_k indicate the environmental factors, the τ_t represent school-year indicators and ε represents an error term. If costs have changed for the OHSTI campuses since the implementation of the program, β_2 will be significantly different from zero.

Our baseline analysis uses ordinary least squares (OLS) regression analysis to estimate the parameters of equation (1). OLS analysis solves for the values of β , γ , δ and η that minimize the sum of the squared differences between the predicted expenditures and the observed expenditures for each school. The first column of Table A-2 presents the coefficient estimates and robust standard

errors from the baseline analysis. This baseline model focuses on two of the four possible outcome measures—changes in the proficiency rate and changes in the attendance rate. Because information on graduation rates was not yet available for the 2007-2008 school year we did not include this as an outcome in the cost function analysis. Preliminary analysis suggested that changes in the disciplinary action rate were not appropriate for inclusion in the cost function model, and that the basic findings were not sensitive to the inclusion or exclusion of this indicator, so it was also excluded.

As the table illustrates, the analysis indicates that costs were significantly higher in the OHSTI campuses before the implementation of the small schools initiative. There is no evidence that those costs changed significantly after implementation, once labor costs, outcomes and environmental factors are taken into account.

To supplement the OLS analysis, we also estimated equation (1) using stochastic frontier analysis (SFA). The main difference between the SFA and OLS models is that the SFA model attributes a portion of the deviation between actual and expected expenditures to inefficiency and a portion of the deviation to random “noise” (e.g., data errors, omitted variables), while OLS does not distinguish between noise and inefficiency, treating them both the same.³¹ As such, the SFA model offers a way to determine whether campuses are operating at minimum cost (maximum efficiency), without presuming that every deviation from predicted cost represents inefficiency.

For purposes of this study, efficiency refers to the way a high school allocates and organizes resources to improve such student outcomes as attendance, graduation rates, and test scores. According to economists (Stiefel et al., 2005, page 2), “...efficiency measurement presumes a connection between inputs and outputs. At its most basic, measures of technical efficiency seek to identify those schools getting the most ‘bang from their buck,’ where ‘bang’ is typically a series of test score measures (or changes in test score measures) and ‘bucks’ may include a variety of inputs such as resources, organizational characteristics, and student attributes.”

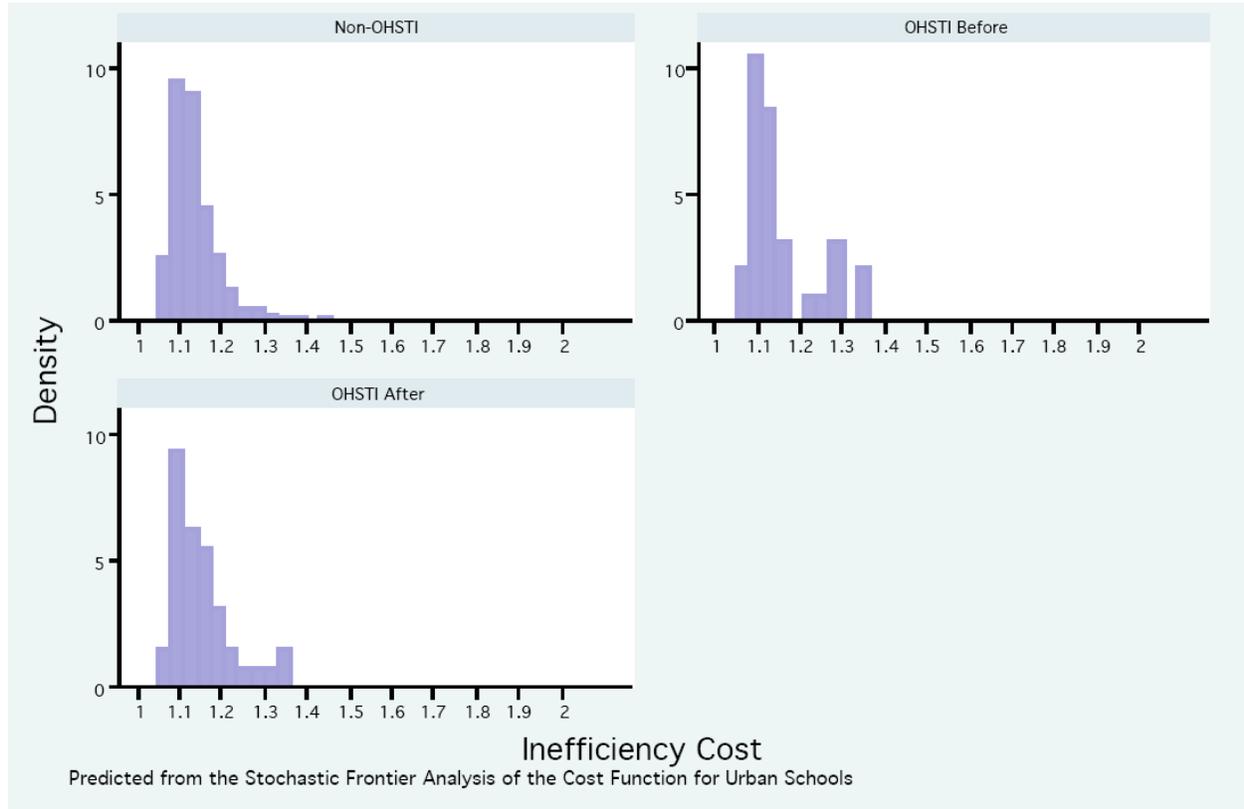
The second column of Table A-2 presents coefficient estimates and standard errors from the SFA estimation of equation (1), while Exhibit 17 illustrates the distribution of technical efficiency scores for the OHSTI and non-OHSTI campuses. As the table illustrates, OHSTI campuses had significantly higher costs than other urban high schools in Ohio before the implementation of the program, once labor costs, outcomes, environmental factors and potential differences in efficiency are taken into account. The distribution of efficiency scores suggests that the OHSTI campuses were also slightly less efficient than other campuses. However, there is no evidence that the program led to a significant increase in costs or any increase in inefficiency among OHSTI campuses.

In addition to the OLS and SFA models, we also explored using an instrumental variables (IV) approach to the cost function estimation, treating the outcomes measures as endogenous and using the outcomes in surrounding districts as our instruments for the endogenous outcome measures. This approach to identifying a valid set of instruments for output quality draws upon the imitation or “copycat” model of Case, Rosen and Hines (1993). The copycat model suggests that voter demands for educational outcomes in a given district are influenced by the outcomes in surrounding

³¹ Thus, in the SFA specification $\epsilon = v + u$, where v is typical statistical noise and u is a one-sided component that reflects technical inefficiency. To control for possible heteroskedasticity and to allow for the possibility that technical inefficiency is a function of school district size, the statistical model also allows the variance of u to be a function of school district enrollment.

districts. Our IV specifications, which were very imprecisely estimated and are presented in the third column of Table A-2, also did not indicate that there was any change in cost for the OHSTI campuses after the implementation of the small schools initiative.

Exhibit A-17. Technical Inefficiency Scores for OHSTI and Non-OHSTI Campuses



AIR also estimated the model with a slight variation, wherein we calculated an index of implementation fidelity based on the non-negotiable points defined by KnowledgeWorks. Campuses that received more than 2.5 points were classified as high-fidelity implementers while campuses that receive less than 2.5 points were classified as low-fidelity implementers. This classification variable was then included as an independent variable in the baseline estimation. As the fourth column of Table A-2 illustrates, this change in specification did not affect the main finding of our analysis; costs did not increase under the OHSTI program.

Finally, AIR decomposed the change in student proficiency rates into the change in rates for economically disadvantaged students and the change in rates for students who were not economically disadvantaged. Table A-2a illustrates these estimates for a model estimated with OLS. As the model illustrates, allowing for the possibility that it costs more to achieve proficiency among economically disadvantaged students than it does to achieve proficiency among economically advantaged students does not change the basic conclusion of this analysis.

Because the expenditure profile in Cleveland Heights is very different from that of other campuses, the researchers were concerned that this specific OHSTI campus was driving the results. Therefore,

AIR also estimated all of the specifications in Table A-2, excluding Cleveland Heights from the data. In no case were the conclusions of the analysis sensitive to this change in sample, although when Cleveland Heights is excluded the coefficient on the indicator for OHSTI campuses is smaller and not significantly different from zero. In other words, excluding Cleveland Heights, there is no significant difference between the cost of operating an OHSTI school and the cost of operating a non-OHSTI school, either before or after the implementation of the small schools initiative.

Table A-2: Cost Function Estimates for Urban Schools

VARIABLES	OLS	SFA	IVReg	VARIABLES	OLS – Implementation Index
KnowledgeWorks	0.110*** (0.0362)	0.104*** (0.0366)	0.0972 (1.640)	KnowledgeWorks	0.110*** (0.0361)
KnowledgeWorks After	0.0148 (0.0472)	0.0209 (0.0474)	-1.438 (3.643)	Fidelity: High	0.0550 (0.0512)
Change In Student Attendance Index	0.690*** (0.227)	0.591** (0.240)	41.03 (103.6)	Fidelity: Low	-0.0771 (0.0662)
Change In Test Scores	0.0755 (0.128)	0.118 (0.132)	-99.60 (164.0)	Change In Student Attendance Index	0.673*** (0.227)
Student Attendance Censored	-0.00603 (0.00799)	-0.00540 (0.00789)	-0.141 (0.601)	Change in the Average Test Scores	0.00615 (0.00589)
Any Test Score Censored	-0.0638*** (0.0108)	-0.0642*** (0.0108)	0.0715 (0.242)	Any Test Score Censored	-0.0639*** (0.0108)
Log enrollment	0.0505 (0.115)	0.101 (0.120)	0.0828 (1.989)	Student Attendance Censored	-0.00592 (0.00798)
Log Enrollment Sq.	-0.0116 (0.00880)	-0.0139 (0.00914)	-0.00973 (0.166)		
Year2	0.0705*** (0.0146)	0.0627*** (0.0145)	0.428 (1.350)		
Year3	0 (0)		0.183 (1.556)	Log enrollment	0.0558 (0.115)
Year4	0.00500 (0.0140)	0.00715 (0.0138)	-0.514 (0.732)	Log Enrollment Sq.	-0.0120 (0.00880)
Year5	0.00115 (0.0155)	0.00861 (0.0153)	-3.492 (5.635)	Year2	0.0673*** (0.0169)
Year6	0.000493 (0.0154)	0.00882 (0.0153)	1.756 (2.870)	Year3	-0.00269 (0.0152)
Year7	-0.128*** (0.0160)	-0.117*** (0.0160)	0.247 (0.814)	Year4	0.00369 (0.0144)
Year8	-0.00578 (0.0169)	0.00624 (0.0169)		Year5	0 (0)
Log CWI	0.738*** (0.105)	0.650*** (0.104)	1.548 (2.089)	Year6	-0.00244 (0.0151)
Log CWI Non P	0.168 (0.115)	0.190* (0.112)	-0.341 (1.919)	Year7	-0.130*** (0.0149)
Mobility index	-0.343*** (0.0600)	-0.389*** (0.0631)	0.142 (1.085)	Year8	-0.00692 (0.0154)
Economic Disadv. index	0.256*** (0.0342)	0.249*** (0.0348)	-2.026 (4.579)	Log CWI	0.741*** (0.105)
Limited English Proficiency index	1.498*** (0.348)	1.535*** (0.339)	-9.260 (13.87)	Log CWI Non P	0.154 (0.115)
Disabilities index	1.041*** (0.104)	1.073*** (0.106)	0.106 (4.516)	Mobility index	-0.344*** (0.0599)

VARIABLES	OLS	SFA	IVReg	VARIABLES	OLS – Implementation Index
Economic Disadv X Limited English	-1.965*** (0.685)	-1.981*** (0.685)	17.79 (25.81)	Economic Disadv. index	0.259*** (0.0342)
Proportion of students in grade 10	-0.253** (0.120)	-0.161 (0.123)	0.360 (3.772)	Limited English Proficiency index	1.509*** (0.348)
Proportion of students in grade 11	0.374*** (0.137)	0.392*** (0.138)	5.600 (9.066)	Disabilities index	1.032*** (0.105)
Proportion of students in grade 12	0.0787 (0.117)	-0.0644 (0.123)	-4.948 (9.432)	Economic Disadv X Limited English	-2.002*** (0.684)
District size less than 2000 students	-0.159*** (0.0157)	-0.121*** (0.0212)	0.0533 (0.617)	Proportion of students in grade 10	-0.257** (0.120)
District size between 2001 and 5000 students	-0.132*** (0.0119)	-0.114*** (0.0145)	0.00114 (0.416)	Proportion of students in grade 11	0.374*** (0.137)
Log of the district size				Proportion of students in grade 12	0.0849 (0.117)
Constant	9.057*** (0.378)	8.686*** (0.398)	8.528 (6.476)	District size less than 2000 students	-0.161*** (0.0157)
Observations	2714	2714	2714	District size between 2001 and 5000 students	-0.134*** (0.0119)
R-squared	0.350	.	-147.698	Constant	9.046*** (0.378)
				Observations	2714
				R-squared	0.351

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

Table A-2a: Cost Function, Technical Inefficiency Second Stage Estimates

VARIABLES	Urban Schools
KnowledgeWorks	0.000465 (0.0129)
KnowledgeWorks After	-0.00256 (0.0168)
Log of the District Size	0.0126*** (0.00111)
Constant	1.036*** (0.00937)
Observations	2714
R-squared	0.047

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

Table A-2b: Cost Function Estimates for Urban Schools with Test Scores Disaggregated by Economically Disadvantaged Students

VARIABLES	OLS –TEST SCORES DISAGGREGATED	SFA –TEST SCORES DISAGGREGATED
KnowledgeWorks	0.107*** (0.0359)	0.101*** (0.0363)
KnowledgeWorks After	0.00154 (0.0468)	0.00559 (0.0469)
Change In Student Attendance Index	0.795*** (0.224)	0.707*** (0.235)
Change In Standardized Change in Test Scores: No	0.103** (0.0487)	0.112** (0.0501)
Change In Standardized Change in Test Scores: Disadvantaged	0.0138 (0.0198)	0.0112 (0.0195)
Missing Test Scores Not Dis.	0.0219 (0.0267)	0.0153 (0.0275)
Missing Test Scores Dis.	0.0681*** (0.0139)	0.0665*** (0.0138)
Student Attendance Censored	-0.00897 (0.00776)	-0.00842 (0.00766)
Any Test Score Censored: Not Disadvantaged	-0.0638*** (0.00969)	-0.0631*** (0.00952)
Any Test Score Censored: Disadvantaged	-0.0361* (0.0185)	-0.0366** (0.0183)
Log Enrollment	0.0636 (0.116)	0.104 (0.121)
Log Enrollment Sq.	-0.0116 (0.00885)	-0.0133 (0.00922)
Year2	0.0552*** (0.0155)	0.0474*** (0.0155)
Year3	-0.00878 (0.0140)	-0.0103 (0.0138)
Year4	0 (0)	
Year5	-7.03e-05 (0.0144)	0.00279 (0.0142)
Year6	0.00419 (0.0147)	0.00972 (0.0145)
Year7	-0.127*** (0.0153)	-0.120*** (0.0151)
Year8	-0.00496 (0.0160)	0.00313 (0.0159)
Log CWI	0.674*** (0.105)	0.601*** (0.104)
Log CWI Non P	0.205* (0.115)	0.226** (0.111)
Mobility index	-0.336*** (0.0604)	-0.379*** (0.0635)
Economic Disadv. index	0.341*** (0.0427)	0.338*** (0.0427)
Limited English Proficiency index	1.540*** (0.351)	1.537*** (0.341)

VARIABLES	OLS –TEST SCORES DISAGGREGATED	SFA –TEST SCORES DISAGGREGATED
Disabilities index	1.121*** (0.106)	1.148*** (0.108)
Economic Disadv X Limited English	-2.202*** (0.692)	-2.146*** (0.689)
Proportion of students in grade 10	-0.239** (0.119)	-0.154 (0.121)
Proportion of students in grade 11	0.468*** (0.138)	0.482*** (0.138)
Proportion of students in grade 12	0.0435 (0.117)	-0.0751 (0.122)
District size less than 2000 students	-0.155*** (0.0156)	-0.119*** (0.0215)
District size between 2001 and 5000 students	-0.125*** (0.0118)	-0.108*** (0.0147)
Constant	8.907*** (0.381)	8.580*** (0.400)
Observations	2714	2714
R-squared	0.362	

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

Table A-2c: Cost Function, Technical Inefficiency Second Stage Estimates

VARIABLES	Urban Schools	Without Cleveland Heights
KnowledgeWorks	0.00111 (0.0118)	-0.00675 (0.0142)
KnowledgeWorks After	-0.00222 (0.0154)	-0.00329 (0.0186)
Log of the District Size	0.0119*** (0.00102)	0.00291** (0.00115)
Constant	1.035*** (0.00859)	1.115*** (0.00969)
Observations	2714	2707
R-squared	0.049	0.002

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

Table A-3: Cost Function Estimates for Urban Schools Excluding Cleveland Heights from the Sample

VARIABLES	OLS	SFA	IVReg	VARIABLES	OLS – Implementation Index
Knowledge Works	0.0604 (0.0378)	0.0612 (0.0383)	0.111 (1.820)	KnowledgeWorks	0.0603 (0.0378)
Knowledge Works After	0.0154 (0.0494)	0.0205 (0.0497)	-1.527 (3.910)	Fidelity: High	-0.0277 (0.0669)
Change In Student Attendance Index	0.716*** (0.226)	0.620*** (0.238)	43.23 (96.16)	Fidelity: Low	0.0382 (0.0543)
Change In Standardized Change in Test Scores	0.0724 (0.128)	0.111 (0.131)	-91.09 (150.8)	Change In Student Attendance Index	0.701*** (0.226)
Student Attendance Censored	-0.00638 (0.00794)	-0.00573 (0.00786)	-0.159 (0.561)	Change in the Average Test Scores	0.00624 (0.00587)
Any Test Score Censored	-0.0651*** (0.0108)	-0.0655*** (0.0107)	0.0593 (0.220)	Any Test Score Censored	-0.00629 (0.00794)
Log enrollment	0.0982 (0.115)	0.133 (0.120)	0.112 (1.808)	Student Attendance Censored	-0.0652*** (0.0108)
Log Enrollment Sq.	-0.0154* (0.00877)	-0.0166* (0.00911)	-0.0113 (0.150)	Log enrollment	0.0996 (0.115)
Year2	0.0706*** (0.0145)	0.0633*** (0.0144)	0.368 (1.261)	Log Enrollment Sq.	-0.0155* (0.00877)
Year3	0 (0)		0.114 (1.452)	Year2	0.0670*** (0.0168)
Year4	0.00489 (0.0139)	0.00694 (0.0137)	-0.504 (0.668)	Year3	-0.00326 (0.0151)
Year5	0.00163 (0.0154)	0.00841 (0.0153)	-3.208 (5.187)	Year4	0.00297 (0.0144)
Year6	0.00115 (0.0153)	0.00875 (0.0152)	1.615 (2.649)	Year5	0 (0)
Year7	-0.127*** (0.0159)	-0.117*** (0.0159)	0.212 (0.760)	Year6	-0.00264 (0.0150)
Year8	-0.00501 (0.0168)	0.00608 (0.0169)		Year7	-0.130*** (0.0149)
Log CWI	0.724*** (0.104)	0.646*** (0.104)	1.455 (1.924)	Year8	-0.00726 (0.0154)
Log CWI Non P	0.178 (0.115)	0.196* (0.111)	-0.320 (1.760)	Log CWI	0.726*** (0.104)
Mobility index	-0.338*** (0.0596)	-0.380*** (0.0626)	0.125 (0.997)	Log CWI Non P	0.171 (0.115)
Economic Disadv. index	0.258*** (0.0340)	0.250*** (0.0346)	-1.776 (4.212)	Mobility index	-0.339*** (0.0596)
Limited English Proficiency index	1.535*** (0.346)	1.570*** (0.338)	-8.725 (12.62)	Economic Disadv. index	0.260*** (0.0340)
Disabilities index	1.052*** (0.104)	1.080*** (0.105)	-0.0185 (4.177)	Limited English Proficiency index	1.543*** (0.346)
Economic Disadv X Limited English	-2.021*** (0.681)	-2.044*** (0.683)	16.85 (23.54)	Disabilities index	1.048*** (0.104)
Proportion of Students in Grade 10	-0.227* (0.119)	-0.147 (0.122)	0.229 (3.465)	Economic Disadv X Limited English	-2.045*** (0.681)
Proportion of Students in Grade 11	0.359***	0.379***	5.141	Proportion of Students in Grade 10	-0.231*

VARIABLES	OLS	SFA	IVReg	VARIABLES	OLS – Implementation Index
	(0.137)	(0.137)	(8.406)		(0.119)
Proportion of Students in Grade 12	0.0789 (0.116)	-0.0486 (0.123)	-4.456 (8.695)	Proportion of Students in Grade 11	0.357*** (0.137)
District size less than 2000 students	-0.160*** (0.0156)	-0.123*** (0.0214)	0.0658 (0.568)	Proportion of Students in Grade 12	0.0840 (0.116)
District Size Between 2001 and 5000 Students	-0.133*** (0.0118)	-0.114*** (0.0146)	0.0118 (0.382)	District Size Less than 2000 Students	-0.161*** (0.0156)
Constant	8.904*** (0.377)	8.596*** (0.396)		District Size Between 2001 and 5000 Students	-0.134*** (0.0118)
Observations	2707	2707	8.438 (5.904)	Constant	8.905*** (0.377)
R-squared	0.349	0.104***	2707	Observations	2707
				R-squared	0.349

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

Table A-3a: Cost Function, Technical Inefficiency Second Stage Estimates

VARIABLES	Without Cleveland Heights
KnowledgeWorks	-0.00808 (0.0122)
KnowledgeWorks After	-0.00219 (0.0160)
Log of the District Size	0.0131*** (0.00100)
Constant	1.025*** (0.00847)
Observations	2707
R-squared	0.059