Oregon Public School Transportation Funding: An Evaluation of Alternative Methods

Prepared for

The Oregon Department of Education

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Executive Summary

Purpose of the Study

Oregon law requires school districts to provide transportation to and from school for elementary school students who live more than one mile from school and, for secondary student, more than 1.5 miles from school. Through the State School Fund, the state reimburses school districts for a share—typically 70 percent—of their actual transportation expenditures from home to school and school to home trips. Reimbursement applies to trips for all students, including special education populations.

Through a budget note, the 2007 Legislature called on the Oregon Department of Education (ODE) to conduct a study on alternative methods of funding school transportation. The budget note, in its entirety, reads:

> *"The Oregon Department of Education will conduct a study on alternative methods to funding transportation costs for students. The study should focus on reducing costs and increasing efficiency. The Department will report to the interim Joint Committee on Ways and Means or the Emergency Board on the options available along with recommendations on suggested changes before the 2009 Legislative session."*

This study represents ODE's response to the Legislature. The budget note is silent about the level of service or standards that Oregon's school transportation system would deliver in a more efficient or reduced cost environment. For example, Oregon could sharply reduce costs by eliminating the legal mandate to transport most students to and from school. Alternatively, by adopting the best practices of the most cost efficient student transportation systems, Oregon school districts might deliver a substantially similar level of service at a lower cost—thereby improving efficiency. In short, the ODE cannot evaluate options for either reduced costs or efficiencies without an explicit statement of what the school transportation system is attempting to accomplish.

To proceed, this study makes a critical upfront assumption that the legal mandate to transport certain student to and from school remains in place. With that assumption made, the heart of this study could be more accurately described as focusing on reducing costs and increasing efficiency associated with districts' execution of the student transportation mandate. Or put differently, the study asks two questions:

> *Could districts deliver transportation services similar to levels delivered during the 2007-08 school year but at a reduced cost?*
>
> And
>
> *Is it likely that a change in the finance system could facilitate that cost reduction?*

Key Findings

The study opens with a discussion of goals related to the student transportation system and its associated reimbursement formula. Next, the study turns to a broad review of finance methods, and corresponding levels of service, used in Oregon and select number of other states. The report concludes with an in-depth investigation of district-by-district transportation expenditures and an evaluation of alternative methods to finance the system. Below we outline a number of the key findings:

- **Approved cost formulas provide weak incentives for efficiency**. Under an approved cost method, school district managers to do not pay the full cost of an expansion to the transportation program or realize the full savings of a contraction. For example, districts that identify ways to deliver the same level of service, at a lower cost, are rewarded with only $0.30 for every dollar of savings they find. The state recoups the rest.

- **Data currently collected by ODE—and supplemented by other sources—allow a robust investigation of efficiency across districts. Some additional data collection could strengthen the analysis.** ODE has collected the key data elements required for cross-district efficiency comparisons since the 1999-00 school year, including the numbers of school-to-home riders, enrollment of students with severe disabilities, reimbursable miles, buses, and reimbursable expenditures. Other important cost-determinants, including the cost of diesel fuel, average regional wages of school bus drivers, and the population density, were drawn from the US Census, Oregon Employment Department and other sources. The Department could refine its cross-district cost comparisons by collecting separate information on reimbursable trips and expenditures related to special education.

  The available data support a multi-year, econometric model that explains the large majority of variations in expenditures across districts. Moreover, the model confirms hypothesized and intuitive relationships between the cost-determinants and reimbursed expenditures. Not surprisingly, the number of riders is the dominant cost factor. The cost of diesel fuel and the district's enrollment of students in restrictive settings also put upward pressure on spending. The analysis controls for square miles in the district and the average commute distance.

  Very small districts—those with fewer than 250 riders—were excluded from the statistical analysis because of the extreme variations in operating environments. While those districts account for approximately one-third of all Oregon school districts, they serve only three percent of bus riders and represent four percent of transportation costs.

- **Expenditures could be reduced by an estimated 9 percent if inefficient districts adopted the practices of the most cost-efficient districts**. The statistical model developed for this report indicates that, if all districts adopted the management practices of the most cost-efficient districts, transportation expenditures would have been about $19.6 million lower in the 2006-07 school year (a 9 percent reduction in total transportation costs). Additional savings might accrue if districts closely examined the impact on transportation costs of the existing number and location of schools.

- **Districts have become more efficient in delivering student transportation since 1999-00.** Student transportation costs have risen at a slower rate than the costs of transportation inputs and the population of student riders. Over the 8-year study period, student transportation has increased on an average annual basis by 2.2 percent per year. Nevertheless, not all districts experienced increases in cost efficiency between the 1999-00 and 2006-07 school years.

- **Inefficient districts spend more per bus in operation than efficient districts**. Controlling for key factors outside the control of districts (e.g., geographic size and average commute distance), we conclude the main source of cost inefficiency is the average cost of operation for each bus in a district's fleet. Variations in the cost of operating a bus could take multiple forms. Inefficient districts may employ more centralized managers than their efficient counterparts, pay more overtime to staff, or rely on more part-time staff that draw full pension and health benefits. Additionally, inefficient districts may allocate more indirect administration charges to the transportation function.

  The analysis found no systematic correlation between bus occupancy rates—that is, the number of riders per bus—and measures of efficiency. That is to say, district decisions about routing, and the number of buses used, does not appear to be the distinguishing factor that separates efficient and inefficient districts. The broad dissemination of sophisticated software, which helps transportation managers optimize their routing, may explain this finding.

  Finally, in-house and contracted transportation operations were comparably efficient when evaluated over the 1999-00 to 2006-07 period.

- **Operational efficiency—and inefficiency—is found in small and large districts alike.** An in-depth analysis of expenditures and associated cost drivers for the 1999-00 through 2006-07 school years found that in every year examined, gaps in efficiency exist between the top and bottom performing districts. Efficiency gaps exist for all sizes of districts analyzed.

- **Simple cost efficiency measures, such as cost per rider and cost per mile, fail to account for the environmental factors in which each district operates**. These measures provide at best an incomplete picture of a district's cost efficiency. Comparatively, the *relative* cost efficiency estimates derived from the statistical model provide a complete measure of cost efficiency of each district—relative to the most efficient districts—while accounting for the environmental factors in which each district operates.

- **Alternative finance methods—that place the full fiscal consequences of transportation decisions at the district level—should accelerate the move to cost-efficiency**. Any of a number of funding methods—from block grants to efficiency-based formulas—would strengthen the incentives for efficiency relative to Oregon's current finance method.

Framework for a Policy Decision

Based on the information gathered in this study, a framework emerged to assist in the selection of a student transportation funding formula model. The framework consists of three steps:

1. Confirm or modify the goals sought through a funding formula.

2. Identify the finance method that helps the state and school districts meet the agreed-upon goals.

3. Communicate clearly the impact a change in the finance method would have on local school district budgets and ensure districts can maintain effective and safe operations during the implementation of the new method.

The first step, selecting goals, is critical and requires a series of questions. These include:

- Do the characteristics outlined in ORS 329.025, fully reflect policymakers' goals for the delivery of transportation services to K-12 students?

- Should those goals be expanded and address cost efficiency, funding stability, and adequacy?

- Should the system have explicit goals for the transportation of special education students?

- Should the state align its student transportation goals with its expectations for public transportation?

- Should activity transportation expenses be considered when funding school transportation as an incentive for meeting public transportation goals?

- What kind of incentives—fiscal and otherwise—could be devised to encourage districts to meet the system goals?

Upon agreement of the goals, policymakers next should select the finance method, or combination of methods, to support the goals. As an illustration, policymakers may adopt efficiency as a goal and also conclude that student transportation should be better aligned with regional public transportation plans. With those joint goals in mind, policymakers could devise a model that encourages school bus ridership among high school students and reduces general traffic in the community.

As policymakers narrow their options, they should evaluate: the relative strengths and weakness of finance methods, the outcomes of similar methods, and the fiscal impact on school districts. If policymakers agree that a change in finance method is appropriate but are concerned about short-term budget impacts during a transition, they could devise hold-harmless provisions that would mitigate adverse budget impacts during a phase in period.

Finally, the selected option and implementation process needs to be clearly communicated to the districts. Communication should clarify the goals and the changes in operational procedures and the impact on each individual district.

Introduction

Background

Oregon law requires school districts to provide transportation to and from school for elementary school students who live more than one mile from school and, for secondary students, more than 1.5 miles from school. Through the State School Fund, the state reimburses school districts for a share of their actual transportation expenditures from home to school and school to home trips. For the 10 percent of districts with the highest transportation expenditures per student, the reimbursement rate is 90 percent. For the next 10 percent of districts, the reimbursement rate is 80 percent, and for the remaining districts, the reimbursement rate is 70 percent. This reimbursement formula applies to trips for all students, including special populations. For the 2005-06 school year, Oregon school districts received a total of $151 million in reimbursements from the State School Fund. Total expenditures, including the districts' shares, equaled $215 million.

As part of the Oregon Department of Education's (ODE) budget appropriation, the 2007 Oregon Legislature included a budget note requiring the ODE to conduct a study on alternative methods of funding school transportation. The budget note, in its entirety, reads:

> *"The Oregon Department of Education will conduct a study on alternative methods to funding transportation costs for students. The study should focus on reducing costs and increasing efficiency. The Department will report to the interim Joint Committee on Ways and Means or the Emergency Board on the options available along with recommendations on suggested changes before the 2009 Legislative session."*

The budget note is silent about the level of service or standards that Oregon's school transportation system would deliver in a more efficient or reduced cost environment. For example, Oregon could sharply reduce costs by eliminating the legal mandate to transport most students to and from school. Alternatively, through better management, Oregon school districts might deliver a substantially similar level of service at a lower cost—thereby improving efficiency. In short, the Department cannot evaluate options for either reduced costs or efficiencies without explicit statement of what the school transportation system is attempting to accomplish.

To proceed, this study makes a critical upfront assumption that the legal mandate to transport certain students to and from school remains in place. With that assumption made, the heart of this study could be more accurately described as focusing on reducing costs and increasing efficiency associated with districts' execution of the student transportation mandate. Or put differently, the study asks two questions:

1. Could districts deliver transportation services similar to levels delivered during the 2007-08 school year, but at a reduced cost?

And

2. Would a change in the method for funding student transportation increase the likelihood of such a cost reduction?

Funding Distribution and Efficiency

Looking across the United States, states employ a number of methods to fund student transportation expenditures, including block grants, cost-prediction formulas, and approved cost matching programs. Each method has strengths and weaknesses.

Some observers have characterized the approved cost method—like the one used by Oregon—as inefficient because it creates relatively modest incentives to control costs at the district level. For example, Washington's Joint Legislative Audit and Review Committee (JLARC) noted that "in states that reimburse on a percentage basis…efficiencies may not be realized because districts are reimbursed at the same rate regardless of their operating practices."[1]

Under an approved cost method, local district managers do not pay the full cost of an expansion to the transportation program or realize the full savings of a contraction. The sizable difference between the actual and realized price can affect local decision makers.

Consider the example of a school district facing a budget shortfall that is forced to cut a fixed dollar amount to balance its budget. Under Oregon's school finance system, the district captures the full savings associated with reductions to instruction or other non-transportation services. However, if the district redesigns its transportation program to provide a similar service at a lower cost, the district realizes only $0.10 to $0.30 in savings for every dollar of transportation savings it creates. The state captures the balance of the savings. Consequently, a district may be more apt to investigate instructional cuts than a redesigned transportation program.

[1] See State of Washington Joint Legislative Audit and Review Committee. November 29, 2006. *K-12 Pupil Transportation Funding Study Report 06-10.page 47.*

The lower realized cost of transportation also could affect decisions about the location of new district facilities. Throughout the general land use planning literature, many experts have made a connection between inexpensive transportation and proliferation of suburbs, longer commutes, and low-density development (O'Sullivan 2006). Within the context of Oregon schools, school boards and facility planners may be willing to site schools farther from student populations because transportation comes at discount while land does not. A recent Oregon Transportation and Growth Management report highlighted the role of the transportation funding method on school siting processes[2]:

> *"…if schools are relatively small and built in close proximity to higher density housing, children will live nearby and will be more likely to walk or bike to school. However, since the state of Oregon pays a large percentage of busing costs, there is little financial incentive for school districts to encourage biking and walking, as opposed to busing."*

Finally, Oregon's method creates incentives for aggressive cost allocation to transportation. The open-ended matching program makes transportation the only area within K-12 in which a district can generate additional revenue by identifying additional expenditures. Consequently, business and transportation managers thoroughly investigate expenditures for all legally allowable transportation expenses. Districts with larger and more sophisticated central office capabilities have an advantage in tracking and defending their cost allocation methods. In short, what's legitimately considered a transportation cost in one district may not make the list in another.

The mere existence of incentives does not imply that all or most local managers act on them. Some proponents of the current finance method would argue that school budgets are so tight, and the push to improve student achievement so strong, that even a $0.30 return on every dollar of identified transportation savings is sufficient to ensure that managers devise and operate efficient systems.

Through an investigation of expenditure data and interviews with state and local decision makers, this study will help policymakers assess the degree to which the incentives, built into Oregon's finance system, matter.

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[2] See Oregon Transportation and Growth Management Program. June 2005. *Planning for Schools and Livable Communities: The Oregon School Siting Handbook.*

Scope and Organization of the Report

This study's purpose is to investigate current and alternative methods of financing school transportation and describe how those methods could support or detract from efficiently meeting the goals of Oregon's school transportation system. While considering such a change, policymakers at all levels should have a clear description of the goals of those operations. Local goals are likely to vary. At a minimum, all districts seek to stay in compliance with the state's legal mandate. But, district views about the quality of service—even within the context of a seemingly uniform mandate—differ. Forty-five minute bus rides may be acceptable in one district but not in another. Beyond that, districts will have differing views about transportation's role in improving attendance, facilitating scheduling flexibility, or implementing educational options. This study seeks to clarify goals and illustrate the possible tradeoffs that could arise by changing the finance method and delivering the home-to-school-to-home mandate at a lower cost.

While the budget note demands that efficiency be a central focus of the study, policymakers must also consider how other public finance principles could be affected in the drive to efficiency. Stability and predictability of funding, equity, and ease of administration are other criteria policymakers may want to consider along side efficiency as they weigh the pros and cons of the existing funding method and its alternatives.

With these issues in mind, the study opens with a discussion of goals and specifically what the Legislature should be trying to accomplish with its distribution formula and its student transportation system. Next, the study turns to a broad review of finance methods, and corresponding levels of service, used in Oregon and a select number of other states. The report concludes with an in-depth investigation of district-by-district transportation expenditures and an identification and evaluation of alternative methods to finance the system.

The balance of the study consists of the following chapters:

Chapter 2: Goals for School Transportation Finance. A funding method should rest on a foundation of objectives that it's attempting to accomplish. In Oregon, the school transportation formula should be judged on how well it supports broad public finance goals (e.g., efficiency, equity, stability) and also by how well it supports the goals of transportation system itself (e.g., access to educational opportunities, expanded educational options, reduced traffic congestion). This chapter looks across the country, documents the goals that exist in other education departments, and suggests goal-based frameworks that policymakers could use to compare alternative finance methods.

Chapter 3: Alternative Methods of School Transportation Finance. States use a variety of methods to reimburse local school districts for transportation spending. This chapter takes an in-depth look at Oregon's method and compares it to those of eight other states. For each state, the study describes the legal context of the school transportation, the details of the state's funding formula, and comments from state and local officials about how well the funding method supports goals of the system.

Chapter 4: Statistical Analysis of Oregon School Transportation Spending. Through an investigation of spending and ridership over time, this chapter identifies key drivers of school transportation costs and provides an assessment of the relative efficiency of school district operations. The efficiency analysis takes into consideration only those cost factors that are currently measured by school districts. The chapter calls out other unmeasured factors that may also play an important role in determining expenditure levels.

Chapter 5: Alternative Finance Methods. The chapter describes a number of specific alternative finance methods and evaluates them relative to the existing "approved cost" approach. The current and alternative methods are evaluated on public finance principles outlined in Chapter 2. The chapter also details the impacts on individual districts.

Chapter 6: Conclusions and Recommendations. The study closes with recommendations on how the Legislature should proceed as it considers a possible change to the finance method. The study does not go as far as recommending an alternative method but rather lays out a decision-making framework.

Goals for School Transportation Finance

Introduction

Evaluating the existing transportation finance method, or any alternative to it, requires an understanding of the goals that the finance method is attempting to achieve. Absent goals, the system simply evolves from patching previous problems or creating a composite of what others have discovered in the past.

To provide the completed package, all goals must be articulated. Oregon does not have goals clearly articulated for its school transportation system or the formula that funds it. Oregon is not alone in this void. Goals tailored specifically to school transportation funding formulas are exceedingly rare. However, Oregon does have targeted characteristics for the public school systems documented in ORS 329.025. Of the sixteen characteristics identified, nine can be related to transportation services and used to articulate transportation formula goals. In addition, the introduction of ORS 329.025 states the goal of accountability. The characteristics that are related to transportation can be summarized, by reference number, as follows:

(1) Equal access regardless of geographic location

(2) Recognize different individual instructional levels

(3) Provide special programs to all students who need those services

(9) Provide students skills that lead to a healthy lifestyle

(12) Involve community in total education of students

(13) Transport children safely to and from school

(14) Ensure funds allocated reflect differences in costs facing each district

(15) Ensure that local schools have adequate control of how funds are spent

(16) Provide for a safe, educational environment

These targets can be summarized as:

a. Equity for all students

b. Flexibility and local control

c. Safety

d. Community involvement

e. Promote health

f. Adjust for uncontrollable differences

This chapter provides an overview of public finance and transportation goals advanced in the academic literature and used in other public agencies. The public finance goals identified below should be considered when evaluating the funding options developed in Chapter Five. Transportation goals, which are more specific than the public financing goals, are also discussed below and should be considered when considering the funding options presented in Chapter Five.

When evaluating finance options, the Legislature will need to consider two broad categories of goals:

- **Public finance goals**. Does the funding method of financing distribute funds fairly, promote good fiscal stewardship, and minimize administrative overhead?

- **Transportation goals.** Does the funding method help districts meet the Legislature's, and individual district's goals for the transportation system?

Public Finance Goals

A review of the public finance literature, textbooks, and documents advanced by boards of education uncovered the following commonly advanced goals of public revenue collection and distribution systems.

- **Efficiency**. The method of revenue distribution should promote an efficient use of scarce public resources. That is, for a given level of service, delivery in a cost effective manner is preferred. The key to measuring efficiency is in knowing the desired level of service.

- **Equity**. A revenue system should distribute funds fairly across recipient agencies. Similarly situated agencies should be treated alike. Agencies should not be penalized for factors that fall outside of their abilities to control. Further, taxpayers providing the resources to generate the funds should be assessed in a fair and equitable manner.

- **Ease of administration, simplicity, and transparency**. All other things being equal, a revenue distribution that is relatively inexpensive to manage and administer is preferred to one that isn't. Moreover, simple and transparent distribution systems are preferred and more trusted than complex alternatives.

- **Stability and predictability**. A funding distribution that produces a stable stream of revenue with predictable cycles is generally preferred to a system with sharp increases and declines.

- **Adequacy**. A funding system should provide a level of revenue that is appropriate given the level of service that is desired by the funding agency.

Goals Specific to the Transportation System

Our review of state departments of education websites uncovered only one state with clearly articulated goals for its school transportation system: Massachusetts. The state outlines four goals, two being better characterized as education goals. These include:

- **Access to education opportunities**. This addresses the issue of equal opportunity for education, regardless of where one lives.

- **Enrich school programs**. In addition to acknowledging that transportation allows varied educational experiences not always available in a conventional school facility, this goal also addresses the flexibility for communities to provide additional educational opportunities.

- **Safe and healthful transportation**. Most state and federal guidelines focus on this element: assuring the vehicle, driver and procedures to transport school children are as safe as possible.

- **Efficient service**. As in the general public finance goals, this focus seeks to provide the desired level of service in a cost effective manner. Again, the key is in knowing the desired level of service.

Given the shortage of goal setting specific to school transportation, we widened our search to include goals developed by public transit agencies. In many places across the country, the lines between school transportation and general transit systems are blurred. For example, Maine already has the school transportation function incorporated into the Public Transit Program efficiency reviews. In North Carolina, school buses are charged with expanding service to school employees and senior citizens. And, in Oregon Transportation and Growth Management Program's (TMG) report on Siting Schools, they recommended integrating school transportation into Transportation System Plans for local jurisdictions.

Conclusions

The existing targets set by ORS 329.025 and the goals used elsewhere, whether originating in public finance or transportation systems, provide an evaluative measurement when reviewing the different models used for funding formulas. Chapter 3 addresses these basic models and reviews what is used in other states. By summarizing these models and the impact they have in achieving desired goals, the Legislature will have some decision points to determine which goals are desired and which model best meets those goals.

Chapter 3 Alternative Methods of School Transportation Finance

Introduction

Public school transportation takes many different forms across the United States. At a minimum, federal law requires that local school districts make provisions for transportation as part of special education plans and Section 504 accommodations. Special Education students with an Individual Education Plan (IEP) or Individual Family Service Plan (IFSP) identifying transportation as a "related service," must be provided transportation as a part of a Free Appropriate Public Education (FAPE) regardless of costs or current resources. Additionally, students qualifying under Section 504, a disabilities act, must be provided reasonable accommodations, including transportation, if the disability prevents access to education services. Recently passed federal legislation significantly increases the scope of conditions requiring service under Section 504. Beyond that, no federal mandate exists to provide regular home-to-school transportation.

At the state level, the responsibility for funding student transportation varies. A small number of states has made student transportation a local responsibility and provides no state support earmarked to transportation.[3] Other states, like Oregon, require districts to transport students, establish minimum program requirements, and share in the cost of the program. Every district faces unique challenges in providing transportation, including the density of the student population, the number and types of schools, and unique geographic and weather conditions. All of these factors impact costs.

The National Center for Education Statistics (NCES) reports that state and local school districts spent $18.9 billion on student transportation in the 2005-06 school year, which represents 4.2 percent of the day-to-day operational costs of the nation's public K-12 schools (see Appendix 1). *School Bus Fleet* magazine assembles state-by-state estimates on the number of public students transported—almost 25 million in 2005-06—but the data are sometimes out-of-date. The rough ridership estimates permit broad comparisons. For example, California has a narrowly targeted program—school bus riders equal only 14 percent of the state's fall enrollment. At the other extreme, a number of states, including Arkansas, Connecticut, and Massachusetts, report ridership that exceeds two-thirds of fall enrollment.

[3] Locally funded states include Indiana, Rhode Island, New Hampshire, Vermont, Massachusetts, and Nevada. Each state provides a basic aid for K-12 education, which may be used for a variety of services including transportation.

Transportation finance methods

Approved Cost

The *Approved Cost* model is based on the identification of specific local expenses for which the state will provide a given level of support, ranging from 30-90 percent, depending on the state. The approved costs method does not prescribe a service delivery model and allows districts significant latitude in developing models to best meet local needs.

Conversely, all transportation costs are not usually considered approved expenditures as the local district will often opt to provide services beyond those allowed or required by the state. Transportation inside prescribed limits, field trips, athletic trips and even costs for facilities may not be supported by the state.

Block Grant

The *Block Grant* funding model can use many different methods for determining levels of support. The grant can be determined on an efficiency basis such as in North Carolina, or an approved cost method as is done in Idaho. Other methods could also be used to determine the level of funding, such as based on the number of students in the district, the number of students eligible for transportation, or the number of actual riders. Regardless of how the level of support is determined, many states do not restrict what local districts do with the dollars returned by the state. This includes both states that reimburse for actual incurred costs and those that imburse for projected costs.

Oregon used a type of block grant during the late 1980's when addressing the deficiencies created by the Safety Net. Districts were given the same level of transportation support received the previous year, adjusted for growth and inflation, without consideration of services provided.

It is critical to note at least two factors when evaluating block grant processes, which are beyond the local districts' control and may have significant impact on the costs of operation. The first is the requirement to provide federally mandated transportation services for programs such as Special Needs, McKinney-Vento, and No Child Left Behind. Additionally, certain states have statutory requirements to provide student transportation, such as Florida, Idaho and Oregon. Failure to address any of these issues could leave the local district open to questions of compliance.

Per Unit Allocation

The *Per Unit Cost* model allows the state to distribute support based on defined factors applied to units in operation. Arizona identifies an amount per mile per bus that is modified by number of students per mile. High student numbers per mile and low student numbers per mile both receive a higher rate of support than the mid-range use. Issues resulting from Arizona's 2006 Legislative freeze on transportation budget increases as articulated in Transportation Revenue Control Limits (TCRL) and the Transportation Support Limits (TSL), have severely impaired the formula's ability to function as designed in many districts.

Washington's current formula includes greater data collection requirements than Arizona, and a complicated capital reimbursement process that allows the recalculation of depreciation each year. Washington is currently undergoing a formula review based on legislative direction. A 2006 JLARC Report indicates only South Carolina has a funding requirement similar to Washington.

Efficiency Based Formula

The *Predictive/Efficiency* model offers the opportunity to use a statistical analysis of existing costs to determine the distribution of state support for pupil transportation. The analysis (usually a form of regression analysis) is used to establish comparative norms for determining the perceived efficiency performance of the local district.

Each state may elect to include differing factors in the formula analysis, *e.g.*, bus purchases or depreciation. They may also elect to define a specific weighting (reward/discount) system for various operational requirements and environments. The data collection requirements for this model are significant and are critical for its effective application.

The distribution of transportation funds can then be adjusted to encourage or discourage differing service delivery models or operating procedures based on specific criteria and site characteristics. For example, a district may be "rewarded" for maintaining a high bus occupancy rate or may receive "discounted" support for buses operating below capacity. Additionally, districts having high cost of living factors may receive added weighting and support, as may districts with large geographic areas and low student populations.

Review of Finance Methods in Oregon and Other States

The four primary methods for funding pupil transportation identified above are found in states throughout the country. We selected several states in order to conduct an in-depth review of the funding methods. The state-level reviews are based on the following criteria:

- Representative funding models (Approved Cost, Predictive/ Efficiency, Per Unit and Block Grant)

- National footprint (West Coast, Central, East Coast)
- State with the greatest experience in efficiency-based formula utilization (North Carolina)
- States with recent/ongoing/planned formula reviews (Washington, Ohio, Florida)
- Geographic proximity (Idaho, Washington)

The four funding methods represent significantly different approaches to providing state support for pupil transportation. The review of each method includes a discussion of the data collection and analysis associated with each funding approach.

Several states have made significant changes in their funding formulas over the years. Changes in funding methods have been in response to changes in statute, available resources, or perceived need. No attempt has been made to assess the relative effectiveness of the identified methods given the general absence of evaluative standards.

Oregon (Approved Cost)

Legal Context and Standards of Service

Student transportation for certain students is clearly required in Oregon statute. **(ORS 327.043)**

1. Elementary students who reside more than one mile from school
2. Secondary students who reside more than 1.5 miles from school
3. Students identified in a State Board approved supplemental plan (including special education requirements)

An exclusion from the requirement is identified in **327.043(2)** which states:

"…the State Board of Education may waive the requirement to provide transportation for secondary school students who reside more than 1.5 miles from school. A district must present to the board a plan providing or identifying suitable and sufficient alternate modes of transporting secondary school students."

ORS 332.405 specifies the "school district board shall provide transportation where required by law or considered advisable by the board," however, the law goes on to include provisions for "in lieu of transportation," support, and even the use of "funds to improve or provide pedestrian facilities." **332.415** also includes provisions for services to private and parochial school students whose school lies along or near the existing route.

ORS 327.008 identifies state support for the “Transportation Grant” (as computed per 327.013) as one of the components of the “State School Fund.”

ORS 327.013(9)(a)&(b) define the transportation grant as 70 percent to 90 percent of the “approved costs” reported by the districts. No adjustment of this support is indicated in the law, regardless of the dollars made available to the state school fund.

ORS 327.033 addresses “approved costs” and includes provisions for supporting purchases of buses and transportation equipment from dollars links to bus depreciation. These funds are limited in their use and must be accounted for separately.

Finance Method

The current funding formula was the response to changes required by the passage of mandatory student transportation in 1991. Prior to that time, student transportation provided by local districts, other than for special education, was considered optional. Funding at that time was based on the reimbursement of approved costs at a rate that varied between 52 and 58 percent. Dollars were distributed to the local districts in the year following the expenditure, (see ORS 332.008(4)) and were included in the basic school support checks.

Until the repeal of ORS 339.030(5) in 1985, transportation was viewed as extremely important, particularly for the more rural districts.[4] However, by the late 1980’s a number of local school districts had opted out of student transportation service.

Given the existing circumstances in many districts at the time, the implementation of a mandatory student transportation act required the Legislature to fund the “anticipated” transportation costs rather than simply reimburse expenditures. This was the genesis of the “imbursement” system now in place. The current process requires the local district to provide the Oregon Department of Education an estimate of its “next year’s” approved transportation costs by December.

OAR 581-023-0040 provides a relatively extensive list of “approved” costs as well as a list of items to be “excluded” from approved costs. Additionally, the OAR provides a calculation for deducting “non-reimbursable” transportation miles and cost offsetting revenues.

[4] ORS 339.030(5) is the exemption from compulsory attendance for elementary students residing more than 1.5 miles from school and secondary students residing more than three miles from school unless transportation was provided.

Fund Distribution

A district uses the OAR as a template to forecast what it believes transportation will cost the following year and the Department of Education determines whether those costs will be supported at a 70 percent, 80 percent, or 90 percent level as prescribed in ORS 327.013. Once the calculations are complete, the district receives those funds in the eleven State School Fund support checks. Adjustments, if needed, are made in the May check.

Comments from State and Local Officials

The research team interviewed superintendents, business managers, and transportation managers in six districts and inquired about the districts' goals for transportation, cost drivers, and the state's finance system (see Appendix 4). The six districts selected—Bethel, Crook County, David Douglas, Klamath Falls, Lebanon and West Linn—varied in total enrollment, share of enrollees who use school transportation, and the use of in-house and contracted transportation services. Moreover, geographic, weather, and population density differed from district-to-district.

Looking across the six districts, a number of common themes emerge.

- **Student safety is the top concern of transportation officials and their supervisors**. While none of the districts interviewed had adopted formal standards for its transportation program, rider safety was mentioned first by every person interviewed.

- **Student ride times are a key concern.** Districts try to limit maximum ride times to no more than 45 minutes in urban areas and no more than an hour in non-urban areas.

- **Parental complaints—or the lack thereof—are a key performance measure.** Officials said parents were quick to notice and comment on changes in transportation services. As one superintendent put it, "the minute you change the service, you hear from the parents. On transportation matters, they show up at the school board meetings."

- **Fuel, special education, and unique geographical challenges drive transportation costs.** With diesel prices at near record highs during the time of the interviews, the cost of fuel was at the top of the list of cost drivers. Following concerns about fuel costs were mandates to transport special education students and unique geographical challenges. On the latter point, rural districts mentioned the challenge of serving widely dispersed populations while urban districts noted dangerous walking conditions that required supplemental routes. Weather and *No Child Left Behind* mandates were not considered major cost drivers.

- **Some districts struggle to hire and retain school bus drivers.** Driver availability was a top concern in three of districts interviewed.

- **Districts deployed a variety of strategies to improve efficiency**. All of the districts interviewed had deployed one or more strategies to keep costs down, particularly during the fiscal downturn of the early 2000s. Those strategies included purchasing software to optimize routes, altering schedules and bell times, increasing bus occupancy rates, closely monitoring special education plans, and managing field trips.

- **Moving away from the approved cost method would not change behavior—in the view of local officials.** Interviewees argued that netting $0.30 on a dollar of identified savings was sufficient to incent efficiency. Districts argue they are already trying to be as efficient as possible and a change to block grant, or other approach would not yield a significant change in the cost of the service.

- **Districts said any change in the finance method should consider unique district characteristics**. Interviewees said any move away from the approved cost method would require an in-depth consideration of local cost factors, especially student density and the ability to hire and retain school bus drivers.

- **Stability and efficiency should be the top goals of the transportation finance method**. When asked to rank evaluative criteria for a transportation finance system, interviewees listed funding stability as the top goal followed by efficiency. An allowance for capital expenses was a mid-level interest. Achieving equity across districts and clearly defining allowable expenses were lesser concerns.

- **Finance systems should respond to fast changing conditions**. District officials argued the current cost reimbursement method was too slow in responding to unanticipated cost factors that fall outside the district's control, including fuel cost increases and rapidly declining ridership.

Arizona (Per Unit Cost)

Legal Context and Standards of Service

Arizona Revised Statutes 15-921 provides the basis for transportation funding with the formula specifics included in ARS 15-945 and 946.

The law allows local school districts to provide general education transportation, but mandates the operational process, documentation and reporting procedures if state support is to be provided. State support is based on "eligible" students and approved daily route miles and is provided on a "reimbursement" basis.

The state defines eligible students in two categories, “common school” and “high school.” Common school students are kindergarten through eighth grade and are considered eligible if they live more than one mile from the school they attend. High school students are eligible if they live more that one and one half miles from school.

The difference in school designation is also important as the state provides different levels of support for activities and extended year service as noted in the formula below. Arizona also requires districts offer open enrollment to students outside their district, ARS 816-01, but limits transportation support to a maximum of forty miles per day per student. Services to Charter schools are also included as allowable.

Arizona is one of the states adopting the national guidelines prescribed by the National Congress on School Transportation. These guidelines include both equipment standards and operation procedures, ARS 28-900.

Finance Method

The current formula uses two primary calculations to determine the level of state support for local district transportation; the Transportation Support Limit (ARS 15-945) and the Transportation Revenue Control Limit (TRCL) (ARS 15-946). The TSL is the operating expenses level the state believes should be obtainable and the TRCL is a “grandfathered” amount prior to 1984 increased annually by the expense in the TSL from the current budget year. The TSL increases only if a district incurs more transportation miles, changes the number of students per mile, or state support increases mileage level support. The final allocation is adjusted by growth prescribed by law and is subject to appropriation levels.

The TRCL cannot be decreased, regardless of changes in mileage and/or ridership, however, the 2006 Legislature added a provision in ARS 15-946 (B) prohibiting growth in the TRCL if the new level would exceed 120 percent of the TSL.

The Arizona Department of Education collects the data prescribed in ARS 15-922 electronically and the Auditor General’s Office audits a given number of districts each year.

Fund Distribution

Payments based on the transportation formula are included in the general fund support checks issued by the Department of Education and are not restricted. The 2008 legislature considered SB 1047 that at one point would have restricted these grant dollars to “transportation related services,” but the bill did not pass in the House.

The Basic Calculation of Arizona's TSL:

TSL =
Miles (to and from school) X the state support level per mile plus allowances for athletics, field trips, extended school year programs, etc. (Maximum allowable days per year =180)

Approved Daily Routes

Miles/Student	Support Level per Mile
0.5 miles or less	$ 2.23
More than 0.5 less than 1.0	$1.81
More than 1.0	$ 2.23
Added Allowance Factors (see below)	

Approved Daily Route

(Miles/Eligible Type Student Transported)	District Type 03	District Type 04	District Type 05
0.5 miles or less	$0.15	$0.10	$0.25
More than 0.5 less than 1.0	$0.15	$0.10	$0.25
More than 1.0	$0.18	$0.12	$0.30

"For the purposes of this paragraph, "district type 02" means a unified school district or an accommodation school that offers instruction in grades nine through twelve, "district type 03" means a common school district not within a high school district, "district type 04" means a common school district within a high school district or an accommodation school that does not offer instruction in grades nine through twelve and "district type 05" means a high school district."

Comments from State and Local Officials

- Many districts perceive the TSL as an unrealistic operating level. An earlier Auditor General's report of one Phoenix area district indicated that even though they expended less than a number of comparable districts, they still had to supplement state transportation support with over two million local dollars. The formula is relatively easy to administer for fund distribution, and the Auditor General's Office simply reported findings.

- Local districts are somewhat encumbered by the required 100 Day Report, but electronic routing information collection tools may make this task easier in the future.

- The TSL only increases if a district has more miles or the state support level is increased, regardless of added costs or unfunded mandates.

- No recognition is given for higher costs related to special needs transportation, or the impact out-of-district placements may have on the student density component of the formula.

- TSL increases lag behind actual cost increases because the per mile cost is low.

- Districts do not receive credit for mileage increases until the year after the miles are traveled.

- Elementary districts located inside a high school district receive significantly less support for activities and extended school year transportation services.

- Districts with declining miles are left with the same level of funding even if expenses decrease.

Florida (Predictive/Efficiency)

Legal Context and Standards

Pupil transportation is required for eligible students (Florida Statute 1006.21) living more than two miles from the school they attend, elementary students in hazardous walking zones, and students with special needs.

Finance Method

Florida uses an annual legislative appropriation to fund pupil transportation. The level of funding may vary depending on numerous state factors, but it typically will equal about 50 percent of the reported expenses ($493 million, reduced to $483 million with last recalculation). In the event the legislature does not appropriate enough dollars to fund the expenses generated via the formula, the Department of Education will prorate the funds on a percentage basis. The distribution method is identified in Florida Statute Title XLVIII, Chapter 1011.68, and is the responsibility of the Deputy Commissioner for Finance and Operations for Pupil Transportation.

This statute does not appear to include a goal or standard; however, the 1995 study precipitating the current formula identified five criteria:

1. Ease of administration and “auditability”

2. Equitable distribution of state support

3. Efficient delivery of transportation services

4. Simplified data collection (state student database including transportation eligibility)

5. Support for “Blue Print 2000” (Education Goals)

This formula was the result of work done by the University of South Florida and has been in place since 1995. The State Board of Education has also promulgated rules related to pupil transportation in FAC 6A-3.

The allocation is recalculated four times each year, and changes are made based on both revenue and costs. A local school district is not assured of a specific dollar amount until the end of the year as the result of these recalculations.

Florida's School Transportation Formula

The formula is a "Base" plus "EX" for special education students:
T (Transportation Allocation) = **B** (Base) + (**EX**) Special needs
B= Local allocation prorated by adjusted membership count derived from the following:
Multiplying it by the indices:
Florida Price Level Index (natural log of most recent year's index)
Average bus occupancy
Rurality (Rural populations in each District (67) from census, Florida Statistical Abstract, data)
EX= "Base" transportation dollars prorated by adjusted Special needs count.
Adjusted total state base Special Needs membership weighted for added cost (FLDOE indicates current weighting is 1.8) times the prior year's average cost per student for transportation, times the three indices with a net result of +/- 10% for each.
If allocation exceeds both Base and EX due to added special education costs beyond the previous year's average costs, Special needs will be limited to the calculation identified above and balance distributed via the base.
(Note: students can be counted only ONE time each day, regardless of any other trips (activity/field/etc.)

Distributions from the appropriation are made to the districts monthly, with the highest level of state support being almost 80 percent of costs, the lowest being approximately 38 percent. The differences are the result of the application of weighting indices and special needs factors.

Idaho (Approved Costs)

Legal Context and Standards

Idaho Code 33-1000 and 33-1500 (statutes) provide the basis for transportation funding.

Idaho regulations allow for schools to provide transportation to eligible students. Eligibility is typically based on distance to school (1.5 miles or more, IEP/Section 504 requirements and hazardous walk areas). It is important to note students in Academy schools, Charter schools and Virtual Academy schools are treated the same for state support of transportation. Private and parochial schools are specifically excluded.

Code 33-1006 (statute) indicates the State Department of Education shall adopt rules and coordinate with statutes related to pupil transportation operations and funding. Additionally, the "State Department of Education shall develop a 'best practice' model and cost containment guidelines for school district pupil transportation operations …," IDAPA 08.02.02.150-219, 12.23.1. (See *Best Practices*, Appendix 3)

- Defines transportation eligible students
- Requires bus routes be submitted to SDE for approval and specifies options for non-transport areas
- Requires liability insurance at state minimum levels. No indication of tort limitation was noted, even for public entities.
- Provides structure for transportation contracts and requires use of state's model contract form
- Provides for withholding of state monies for non-compliance
- Establishes a Pupil Transportation Support Fund that accrues to SDE and is capped at 10 percent of state transportation support to schools
- Administrative fee (identified above) is reimbursable and not considered when establishing the 103 percent limit
- Idaho Code 33- 317: Allows districts to form cooperatives for transportation
- Idaho Code 33-1006(2) references "basic bus" costs, but SDE has elected in IDAPA 08.02 to use an "average state price" related to bus depreciation allowances. (Also see ID Code 33-601 and 33-402 for more information on bus leases and depreciation)

Finance Method

The current formula was developed in conjunction with the Idaho Office of Performance Evaluation (similar to Washington's JLARC). It is a reimbursement process and is based on the approved expenditures from the previous year.

The State pays up to 85 percent of the local district's reimbursable expenses based on home to school services. Expenses for driver wages, fuel, vehicle maintenance, tools and bus purchases are some of the approved costs. Payments for buildings, fences and other capital items are not reimbursable. The state uses a Reimbursement Claim Form (Web-based SISTR program). Bus depreciation is backed out of District operations, but not from contractor billings.

A funding cap is applied based on state averages for cost per mile and/or cost per student. The cap is currently set at 103 percent but was higher at its inception. Most Idaho districts are currently between 103 percent and 107 percent. The state collects its data via a web-based program.[5]

The waivers may be issued for reasons such as excessive deadhead mileage requirements or excessive dirt roads. A local District must apply for the waiver and provide all necessary documentation for consideration by the State Board. Four (4) districts currently have received waivers to the 103 percent limit and 22 are over the cap. The number of waivers issued by the Department of Education was reduced significantly when the legislature added requirements for approvals.

The Department of Education estimates they review approximately 50 percent of Idaho districts each year. Reviews include operations and accounting. The state provides a recommended Chart of Accounts, but its use is not required. The state notes few problems, usually improper coding.

Fund Distribution

The distribution of state support dollars for pupil transportation begins in August. Checks for approximately 90 percent of the identified state support are issued to the districts at the beginning of the school year. The balance is retained until the end of the year and used for corrections if needed. The final payments (10 percent +/- adjustments) are typically received in June or July.

Comments from State and Local Officials

- Discussions with the Office of Performance Evaluation indicate they are in the process of reviewing the Education Funding formula, but that Transportation and Facilities are not included. The perception is the changes that occurred in 2004 and the added legislative review from 2006 resulted in an adequately functioning formula.

- SDE believes the formula is both easy to administer and relatively equitable.

- SDE provides a Reimbursement Checklist and a Ride Count Form that assist in calculating fund distribution.

- Transportation is funded before any other education allocation, and is therefore funded at 100 percent of the formula-provided amounts.

[5] Expenditures above the 103 percent level are borne totally by the local school district, unless they have received a State Board of Education Waiver.

Indiana (Block Grant)

Legal Context and Standards of Service

Pupil transportation is an allowable activity for local municipal school corporations (school districts); however, the Indiana legislature eliminated all state funding support for transportation services except those for special needs students. Indiana Code (IC) 20-46-4-3 identified the last state distribution for general education transportation service in 2006. No expenditure for pupil transportation beyond special education is required.

Transportation for special needs students is supported by state dollars, likely as a response to mandated services by federal regulation and equitability requirements.

The state continues to regulate transportation when the local district chooses to provide it, and identifies the specific funds (statutory funds) they must use for accounting purposes. The state limits the amount of growth that can occur in transportation funding to either 5 percent over the previous year, or the average percent of annual growth in property value for the past three years, maximum 10 percent.

In addition to training and operational requirements for local school bus operations, the state also requires buses purchased for pupil transportation must remain in service for at least twelve years. Operational data for pupil transportation is not collected by the state. Waivers for damaged or inoperable buses are available upon request to the state. The state has never provided capital support for bus purchases.

Finance Method

The current transportation formula is included as a part of one of the five statutory school funds. No transfer of monies between funds is allowed without legislative approval even though they are supported largely by local taxes, as addressed in the “Guaranteed Tax-base Formula.”

Statutory School Funds:

- General Fund
- Debt-Service Fund
- Pre-school and special fund
- Transportation Fund
- Capital Fund (only fund with unlimited growth capacity)

The current formula for general education is relatively simple given the limitations placed on the local districts. The limitations are based on eligible pupils, with a cap based on a prescribed limit (5 percent) or a percentage of average property value growth over the past three years, maximum 10 percent (IC 21-3-3.1-4). Virtually no state dollars are included, with the exception of support for special education.

Special Education transportation receives state support based on previous year expenses for eligible students, with a stated limit of 80 percent. The overall state support for pupil transportation, including special education, is less than 1 percent.

Fund Distribution

The state issues monthly reimbursement checks to local districts based on the formula calculations and statutory limitations.

Comments from State and Local Officials

- The state indicates the formula provides improved formula adequacy and insures greater levels of equitability than the previous formula. The previous formula, 1996, was based on students (more than one mile from school) and miles.

- The formula cannot adequately respond to significant uncontrollable increases in costs, such as fuel cost escalations, in a timely manner.

- The formula may not adequately address the high costs of special needs transportation.

- Some level of efficiency is encouraged by limiting growth in transportation costs while still mandating levels of activities when the local district chooses to provide pupil transportation services.

- The formula is relatively easy for the state to administer based on its limited participation in funding activities. Finding the balance of desired service levels and the limitations of prescribed funds identified as revenue sources, in compliance with state regulation, is often a challenge for local districts.

North Carolina (Predictive/Efficiency)

Legal Context and Standards

Operational and funding requirements are listed in North Carolina General Statutes 115c-239 to 259. Transportation of regular education students is not required, but if provided, it must comply with all applicable regulation. North Carolina provides tort liability coverage for all local districts (self-insured). The state designates buses (Electronics Commerce Act 66-58) for replacement/growth, and the local district must replace or repair any damaged units.

The state has a parallel fleet of activity buses supported locally and not a part of the formula, as regulated under North Carolina State Board of Education policy EEO-H-004. If a school bus is used for a field trip, the local district must reimburse the state account for its use. Local districts can contract for non-conforming pupil transportation vehicles.[6]

Finance Method

North Carolina has the longest recent history of using a predictive, efficiency-based pupil transportation funding formula. Its basis lies in 1989 legislative action requiring the Department of Public Instruction to initiate a study that would yield recommendations for "achieving improved efficiency and economy in the pupil transportation system…. (including) incentives for cost-effective operations in local school administrative units…" (SB44, Sec.55)

Buses are purchased by the state and funded via a separate process.

Ernst & Young conducted the commissioned study seeking the following;

- Allot funds in a way that creates incentives for LEAs to provide the most efficient service
- Structure funding to maximize LEA's discretion in meeting transportation objectives, while holding them accountable for meeting both service quality and economy goals
- Provide information to help LEAs identify inefficiencies

The study attempted to identify a balance between Accountability and Local Control.

Local Control	Accountability
▪ Block Grant Allotments Eliminated Line Item Allotments Fuel Salaries Repair/replacement parts ▪ Flexibility to use funds as needed	▪ Block Grant based on budget rating Expenditures Students transported Buses operated ▪ Budget rating as an indication of efficiency

[6] Local district employees are allowed to ride the regular route buses (no special trips or routes) and the state further encourages the provision of services to senior citizen groups (GS 115c-243).

North Carolina		
Funding Base	**Budget Rating**	**State Support**
Determined by previous year's eligible expenditures: All State expenditures except equipment line All local expenditures corresponding to state object codes (ex. Equipment) (Local monies come through counties, not authorized to tax for this purpose) Exceptions: Salaries in excess of State maximum (State provides ranges for salaries) @3/4 of the time drivers with 20 hours/week or less do not receive benefits Salary bonuses Legislative appropriation assumes allotment growth consistent with growth in enrollment and legislated salary increases. A few counties are "capped" each year as a result of expenditures growing faster than enrollment; however, the capped expenses do not count against the budget rating and are not included in the next year's base calculation.	Inputs: Expenditures, students transported, buses operated Site characteristic adjustments for areas beyond local control Average distance from school: Street network (This calculation is made possible by having a statewide computer assisted routing system (TIMS/EDULOG) purchased and operated by the Dept. of Education and the University of NC Charlotte) Pupil Density, student clustering Circuity Seats per bus (Median family income is not currently used though identified in materials.) Percent of Special Needs students Calculate cost per student for each county Calculate # buses per 100 students for each county (These two are used with the TIMS report to identify service indicators) Use linear regression to insure uncontrollable site characteristics are mitigated in formula Lowest budget rating identifies the lowest expense per student and is rewarded with an added 10% funding. Less efficient operations will receive less than "full" funding. (Example: an 8.5 rating will receive 96% funding. Most districts have approximately 90% of their transportation costs funded; however, some receive 100% based on the formula)	B = Base funding BR = Budget Rating G = Growth in students transported L = Legislated Increases (Received locally at 100%) Allotment = B x BR + G + L

Comments from State/Local Officials

- Provides some level of equity for all districts
- Provides consistent service indicators through use of EDULOG and TIMS Report
- Promulgates/maintains existing inequities
- May sacrifice service levels for efficiency (Kids on buses longer)
- Doesn't cover Special Needs Transportation costs
- Favors the wealthy districts, credit for using local money in budget rating

Ohio (Predictive)

Legal Context and Standards of Service

Ohio regulations state districts with students in grades kindergarten through grade eight "shall provide transportation to and from …school." The statute indicates districts are also allowed to provide transportation to students in grades nine through twelve. (RC 3327.01) Added provisions address special education students and students with disabilities.

RC3301-83.01 allows the state to provide support for transportation to students (K-12) who live more than one mile from school. The impact of this provision was made clear when the state suspended the application of the formula, allowing districts to continue to collect current levels of support while cutting services. According to the Ohio Department of Education, one district eliminated transportation services for high school students but continues to receive approximately $5 million in annual state support provided for that purpose. The code also provides support for the transportation of non-public school students who attend a school within given limits. RC 3317.22 identifies the state support to be 60% of the formula defined amount for each local district.

Bus purchases must be made within the limits prescribed by RC 3301-85-01 and are supported by state payments based on the number of students, miles traveled, local district valuation per student and median income. If a district determines buses are no longer needed, the district must consult with the state regarding the disposition of the units.

Finance Method and the Interim Formula

The current distribution formula adopted in 1998 and described below is still identified in rule and regulation, but has been suspended until a new formula can be defined, discussed and finally approved by the Ohio legislature. During the interim, schools districts will receive state support for transportation based on their 2005 support levels, increased each year by 2.0%, regardless of changes in service levels. The proposed new formula cannot be implemented until approved by the legislature, along with associated appropriations. This may not occur until June of 2009.

Existing Formula (Currently Suspended)

The existing formula requires all local districts to conduct a student count the first full week in October. They are to submit this information along with route information and miles traveled to the Ohio Department of Education (ODE.) The actual transportation operating cost amounts are to be submitted to ODE by August 1 of each year. Additionally, route information related to Special Education transportation is collected and RC 3301-83.01 includes provisions for added funding in certain situations.

Existing Formula components:

- **Transportation base** = number of students transported, minus pre-school students with disabilities, plus non-public school students
- **Daily miles per student transported** = number of daily miles traveled, divided by the Transportation Base
- **Transportation Percentage** = ADM divided by the Transportation Base

Formula Application

Regression analysis uses two independent variables, daily miles per student and the transported student percentage to determine the "average efficiency" cost. (Intercept and regression coefficients) The average efficiency is determined annually and is adjusted by multiplying the previous year's cost times an inflation factor and two added indices for rough roads and student density.

Fund Distribution

The targeted 60% state support for transportation is distributed to the local district as a part of the monthly "foundation payments." These twice-monthly payments are identified as "unrestricted funds and may be used at the district's discretion.

Comments from State/Local Officials

The funding formula is currently being reviewed. The stated issues with the current formula relate to its complexity and the inability of local operations to use the techniques and information in a meaningful manner to increase operational efficiencies. An oversight agency believed the complexity of the current formula prevented its effective use by local districts and a review was initiated.

The Ohio Department of Education, in conjunction with a team of 20 stakeholders "invited because of their active roles in various aspects of school transportation," has developed and is proposing a new "volume-based" formula. The group identified four basic formula objectives:

1. Should be understandable
2. Should reward efficiency
3. Should promote ridership
4. Should accommodate special logistical circumstances

The proposed formula includes a "Base payment" determined by identifying the average cost for transportation from the previous year, either cost per mile or cost per student, whichever is greater. This average is then applied to each district's reported ridership.

The "base" is then adjusted by considerations for the volume of mandated non-public school transportation required in the district (up to 10% of base), an "efficiency" adjustment, defined below (up to 10% of base), a walk distance adjustment (up to 2.5% of base), and a high school bus service adjustment (up to 2.5% of base.)

The "efficiency targets" are based on the relative rider population density of a district and identify an "expected" number of students that "should" be transported on a bus in a given district. This target compares the state's median bus load from the previous year (state mandated October student counts: 79 students) with the district load levels adjusted for relative population density. If a district has a low population density, their target will be lower than the 79 state median. The converse is true for districts with high population density.[7]

> Example: Number of students transported divided by district's square miles = rider density (riders per bus) for each district. This factor is then used to adjust the target rider ratio, and ultimately the funding adjustment for efficiency.

[7] The Department of Education has identified and published the anticipated efficiency targets for 2008 even though their application cannot be implemented until the formula achieves legislative approval and funding. The state mean would be recalculated each year based on the student counts received in the October reports. The funding distribution would then be adjusted beginning in January, providing a closer link between state support and current expenditures. Given the "distribution formula" is linked to a legislatively adopted appropriation, no addition to total dollar availability is anticipated.

The current formula was relatively easy to administer for both the state and local districts due to familiarity and length of use.

The current formula could address some significant cost increases through the use of the inflation factor; however the "catch up" was always a year later.

Utah

Legal Context and Standards of Service

Utah Revised Statute 53A-1-402 requires the State Board of Education to establish rules and minimum standards for public schools, including state reimbursed bus routes, bus safety and operational requirements and other transportation needs. The law also identifies school productivity and cost effective measures as areas of control for the Department of Education.

On this basis, the department indicated they believe pupil transportation is required for those students defined as "eligible" in Administrative Code R277-600. Funds are appropriated to the State Board of Education to support pupil transportation in Utah Code Annotated (UCA) 53A-17a-104 and distributed via the funding formula as prescribed in UCA 53A-17a-126 and 127.

UCA 53-7-18.1 and Administrative Code R277-600 provide the process, including approved routes for determining miles and minutes, for use in allocating dollars. UCA 41-6a-1304 includes the specific bus standards and 1308 identifies an anti-idling provision.

It must be noted that the Administrative Code appears to include information from previous versions of the formula and was at times confusing. Department staff indicate the code is in the process of undergoing review.

The UCA identified 85 percent as the targeted rate of state support for eligible transportation programs, subject to budget constraints. On past occasions, these constraints have limited support to a significantly lesser percentage.

The formula is currently undergoing an audit required by the legislature. The audit was precipitated by concerns related to data collection and standards. The four-person audit committee includes the Fiscal Analyst Office and local and state education members.

The Department of Education has initiated additional data collection over the past two years in anticipation of meeting possible new requirements. Their goal was to add uniformity to the data collection. They identified a need to better separate home to school costs from field trips and other eligible and ineligible costs. They are seeking the identification of all costs to assist in the development of standard average costs for use in the formula.

Both UCA and Administrative Rule include operational definitions, but no articulated funding goals were noted. However, the legislative audit group has focused on the following areas:

- Greater accountability
- Clarity of data
- Transparency of data collection
- Verifiability
- Efficiency incentives.

Finance Method

School districts are apportioned state transportation funds for transporting eligible pupils to and from school.

Schedule A of the pupil transportation budget is based on transporting students from home to school and from school to home once each day, required deadhead miles, after school routes, approved disabled pupil routes, vocational routes, the capital cost of buses, and the salaries of office administrators. Schedule A is that portion of a school district's pupil transportation funding derived by formula.

Each year, prior to applying the formula to school district time and mileage data to determine funding, four Allowance Rates must be calculated. These four Allowance Rates are the independent variables used in the formula:

- The *Time Allowance* is paid at a rate that reflects the State Average Cost Per Minute for driver salaries, retirement, Social Security, and health and accident insurance as reported on the F-4 financial report.
- The *Mileage Allowance* is paid at a rate that reflects the State Average Cost Per Mile for bus fuel, lubrication, tires/tubes, and repair parts as reported on the F-4 financial report.
- The *Depreciation Allowance* is paid at a rate that amortizes the current state contract price of a standard equipped 84 passenger bus over the expected life (200,000 miles) of the bus.
- The *Administration Allowance* is intended to provide funds for the salaries and benefits of district transportation administrators. The calculation for administrative allowance consists of three parts:
    - An allowance for pupils transported,
    - An allowance for route minutes, and
    - An allowance for route miles.

The mileage and minute calculations require the development of route maps indicating route, number of stops and students at each stop. Miles and minutes with students on board are then separated from those without (deadhead miles) to establish factors multiplied by each of the allowances.

All calculations are obtained by multiplying the factors on the bus times/miles/students by a .6 exponential power and then multiplying that number by another state identified dollar amount to arrive at the allocation per mile/minute. In 2005 the rates were $0.34 per minute and $0.32 per mile.

Note: this map and the associated mile and minute calculations are submitted to the Department of Education by November 1st each year. An unfunded (state) option for locally supported transportation services is allowed by law up to a 0.003 tax rate.

Fund Distribution

The state distributes pupil transportation support to local districts in monthly checks. It is included in the basic support check and is not restricted in local use. Even though it is a reimbursement of previous expenditures, the Department indicated some corrections to payments may occur in November if the supporting data changes.

Comments from State and Local Officials

- The Department anticipates a number of changes will come out of the Legislative Audit Review Committee (see those noted earlier). Most changes/additions will address concerns already expressed by the Department and build a greater level of credibility with the legislature.

- The downward trend of the current funding allocations had to be addressed. Inequities were noted where some districts could make money on transportation while others experienced a low percentage of support.

- Prior to the recent changes, the current formula was relatively easy to administer by the state, given the limits of audits.

- Recent changes including capturing more data and more appropriate data while insuring its accuracy, presented issues for some districts. However, as budget clarity and ability to separate ineligible costs increases, the Department appears to be winning them over.

- The life-cycle costing for buses needs to be updated to more adequately reflect concerns for emissions, traffic congestion reduction and overall efficient use of funds.

- No provisions have been identified for addressing significant mid-year changes like the dramatic increases in fuel costs.

Washington (Per Unit Cost)

Legal Context and Standards of Service

Washington statute RCW 28A.160.010 allows local school districts to provide student transportation and indicates the state will develop and implement guidelines for the level(s) of support.

> "The operation of each local school district's student transportation program is declared to be the responsibility of the respective board of directors, and each board of directors shall determine such matters as which individual students shall be transported and what routes shall be most efficiently utilized. State moneys allocated to local districts for student transportation shall be spent only for student transportation activities, but need not be spent by the local district in the same manner as calculated and allocated by the state.
>
> School districts may use school buses and drivers hired by the district or commercial chartered bus service for the transportation of school children and the school employees necessary for their supervision to and from any school activities within or without the school district during or after school hours and whether or not a required school activity, so long as the school board has officially designated it as a school activity. For any extra-curricular uses, the school board shall charge an amount sufficient to reimburse the district for its cost."

However some incongruities in regulation and the application of the formula appear. As noted in the 2006 JLARC Report 06-10, the 1983 Seattle litigation against the state resulted in court opinions related to circumstances when transportation may be required.[8]

A review of applicable RCW 28A.160.180 and WAC 392.141.130 terms also indicates inconsistencies in who will establish the rate of state support, *e.g.* the Office of Superintendent of Public Instruction or the Legislature.

The operational requirements and the identification of costs are listed in RCW 160.150 through 160.190. Items such as eligibility definitions, annual report requirements and the allocation rate can be found there. Regulations appear specific regarding the formula's intent to support only the transportation of eligible students to and from school, but also include provisions for crossing guards.

Finance Method

Before any description or discussion of the current formula in Washington State is initiated, it is important to note the entire process is continuing to undergo review and evaluation. Prior to 1981, Washington used an approved cost method to provide state support for student transportation activities. They changed to the current Per Unit Cost model in 1981, and with modifications have continued its use until present.

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[8] Seattle School Dist. v. State, No. 81-2-1713-1, Thurston Co. Sup. Ct., Declaratory Judgment 6 (hereafter, Doran II). But see Brown v. State, 155 Wn. 2d 254, 119 P. 2d 341 (2005) noting that Doran II was not appealed and is not binding precedent (Id., n. 2).

The 2005-07 legislature required the Joint Legislative Audit and Review Committee (JLARC) to conduct a study of the current formula to determine if it was delivering the prescribed statutory state support, 100 percent or as close as reasonably possible, and if it was encouraging efficiencies. That study resulted in a finding of insufficient state support and identified an inadequacy of mechanisms to encourage efficiencies. At present, the study is continuing and alternative models for funding are being reviewed for equity, impact and administrative ease.

The current formula identifies major components for determining the per unit state support. These major components may provide "weighting" or adjustments based on specific local factors. They include:

1. Student counts – based on a five consecutive day count conducted in the morning at the beginning of the school year, usually October. (These numbers are used to statistically determine the number of students at every bus stop.)

2. Number of trips per day each bus completes with those students on board

3. Miles that are predetermined by the state, based on straight line distance between student's bus stops and the school they attend, up to a maximum of 17 radius miles.

4. Distance weighting factors create added funding for longer distances but also are impacted by "other" service delivery models (In-lieu, taxi, etc.)

5. Weighted Units are determined by multiplying the number of students times the "weighting factor." Note: Factors are different between basic and special education.

6. Minimum load factors, identified by the state as 74, with particular implications for special education.

7. The allocation factor established by the legislature for the weighted unit ($43.21 in 2006).

8. A hazardous walk area factor based on the number of K-5 students residing within the one-mile radius of the school they attend.

9. Transportation Vehicle Fund allocates dollars based on the state generated formula and "state prices." These dollars are added to the funds generated by the weighting portion of the formula, but districts are limited to using TVF dollars for vehicle purchases and major repairs.

Washington's Annual Transportation Funding is determined as follows:

(Student Count) times
(Qualifying trips per day) times
(Weighting Factor) times
(Allocation Factor) plus
(Minimum load factor) plus
(Hazardous Walk Area Factor) plus
(Transportation Vehicle Fund Allocation) EQUALS
Annual State Support

Fund Distribution

The Office of State Superintendent of Public Education distributes the dollars to the appropriate Education Service Districts for final distribution to local school districts on the following schedule. In addition to the percentage of the apportionments varying month-to-month, the total amount is adjusted throughout the year based on enrollment changes.

September	9 percent
October	9 percent
November	5.5 percent
December	9 percent
January	9 percent
February	9 percent
March	9 percent
April	9 percent
May	5.5 percent
June	6.0 percent
July	10.0 percent
August	10.0 percent

The state sends the entire funding portion related to the Transportation Vehicle Fund out by September each year so the districts can accrue the associated interest identified in the formula. Additionally, the state updates its student rider data based on the October counts and adjusts the monthly payments beginning in January to reflect current year information. Monthly payments are also calculated to make up for any increases that may result from added students identified in the new count between the start of school and the following January.

Comments from state and local officials

- OSPI staff is relatively comfortable with the administration of the current formula. The processes and data collection activities are somewhat routine, but the JLARC Report 06-10 indicating a 95 percent probability of approximately $100 million underfunding of current services based on the RCW commitment to 100 percent support, has moved them to a key role in the ongoing formula evaluation process.

- Local schools are confident in their ability to complete current formula data requirements and they feel the pressures of the underfunding, especially in light of the recent fuel cost escalations. They are concerned with the current support levels, but also express some anxiety over any potential formula changes that could reduce support or require significantly added data collection tasks.

Statistical Analysis

Introduction

In this chapter we develop a statistical model to explain spending on student transportation by Oregon school districts. The purpose of this exercise is to explicitly quantify the factors that affect transportation spending. Many of these factors are outside the direct control of the districts, (e.g. fuel prices) however it is likely that districts react differently to the environment they operate in, which affects the overall economic efficiency of their transportation operations. Other factors, such as bus routing, staffing, wages and benefits, and management and overhead costs are—at least to some degree—within the control of transportation and district managers.

The goal in developing and estimating the statistical model is to increase the level of understanding of how districts and contractors manage their respective transportation systems in response to the environment in which they operate. By considering the most important environmental and management factors affecting pupil transportation spending, the model is able to estimate the relative cost efficiency of the districts. Clearly, the environment in which districts operate differs greatly across the state. We account for these differences in the statistical model so that differences in cost efficiency between districts are—to the extent possible—a function of management behavior and not a function of environmental differences.

By identifying those districts that operated in the most cost efficient manner, we are able to develop a "best practices frontier," against which all other districts are compared. The best practices frontier is a relative frontier in that it represents the best performances observed, not a theoretical absolute.

We begin the chapter by presenting state-level trends and analysis on transportation spending, riders, miles driven, and special education. The remainder of the chapter is organized as follows:

1. The Literature Review discusses statistical analyses of school transportation that have been conducted for other states.

2. The Model and Data section presents the theoretical model and empirical data used in the analysis.

3. The Summary of Results presents the key results of the statistical analysis.

4. The implications of the findings of the analysis are presented in the Discussion.

Transportation Riders, Miles Driven, and Spending

There are great differences between Oregon school districts with respect to number of students, geographic size, and the size of the communities in which the districts are located. For example, some districts have less than 100 students, while a few have more than 10,000. Some districts are less than 20 square miles in size, while others are more than 1,000.[9] Some districts are urban, with students densely distributed near schools, while others are composed of a central town or urban area with most students located near the schools and a few distributed in rural areas. Still others are entirely or nearly entirely rural with all students widely distributed across the district.

These differences in the physical characteristics of school districts translate into differences in the size of the transportation system operated by each of the districts, bus miles driven per student rider, and most importantly, spending per rider and total spending. It is important to explore and understand these differences in an analysis of the cost structure and cost efficiency of Oregon school districts.

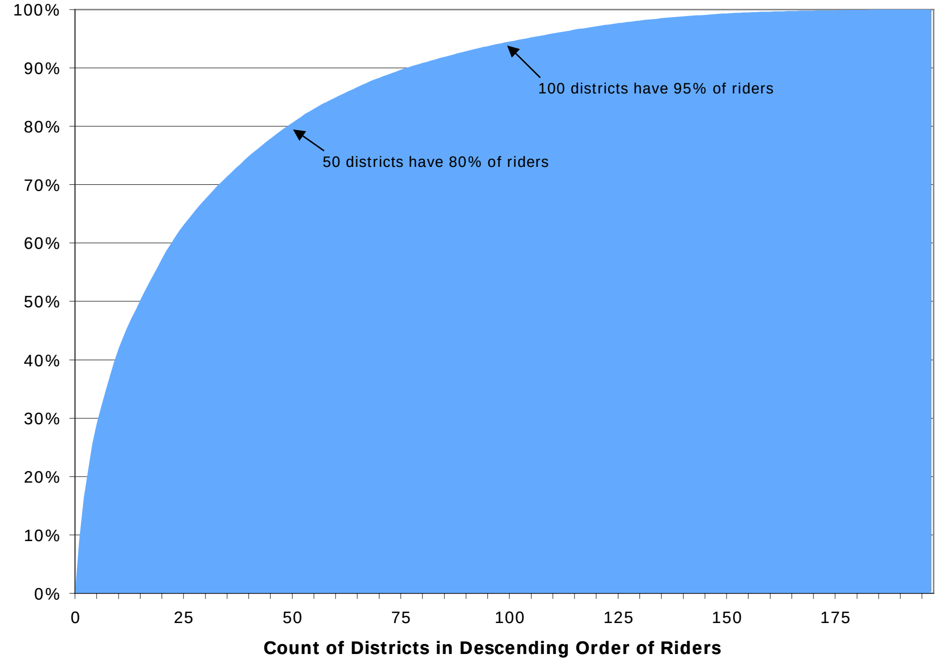
During the 2006-07 school year, the 197 school districts in Oregon transported 273,162 regular home-to-school bus riders. The average number of daily bus riders per school district was 503. The smallest ten districts had less than 10 riders each, whereas the largest four districts had over 10,000 each. As Figure 1 shows, a relatively few districts transport the majority of bus riders and the largest 100 districts (half of all school districts) transported 95% of all regular bus riders.

The number of (bus) miles driven by a district during a school year is strongly related to the number of riders (Pearson correlation = 91.7).[10] Thus, as one might expect, the greater the number of bus riders, the greater on average the number of miles driven. This is not to say that number of miles driven per rider is positively related to number of riders. In fact, just the opposite phenomenon exists. Miles per rider is negatively correlated—although only slightly so—with number of riders (Pearson correlation = -0.19). This is consistent with the many spatially large, but sparsely populated rural districts distributed across the state.

[9] In fact, the Klamath County School District is more than 6,000 square miles.

[10] This includes only reimbursable miles. The Pearson correlation coefficient is a unit-less measure bounded by -1.0 and 1.0 of the linear relationship between two variables. The greater the magnitude (in absolute value) of the coefficient, the greater the indication of a linear relationship between two variables. A typical rule of thumb is that a correlation greater than 0.7 (in absolute value) indicates a strong relationship between two cross-sectional variables.

Figure 1: Most of the State's School Bus Riders Are Located in Relatively Few Districts, 2006-07 School Year

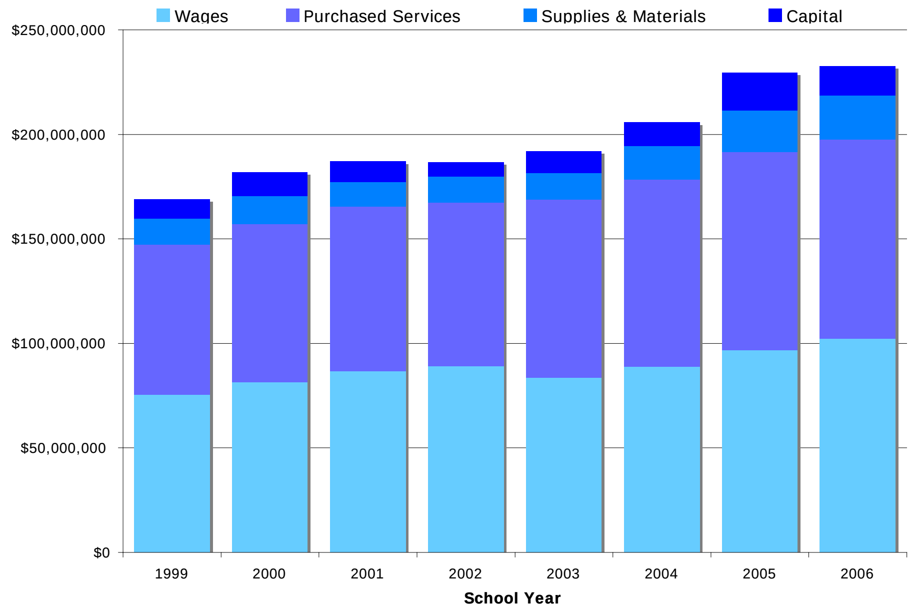


Source: ECONorthwest analysis of ODE data

Transportation Spending by Cost Center

In general terms, transportation spending falls into four cost centers: wages, purchased services (e.g. contract transportation services), supplies and materials (e.g. diesel fuel, tires, maintenance supplies), and capital (e.g. buses). As Figure 2 shows, wages and purchased services comprise the vast majority of spending on student transportation. Supply and material costs, although comprising a relatively small portion of total spending, have grown over time as diesel prices and other petroleum-based supplies, such as tires, have increased. Capital costs, which consist mainly of bus depreciation costs, but also include facility depreciation costs, fluctuate year to year as investments by districts in transportation-related capital tend to be cyclical.

Figure 2: Spending by Operational Category



Source: ECONorthwest analysis of ODE data

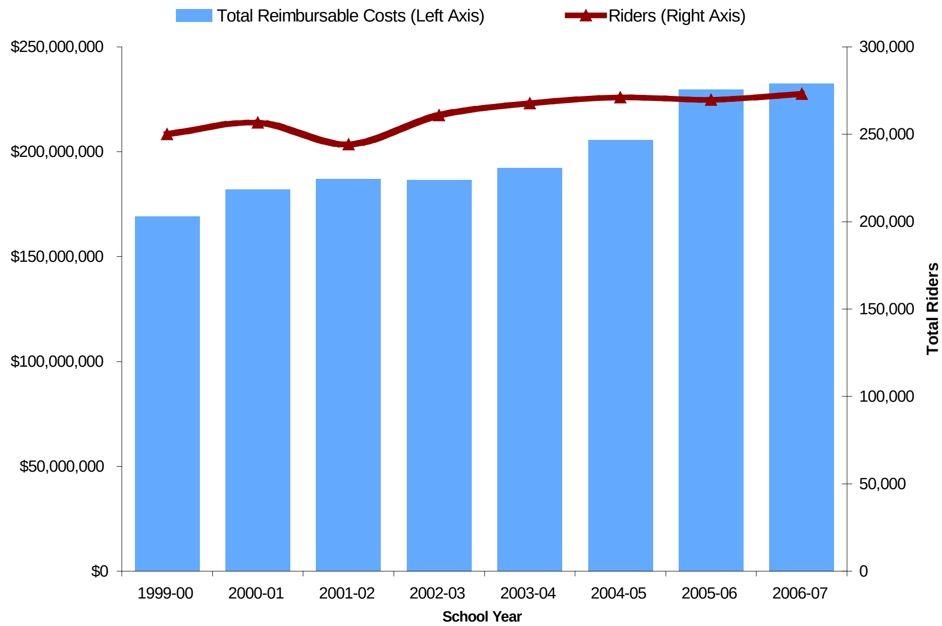
Based on the way information on transportation spending is provided to ODE, it is not possible to disaggregate purchased services into the portions spent (by the contractor) on wages, supplies and materials, capital, or overhead. Thus, it is not possible to compare the extent to which spending on various inputs differs between in-house and contract services.

Transportation Spending by Riders

The number of bus *riders* increased modestly between the 1999-00 and 2006-07 school year, growing on an average annual basis by 1.3%. As Figure 3 shows, there was a drop in riders in the 2001-02 school year, but a rebound in the subsequent year. Rider numbers are calculated by the districts in October and ODE speculates that the lower numbers for the 2001-02 school year are due to the September 11, 2001 terrorist attacks and the response by some parents to drive their children to school rather than put them on school buses. Regardless of the reason for the decline, it was only temporary. Rider numbers continued their upward trend in 2002-03.[11]

[11] In fact, rider numbers may have risen in subsequent months of the 2001-02 school year. However, rider counts are made only in October.

Figure 3: Riders and Reimbursement Cost



Source: ECONorthwest analysis of ODE data

While rider numbers increased on an average annual basis by 1.3% between the 1999-00 and 2006-07 school years, total reimbursable costs increased by 4.7%. The difference, 3.4 percentage points, is explained by growth in wage, energy, materials, and vehicle price inflation. On an average annual basis, wages grew by 3.0% per year, diesel costs by 14% per year, material and supply costs by 4.2%, and bus costs by 3.7%.

To illustrate how price increases, which are beyond the control of districts, have impacted transportation costs over this period, assume that wages comprise 60% of transportation costs, fuel costs comprise 20%, material costs comprise 10%, and bus depreciation costs comprise 10%.[12] Under this scenario, input prices have increased by 4.7% between the 1999-00 and 2006-07 school years—exactly the same rate as total reimbursable spending on student transportation. And this does not factor in the 1.3% per year growth in riders. This simple, back-of-the-envelope analysis indicates that actual growth in transportation spending (4.7% per year) has been lower than expected growth, which would be 6.0%.[13]

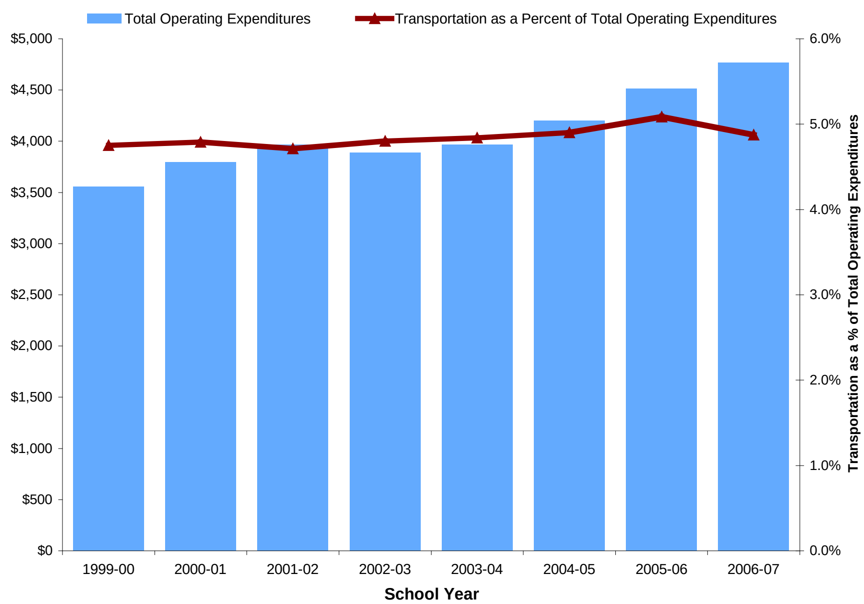
[12] Wages include benefits and retirement costs. For in-house transportation systems, wages averaged nearly 70% during the 1999-00 through 2006-07 school years.

[13] 4.7% per year input price growth + 1.3% percent per year growth in riders = 6.0% per year spending growth.

Spending on Student Transportation as a Percent of Total Spending

Spending on student transportation as a percent of total spending on K-12 operations averaged 4.6% between the 1999-00 and 2006-07 school years (Figure 4). During this period, transportation represented as little as 4.0% of total spending (2002-03 school year) and as much as 4.9% (2005-06). Total Operating spending grew by 4.3% per year over this time, slightly slower than transportation spending. Comparatively, Alspaugh (1996) reports that providing pupil transportation services typically accounts for 5% to 10% of a district's budget.

Figure 4: Total Operating Expenditures for K-12 Education and Transportation as a Percent of Total Operating Expenditures, Statewide



Source: ECONorthwest analysis of ODE data

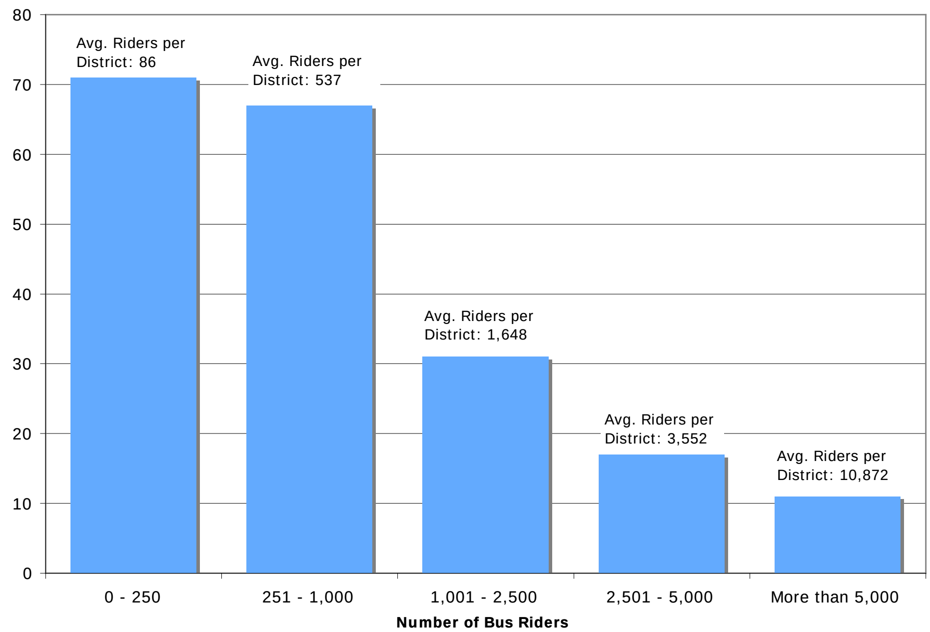
Note: Operating Expenditures are defined as Funds 100, 200, and 500 and Functions 1000 - 3500 from the Program Budgeting and Accounting Manual, ODE, 2006.

Distribution of Riders by District Size

There were 196 school districts operating in Oregon during the 2006-07 school year.[14] Districts vary greatly with respect to enrollment and ridership, which are highly positively correlated. At one extreme, in the 2006-07 school year, 71 districts had an average of only 86 bus riders. At the other extreme, 11 districts had an average of 10,872 riders. That is, each of the 11 largest districts has on average nearly 4,700 more riders than all of the 71 smallest districts combined.

[14] Between the 1999-00 and 2006-07 school year there were as many as 198 school districts operating in Oregon, several of which had fewer than 20 students. Chenowith SD 9 merged with The Dalles SD 12 after the 2003-04 school year to form North Wasco Co. SD 21; Brothers SD 15 closed after the 2004-05 school year.

Figure 5: Distribution of Districts by Bus Ridership



Source: ECONorthwest analysis of ODE data

Special Education in Restrictive Setting (SERS)

Providing transportation services for severely disabled children can pose a financial and operational challenge for a school district. Because the needs of severely disabled children often differ substantially from those of other children, districts either explicitly or on a de facto basis operate two transportation services. Unlike regular school bus routes, where the cost incurred by the district to serve one additional student is very small, the cost of serving one additional severely disabled child may be many thousands of dollars per year. In some instances, a single bus, driver, and driver's aid must be assigned to an individual student in order to safely provide transportation services from and to the child's home.

Districts are not required to account for the costs of special education and regular bus services separately, so it is not possible to conduct a district-by-district or statewide analysis of spending on special education transportation separately from spending on regular transportation, nor is it possible to obtain a complete tally of the number of special education students provided transportation services by the district. However, based on the interviews with school districts, it is believed that special education may account for as much as 40% of total school transportation spending.

There is at least one Oregon school district, Bethel, that contracts-out its regular bus services, but operates in-house transportation services for special education students. Between the 1999-00 and 2006-07 school years, 60% of total transportation spending was for contract services—i.e., for regular busing services. The remaining 40% was spent on wages and benefits, materials and supplies, and capital to operate the in-house operation, which serves special education students.[15] These results, though for only one school district, support the estimated 60% to 40% split from the district interviews. Based on ODE data, over this same period, the number of students in the Bethel School District designated as *special education in restrictive settings* (SERS) represented on average only 1.0% of total riders. The SERS definition of special education students does not account for all special education students served by the Bethel School District, but does represent the most severely disabled based on the following federal definitions:[16]

- **34 - Public Separate School:** Individuals in this placement must receive special education and related services for greater than 50 percent of the school day in separate public schools.

- **35 - Private Separate School:** Individuals in this placement must receive their educational programs, at public expense, in private separate school for greater than 50 percent of the school day.

- **36 - Public Residential Facility:** Individuals in this placement must receive their educational programs in public residential facilities for greater than 50 percent of the school day and be residents of the facility during the school week.

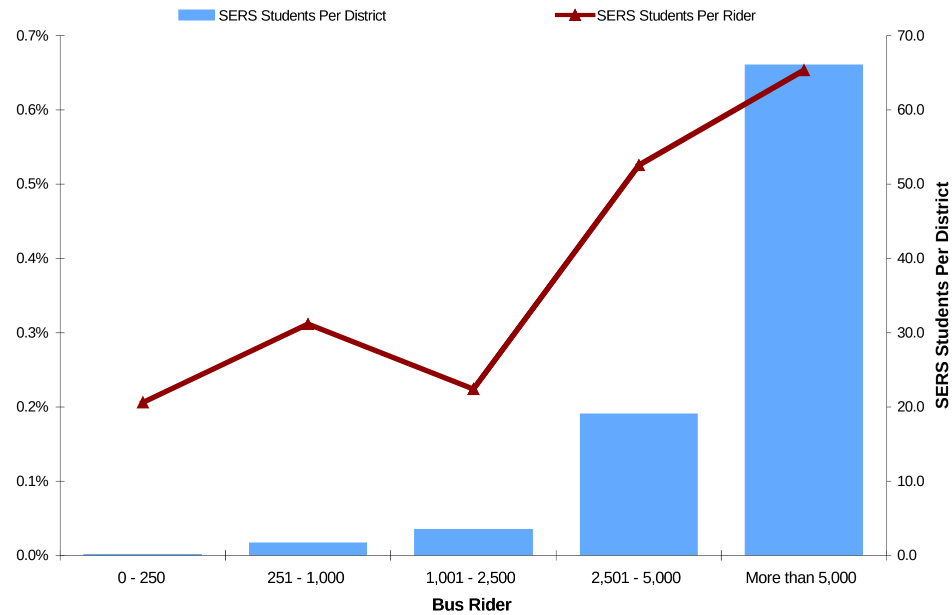
- **37 - Private Residential Facility:** Individuals in this placement must receive their educational programs in private residential facilities for greater than 50 percent of the school day and be residents of the facility during the school week.

Although SERS students are found in districts of all sizes, they tend to be more concentrated in larger districts (see Figure 6). Between the 1999-00 and 2006-07 school years, the largest districts (those with more than 5,000 riders) had three times the concentration of SERS students as a percent of all bus riders as the smallest districts (those less than 250 riders). This concentration into the larger districts is likely due to the greater educational and therapeutic opportunities available in the more urbanized parts of the state.

[15] A small portion of the (in-house) spending on wages and benefits, materials and supplies, and capital is likely used to provide transportation services for the general student body. Approximately 5% of transportation costs incurred by districts that contracted out both regular student and special ed student busing services were in cost centers other than contract services.

[16] Based on email from ODE on August 6, 2008.

Figure 6: Larger Districts Also Have Proportionally More SERS Students Per Bus Rider, 1999-00 Through 2006-07 School Years



Source: ECONorthwest analysis of ODE data

Literature Review

Numerous analyses conducted over the past two decades have examined cost efficiency in providing K-12 education in public schools. The methods of analysis differed between studies and in general the sophistication of analysis has increased over time. Within this set of studies, are several analyses that focused on or considered cost efficiency in pupil transportation. The studies were based on district level data for a particular state and examined questions related to differences in cost efficiency between in-house and contract-based transportation services, scale of operation, and the effect that geographic and management factors have on the cost of student transportation.

Alspaugh (1996) uses ordinary least squares (OLS) regression and correlation analysis to examine the effect of selected geographic and management factors on the cost of student transportation for 533 school districts in Missouri for the 1990-91 school year. The author refers to geographic factors as those that the district has no control over. He considers four factors: square miles of the district, average number of daily riders, square miles per rider, and attendance centers (schools) within the district. The author refers to as management factors those characteristics of the transportation system that the district has control over. These include: in-house vs. contracted, number of bus routes, riders per route, route length, miles per rider, multiple routes, and Kindergarten routes.

Alspaugh (1996) finds that although geographic factors have a strong influence on the variation in per-rider transportation costs, management factors have an even greater relationship. Thus, the author finds that the factors within the control of the districts have a greater influence on costs than the factors outside of the district control. The author does point out that geography and management do not operate in isolation. In fact, the purpose of management is to react to the geography within which the district operates. To this end, Alspaugh finds that student enrollment, square miles per student, and the number of schools within the district is highly correlated with certain management variables.

Alspaugh (1996) also finds that when all management and geographic factors are considered, districts with contracted services had higher per-rider transportation costs than districts that operated their own transportation system. The author notes that districts with contract services tend to have more students being transported, fewer square miles per student, and more schools within the district. Alspaugh estimates that contract services were associated with a nearly 10% increase in cost per rider per day.

Lazarus and McCullough (2004) examined cost efficiency for the 343 school districts in Minnesota for the 1999-00 school year. The authors estimate a variable cost function using OLS methods. They report that most of the explanatory variables are of the expected sign (i.e., positive or negative) and many of these are statistically significant. The authors find that the percentage of students who needed specialized transportation due to a disability was positive and statistically significant. Urban districts were found to have higher transportation costs relative to suburban and rural schools.

Lazarus and McCullough (2004) test for differences in the cost efficiency of in-house and contract transportation services by including an indicator variable for in-house services. They find that after accounting for all other differences between the districts, in-house services had approximately 10% lower costs than contract transportation providers. Although there are substantial differences in the models employed and the states examined, the findings of Lazarus and McCullough with respect to the percent difference in costs between in-house and contract transportation providers is nearly identical to that found by Alspaugh (1996) for Missouri.

A limitation of this analysis is the use of a single year of data rather than multiple years of data. By relying on a single year of data the study provides “a snapshot in time” that may or may not be representative of the districts’ performance over a longer horizon and does not account for year-over-year adjustments that districts make in their transportation services.

The Council of Great City Schools (2008) initiated a project utilizing technical teams of executive administrators to develop and manage a benchmarking project. That project has been collecting data from large, urban school districts (and therefore a limited sample) across the United States over the past three years to "provide detailed analyses and discussion of robust key indicators" related to school operations. The most current publication, *A Report of the Performance Measurement and Benchmarking Project, Spring 2008,* included data related to student transportation. The report identifies why the measurement is important, the key factors indicated, the analysis results and the trends perceived.

The authors of the report state that, even though the level of transportation expenditures relative to the total district budgets decreased between 2005 and 2007 from 5% to 4.3%, transportation expenditures per student increased by 13.3%. The authors postulate the impact of better data collection and reporting of costs in district in-house operations as a key component for some of those increases. Their findings for these large urban schools also demonstrate higher costs for in-house operations in 2007 with respect to cost per operated bus and cost per student than those found in contracted operations—in contrast to the findings of Alspaugh (1996) and Lazarus and McCullough (2004).

Model and Data

The statistical model developed in this chapter is intended to represent the operational and cost structure of district-level public school transportation services in Oregon. We begin with a brief description of the statistical model, which should be sufficient for most readers. Full descriptions of the theoretical and empirical model are provided in the Theoretical Model and Empirical Model sections below, both of which can be skipped by most readers.

The purpose of a statistical model is to represent mathematically a simplification of the phenomenon of interest. In this chapter, we develop a statistical model based on the specification known as the *stochastic frontier cost function* (SFCF)in order to gain understanding of the operational and cost structure of student transportation services provided by and for Oregon school districts. The name of the model underlies three important characteristics that led us to choose this modeling technique for the analysis.

1. **Cost Function** refers to an economic model in which the costs of producing a product or providing a service are explained as a function of level of output and the prices of inputs. The cost function has the ability to characterize completely cost minimizing behavior (Chambers, 1988 p49).

2. **Stochastic** refers to the assumption embodied within the model that there are two forms of randomness:

a. **Random shocks** that affect the processes and costs of pupil transportation departments, but which are outside of their control. With respect to transportation operations, random shocks can be either positive or negative in nature. Examples of positive shocks would include, but certainly not be limited to, unusually favorable weather conditions, an abrupt and large decrease in the prices of inputs, a temporary reduction in road congestion. Negative shocks would include, but not be limited to unusually unfavorable weather conditions, abrupt and large increase in input prices, a temporary increase in road congestion.

b. **Inefficiency effects** are also randomly distributed among transportation operations, however, their impact is only one sided—they can only negatively affect the cost structure of the operations. Unlike random shocks, inefficiency effects are related to the management of the transportation operation and/or the allocation of costs to the transportation functions.

3. **Frontier** refers to the mathematical structure of the model that, rather than focusing on the average performance of transportation operations as is the practice of traditional regression approaches, focuses on the best practices observed of all transportation operations. It is this feature of the model that allows for the estimation of cost inefficiency of each transportation operation of each district.

As in all econometric models, the phenomenon of interest is regressed against the factors believed to have influence on it. With respect to cost of providing student transportation, economic theory would suggest that number of riders and the unit costs of inputs would have the greatest impact. Environmental factors such as the geographic size, distribution of students across the district, and even the incomes of the residents of the district likely impact transportation costs as well. Finally, the objectives of the school districts with respect to their transportation operation, as well as the ability of district leaders and transportation administrators to efficiently manage their transportation operation, will affect transportation costs. The frontier cost function allows us to statistically examine the factors affecting transportation cost and to estimate the performance of the transportation operations with respect to minimizing these costs.

Theoretical Model

The theoretical model developed for this analysis is a long-run cost function, where total reimbursable transportation costs (*C*) is assumed to be a function of bus riders (*Y*), the measure of output, and per-unit costs of the major inputs: labor (*L*), capital (*K*), and fuel and supplies (*F*). The cost function represents the minimum cost of producing a given level of output during a given time period expressed as a function of input prices and output (Chambers, 1988). The characterization of the cost function as "long-run" is due to the inclusion of capital costs in the theoretical model.[17] Alternatively, a short-run (or variable cost) model could be developed, which does not include the costs of capital (e.g. purchases of buses). However, a long-run cost function approach was chosen to model school transportation because of the manner in which student transportation cost are financed in Oregon: the approved cost of both variable and fixed inputs.[18]

The stochastic frontier cost function (SFCF) is defined as

$$C_i = (Y, p)_i \beta + v_i + u_i, \qquad (1)$$

where C_i is the natural logarithm of transportation cost for the i^{th} school district and (i = 1,…, N), Y_i is the natural logarithm of output for the i^{th} district, p_i is a (1 × k) vector of the natural logarithm of input prices facing by the i^{th} district, and β is a (k × 1) vector of coefficients to be estimated. The components of the disturbance term, v_i and u_i, are assumed to be independent. The model is called a stochastic frontier production function because the output values are bounded from below by the stochastic variable $e^{(Y,p)_i \beta + v_i}$.

Battese and Coelli (1995) show that the (cross-sectional) stochastic frontier cost function presented in Equation 1 can also be specified for panel data as

$$C_{it} = (Y, p)_{it} \beta + v_{it} + u_{it}, \qquad (2)$$

where C_{it} is the natural logarithm of total cost for the i_{th} school district (i = 1,…, N) in the t_{th} time period (t = 1,…, T), Y_{it} is the natural logarithm of output for the i^{th} district in the t_{th} time period, p_{it} is a (1 × k) vector of the natural logarithm of input prices facing the i^{th} district in the t_{th} time period, v_{it} and u_{it} are the components of the disturbance term, and β is a (k × 1) vector of coefficients to be estimated.

[17] For more information on long- and short-run cost functions, see Chambers (1988) pp100-109.

[18] The cost of land for transportation facilities is not an approved cost for reimbursement, however the cost of the physical assets is. The cost of a bus is depreciated over a 10-year period; the cost of structures is depreciated over 25 years.

Kumbhakar, Ghosh, and McGuckin (1991), and Reifschneider and Stevenson (1991) proposed models for cross-sectional data that simultaneously estimate the SFCF and an explicit equation of the inefficiency effects associated with the SFCF. Battese and Coelli (1995) extended these ideas to panel data models, allowing for both the estimation of technical change within the SFCF and the estimation of time-varying inefficiency effects (Battese and Coelli 1995). The inefficiency effects specification for the panel data model is as follows:

$$u_{it} = z_{it}\delta + w_{it} \;, \qquad (3)$$

where u_{it} is the estimated one-sided inefficiency for the i^{th} decision making unit (DMU) in time period *t*, z_{it} is a vector of characteristics intended to explain the inefficiency of the i^{th} DMU in time period *t*, δ is a vector of coefficients estimated in the inefficiency model, and w_{it} is defined by the truncation of the normal distribution with zero mean and variance σ^2.[19]

The SFCF and inefficiency effects model are estimated simultaneously using maximum likelihood methods. The estimates of technical efficiency for i^{th} DMU in time period t is given by

$$TE_{it} = e^{-U_{it}} = e^{-z_{it}\delta - w_{it}} \,. \qquad (4)$$

The SFCF function has several advantages over data envelopment analysis (DEA), the primary alternative method for frontier-based modeling. First and foremost, because SFCF is an econometric-based method, it allows for the estimation of standard errors and, hence, hypothesis testing using standard maximum likelihood techniques.[20] As the name indicates, the estimated frontier allows for random noise within the data, thus not all deviations from the efficient frontier are attributed to technical inefficiency. SFCF also supports panel data estimation, whereas with DEA, a new production possibilities frontier must be established for each year of data.

[19] Battese and Coelli (1995) state “the W-random variables are not identically distributed nor are they required to be non-negative…”

[20] Recent developments in DEA have provided a method for estimating standard errors, thus allowing for hypothesis testing and the construction of confidence intervals. However, these techniques are complex and off-the-shelf software does not exist to develop the statistical properties of DEA-based estimates.

The stochastic frontier production function is not without shortcomings. Perhaps the most often cited criticism of this model is that there is not an *a priori* theoretical reason to choose one distributional assumption for the u_i over another. Typically, the composed error term is assumed to be distributed as *normal–half-normal* or *normal–exponential*, both of which are single-parameter distributions.[21] Green (1997) found little difference in the parameter estimates and the estimated u_i^s between models estimated with either of these distributions.

Another criticism of more practical importance is the choice of functional form for technology. There are numerous choices varying from the restrictive, such as the Cobb Douglas or CES, to the flexible, such as the translog. Theory often provides little guidance in the choice of functional form, and this lack of guidance may explain why the majority of published studies that estimate the SFCF use the flexible translog functional form.

As is the case with traditional econometric models, there are advantages to panel data (relative to cross-sectional data) when estimating frontier models. Panel data contain information not available in cross-sectional data, allowing for either the relaxing of some of the distributional assumptions associated with cross-sectional data, or resulting in estimates of technical efficiency with more desirable properties (Kumbhakar and Lovell, 2000 p95). In addition, panel data generally imply the availability of more data than would be available for cross-sectional analysis, translating into more degrees of freedom for model estimation. Perhaps most important in the context of stochastic frontier estimation, panel data allows for the estimation of cost efficiency over time.

Empirical Model

In this study, the Cobb-Douglas functional form is used to represent the state of technology:

$$\ln C_{it} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln w_{it} + \beta_3 \ln k_{it} + \beta_4 \ln p_{it} + v_{it} + u_{it}, \qquad (5)$$

where:

C_{it} is the reimbursable cost of student transportation for the i^{th} school district in year *t*;

Y_{it} is the number of riders for the i^{th} school district in year *t*;

w_{it} is the per rider wage rate of bus drivers for the i^{th} school district in year *t*;

k_{it} is the per rider cost of a bus for the i^{th} school district in year *t*;

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[21] The normal–half-normal and the normal–exponential distributions actually contain two distribution parameters, σ_v and σ_u, where σ_v is the variance of the normally distributed random error term and σ_u is the variance of the half-normal or exponentially distributed (non-negative) random variable that measures deviations from the efficient frontier. It is the distribution of this portion of the error term that is of interest here.

p_{it} is the per rider cost of petroleum and miscellaneous variable costs for the i^{th} school district in year *t*;

t represents the school year of observation (1999 = 1)

v_{it} and u_{it} are, respectively, the symmetric and one-sided random error terms defined above.

The inefficiency effects model is specified as:

$$U_{it} = \delta_0 + \delta_1 * LN\left(Miles_i^2\right) + \delta_2 * LN\left(AvgDist_{it}\right) + \delta_3 * LN\left(PCPI_{it}\right), \qquad (6)$$

where:

$Miles_i^2$ is the size in square miles of the i^{th} school district.

$AvgDist_{it}$ is an estimate of the average distance (in miles) to the nearest school for students in the i^{th} school district in year *t*.

$PCPI_{it}$ is the average per capita personal income in the i^{th} school district in year *t*.

The purpose of the inefficiency effects model is to explain differences in the cost efficiency of districts that are outside of the power of district managers. The primary exogenous factors facing a transportation manger are the size of the school districts, represented by $Miles_i^2$, and the distribution of students across the district, represented by $AvgDist_{it}$.

A primary reason for conducting frontier-based estimation is to obtain estimates of inefficiency and to explain variation in inefficiency across districts and through time. The purpose of simultaneously estimating the inefficiency effects model is to account for the factors outside the control of the districts. The resulting estimates of inefficiency are, therefore, explained by factors (seemingly) within the control of the districts. Because of the assumption that the inefficiency effects are identically distributed, estimation of an inefficiency effects model must occur simultaneously with the estimation of the underlying cost function, as opposed to through a second-stage model.[22]

[22] See Battese and Coelli (1995) for further explanation.

The composite error term of the stochastic frontier model is useful in analyzing the effect of environmental factors on the cost efficiency of student transportation. The first term, the symmetric random error (v_i), is analogous to the error term of a regular OLS regression model and represents factors or events not under the control of the transportation system of the school district. Examples of random factors having adverse effects on transportation cost efficiency include severe weather events, sudden jumps or drops in enrollment, employee strikes, and temporary road closures.[23] Such events are characterized by being short-lived (positive or negative) disruptions that affect the cost efficiency of the district, but are not under the control of the district.

In an analysis of the cost structure of Nebraska schools, Anderson and Kabir (2001) use the symmetric error term to define unique environmental factors affecting the cost efficiency of school districts as either “favorable” or “unfavorable” conditions. The authors define favorable conditions as those that help the school district reduce costs of student services and unfavorable conditions as those that increase costs. In either case, the conditions are recognized as being outside of the control of the school districts. Anderson and Kabir (2001) argue that the school aid formula should be adjusted to account for these favorable and unfavorable conditions, which are accounted for in the estimated stochastic frontier.

Data

ODE provided all data pertaining to riders, SERS enrollment spending on transportation services, or other attributes of each district’s transportation operation. Historical data on wage rates of school bus drivers were obtained from the Oregon Department of Employment. Estimates of cost of a bus were obtained from the Washington Office of Superintendent of Public Instruction. Information on historical diesel prices for Oregon was obtained from the Energy Information Administration. Geographical attributes for each district were developed based on shape file data from the Oregon Geospatial Enterprise Office, demographic information from Claritas™, and road network data from the Oregon Department of Transportation (ODOT).

Dependent Variable in Cost Equation

Total Reimbursable Cost: is the total spending on transportation costs for the i^{th} school district in year *t* that are subject to reimbursement from ODE.

Explanatory Variables in Cost Equation

Riders: is the average count of students that ride the bus to school in the morning in year *t*.

[23] Districts may also experience positive short-lived events on cost efficiency such as unusually mild winter weather.

Wage Rate is an estimate of the annual *per-rider* cost of a bus driver. The wage rate for the i^{th} school district in year *t* is a function of the average annual wage reported by the Oregon Employment Department for a school bus driver for the 15 defined workforce regions in Oregon and the number of school buses operated by the district, divided by the number of riders.[24]

$$WageRate_{it} = \left(\frac{AnnualWage_{rt} * Buses_{it}}{Riders_{it}} \right),$$

Bus Cost is an estimate of the *per-rider* cost of a bus. The average cost of a new school bus in year *t* is multiplied by the number of buses operated by the i^{th} school district in year *t*, *and* divided by 10, ODE's standard number of years for depreciation of a school bus. This yields an estimate of the total "rental cost of capital" for school buses for the i^{th} school district, which is then divided by the number of riders in year *t*.

$$BusCost_{it} = \left(\frac{NewBusCost_t * Buses_{it} / 10}{Riders_{it}} \right),$$

Fuel Cost is an estimate of the *per-rider* cost of fuel. The average cost of a gallon of #2 diesel in Oregon in year *t* is multiplied by the total number of reimbursable miles driven, and divided by 8.0, the average miles per gallon for a school bus. This yields an estimate of the total cost of fuel for the i^{th} school district, which is then divided by the number of riders in year *t*.

$$FuelCost_{it} = \left(\frac{\Pr ice_t * Miles_{it} / 8.0}{Riders_{it}} \right),$$

Control Variables in Cost Equation

Trend is a time trend variable that equals 1 for 1999, 2 for 2000, etc. It serves as a proxy for the direction and magnitude of changes in cost efficiency.

Portland is an indicator variable for the Portland School District, which provides vouchers to students to commute to and from school using the city's public transportation system.[25]

Eugene is an indicator variable for the Eugene School District, which provides vouchers to students to commute to and from school using the city's public transportation system.[26]

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[24] The standard occupational code (SOC) for school bus driver is 53-3022.

[25] Dropped from final model due to statistical insignificance.

[26] Dropped from final model due to statistical insignificance.

SERS Percent is the number of SERS students in the i^{th} school district in year *t* as a percent of total riders. SERS Percent represents the cost impact of SERS students as a function of all riders.

Year2001 is an indicator variable to account for lower ridership following the terrorist attacks of September 11, 2001.

Explanatory Variable in Inefficiency Equation

Square Miles is the geographic size of district *i* in square miles. District shape files were obtained from Oregon Geospatial Enterprise Office, Oregon School Districts. Vector Digital Data updated in 2001

Average Commute Distance is an estimate of the weighted average (road) miles that a student in district *i* must travel to reach the nearest respective school. The average distance variable accounts for the differences in distances traveled for elementary school-aged children to the nearest elementary school; middle school-aged children to the nearest middle school; high school-aged children to the nearest high school. Population data and locations were obtained from Claritas, Inc. *Socio-demographic data by Census Block Group*. Distances were calculated using ESRI. StreetMap Pro 9.3 North American Dataset.

Per Capita Personal Income is a measure of the average per capita personal income of residents in district *i* in year *t*. Population and income data were obtained from Claritas, Inc. Socio-demographic data by Census Block Group.

With the exception of the indicator variables, the trend variable, and the explanatory variable for SERS students as a percent of total riders, all variables are entered into the frontier model as natural logarithms.

Summary of Results

Maximum likelihood estimates of the parameters of the frontier cost function were obtained using the Limdep 8.0 econometric modeling program, one of only a handful of software packages that allow for frontier-based statistical analysis. Data for all eight school years (1999-00 through 2006-07) were used in the model, but only those districts with at least 250 riders were included in the model. These districts represented at least 95% of total riders and spending in each of the school years analyzed. Alternative models were considered that included all or nearly all districts, however the model's ability to represent the cost structure of the districts' transportation systems when districts of such disparate size were included was inadequate.

Results of the Frontier Cost Function

Table 1 presents the results of the SFCF and accompanying inefficiency effects model. The coefficient for the variable Riders (1.074) is statistically significantly greater than one, indicating that the "average" school district is operating at a point of diseconomies of scale. Mathematically this indicates that a 1.0% increase in riders would lead to a 1.07% increase in transportation costs, holding all else constant. In a more practical sense, this result may suggest that the average district is operating at a point beyond its efficient capacity. With no additional slack in its transportation system, even a small (unexpected) increase in riders may lead to a greater than proportional increase in costs.

Table 1: Estimation Results of Frontier Cost Function and Inefficiency Effects Model

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant	1.544	0.120	12.851	0.000
LN(Riders)	1.074	0.009	116.805	0.000
LN(Bus Cost Per Rider)	0.615	0.078	7.871	0.000
LN(Fuel Cost Per Rider)	0.266	0.013	19.818	0.000
LN(Wage Cost Per Rider)	0.119	0.075	1.592	0.111
Trend	-0.022	0.003	-6.861	0.000
SERS Percent	0.064	0.015	4.331	0.000
2001-02 School Year	0.104	0.021	5.058	0.000
Parameters in One-Sided Inefficiency Effects Model				
Constant	-11.333	68.548	-0.165	0.869
LN(Square Miles)	1.809	3.831	0.472	0.637
LN(Average Commute Distance)	2.220	5.725	0.388	0.698
LN(Per Capita Personal Income)	1.192	8.663	0.138	0.891
Variance Parameters for Compound Errors				
Lambda $\left(\lambda = \left(\sigma_u / \sigma_v\right)\right)$	6.538	13.410	0.488	0.626
Sigma $\left(\sigma_s = sqrt\left(\sigma_u^2 + \sigma_v^2\right)\right)$	1.159	2.341	0.495	0.621
Log Likelihood Function	173.5			

Source: ECONorthwest analysis of ODE and other sources of data

The next three coefficients are for the input price variables: bus costs, fuel costs, and wage rates. As expected, the three coefficients are positive, and by design the three coefficients sum to one.[27] The value of the coefficient on *bus cost per rider*, 0.615 indicates that a 10% increase in per-rider bus costs will result in an approximately 6.2% increase in transportation costs, all else held constant.[28] Similarly the coefficient on *fuel cost per rider*, 0.266, indicates that a 10% increase in fuel costs, will result in an approximately 2.7% increase in transportation costs. The estimated coefficient on *wage cost per rider*, 0.119, indicates that a 10% increase in the per-rider wage rate would lead to only a 1.2% increase in total costs. This is small relative to the coefficients on fuel and bus costs and the statistical significance of the estimated coefficient is relatively weak.[29]

The coefficient on the *trend* variable, -0.022, indicates that—holding all other factors constant—districts have increased cost efficiency by 2.2% per year. Cost efficiency is a measure of the economic performance of districts given the number of riders they must transport and the input costs they face. Simply looking at growth in transportation costs without considering growth in riders and input costs would hide this important finding. The estimated cost efficiency from the frontier model is comparable to the 2.12% back-of-the-envelope estimate calculated above in the *Transportation Riders, Miles Drive, and Spending* section. In addition to the trend variable, an indicator variable was included for the 2001-02 school year to account for the substantial drop in riders recorded for that school year.[30]

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[27] This is referred to in economics as *homogeneity of degree 1*: doubling all input prices doubles total cost.

[28] Bus costs would include the costs of maintenance and repair as well as the actual cost of buses.

[29] There are two likely reasons for the relatively low value and weak statistical significance of the wage cost coefficient, relative to the bus cost and fuel cost coefficients. First, variability in the values of an explanatory variable is necessary to develop statistical relationships. There is little regional or temporal variation in the wage cost variable, relative to the fuel cost variable. Second, unlike buses, we have no information on how many drivers, mechanics, or other transportation staff each district actually employed during the study period or how many were full-time or part-time. Instead, to develop the *wage cost per rider* variable, we approximated the number of transportation staff as being equal to the number of school buses. This is only an approximation.

Finally, it should be noted that the upper bound of the 95% confidence interval is approximately 0.27.Thus, with 95% confidence, a 10% increase in the per-rider wage cost may lead to as much as a 2.7% increase in total cost.

[30] Figure 3 in the *Transportation Riders, Miles Drive, and Spending* section indicated a drop in riders in the 2001-02 school year. Based on correspondences with ODE staff, it was suggested that this may have been in response to the terrorist attacks of September 11, 2001. Rider numbers are based on counts for the month of October and the conjecture was that some parents perceived their child would be safer if he or she did not ride the bus. Regardless of the reason for the drop, the data indicate that rider numbers rebounded in the 2002-03 school year.

Indicator variables for the *Portland* and *Eugene* school districts were considered in the cost function to account for the relationship each district has with its respective regional public transit system. [31] However, neither variable was statistically significant and their inclusion had no effect on the log likelihood function of the model. Because of this, they were dropped from the model.

The estimated coefficient for *SERS Percent* (SERS students as a percent of bus riders) is positive and significant, indicating that as the percent of a districts SERS students increases, transportation cost increases. The coefficient, 0.064 indicates that a 10% increase in SERS students as a percent of total riders would increase transportation costs by 0.64% This may not seem like a substantial increase, but on a statewide basis, a 10% increase in this ratio translates into only 124 more SERS students—less than one additional student per district. The statewide impact on total cost of this change would have been $1.5 million or $12,000 per child in the 2006-07 school year.

Results of the Inefficiency Effects Model

As Table 1 shows, none of the coefficients in the inefficiency effects equation are individually statistically significant. However, based on the results of a likelihood ratio test, we found that the explanatory variables are jointly significant and thus should be included in the model.[32] The positive coefficients for the three coefficients indicate that, all else held constant, cost *inefficiency* increases as the geographic size of a district increases (*Square Miles*), the average commuting distance to school increases (*Average Commute Distance*), and as the per capita personal income of the residents of a district increases (*Per Capita Personal Income*). Each of these variables represents an environmental factor outside of the control of a district, but which affects a district's transportation costs.

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[31] The Eugene School District does not provide direct transportation services to high school students. Rather, the district pays a monthly stipend to Lane Transit District (LTD), allowing high school students living more than 1.5 miles from an LTD bus stop, or meeting the "free/reduced" criteria to ride LTD buses for free. Similarly the Portland School District purchases TriMet bus passes for any high school student qualifying for free or reduced lunch. Students utilizing these services are not counted in the rider numbers collected by the districts, thus the data (and by connection, the statistical model) do not fully represent the transportation services funded by the district.

[32] To test whether the coefficients for square miles, average commute distance, and per capita personal income belong in the inefficiency effects equation, we conducted a likelihood ratio test, which is a statistical test for making a decision between alternative hypotheses. Formally, the null hypothesis is that the three variables do not belong in the inefficiency effects equation (i.e., that the coefficients on the three variables are jointly equal to zero).

To conduct the likelihood ratio test we first estimate the frontier cost function that is the same in all ways as the model presented in Table 1, except that it includes only the constant in the inefficiency effects equation (effectively setting the coefficients of the three variables to zero). The log likelihood function for this simpler model is 157.6. The likelihood ratio test statistic is computed as: $\lambda = -2\left(\ln\hat{L}_c - \ln\hat{L}\right)$, where $\hat{L}_c$ is the log likelihood for the constrained model and $\hat{L}$ is the log likelihood of the preferred model. The result, 51.9 was compared to a chi-square critical value of 7.8 (based on 3 degrees of freedom and an alpha of 0.05), thus rejecting the null hypothesis that the explanatory variables in the inefficiency model are jointly insignificant, despite the fact that none of the explanatory variables are individually statistically significant.

Relating Efficiency Estimates to Characteristics of Districts

There are numerous measures that one could use to attempt to explain differences among districts in cost efficiency. Typical ones include:

- Spending per rider
- Spending per mile
- Spending per school bus

Each of these can be referred to as "partial cost efficiency" measures in that they account for only one dimension of transportation and do not account for other factors affecting cost efficiency. Nevertheless, partial efficiency measures are used by many states in allocating resources to fund student transportation. A particular advantage of utilizing the frontier approach is that we are able to develop "total factor cost efficiency" measures by simultaneously considering all of the economic and environmental factors affecting transportation spending. In doing so, we provide a more complete picture of the levels of cost efficiency among districts.

Table 2 shows the cost-efficiency characteristics of districts with 250 to 750 riders for the 2006-07 school year. Districts are grouped based on their estimated cost efficiency from the frontier model. As the table shows, the estimated (total factor) cost efficiency measures correspond with the individual partial cost efficiency measures. What the table doesn't show is that the partial cost efficiency measures do not necessarily correspond with each other. In fact, the highest correlation coefficient between the rider-based, bus-based, and mile-based measures is only 0.37. Thus, many districts that appear efficient under one partial cost efficiency measure are not efficient under another.

Table 2: Cost-Efficiency Characteristics of Small Districts,* 2006-07 School Year

Efficiency Grouping	Cost Efficiency	Spending Per Rider	Spending Per Bus	Spending Per Mile
Lower Quartile	0.85	$1,232	$63,320	$4.30
Inter-quartiles	0.91	$1,101	$49,756	$3.54
Upper Quartile	0.94	$859	$37,239	$3.00
All "Small" Districts	0.90	$1,074	$50,013	$3.60

Source: ECONorthwest analysis of data from ODE and other sources

*Small districts are characterized as those with 250 to 750 riders in the 2006-07 school year

Table 3 shows a similar story for districts with 750 to 5,000 riders during the 2006-07 school year. The most cost effective districts are also the most efficient with respect to all three partial cost efficiency measures. Again, the correlations between the individual partial efficiency measures are not great (the largest is 0.51 between spending per bus and spending per mile). The average estimated efficiencies among the groupings are similar to those for the smaller districts, illustrating the ability of the frontier model to control for differences in environmental factors among districts.

Table 3: Cost-Efficiency Characteristics of Mid-Sized Districts,* 2006-07 School Year

Efficiency Grouping	Cost Efficiency	Spending Per Rider	Spending Per Bus	Spending Per Mile
Lower Quartile	0.86	$1,111	$66,131	$5.02
Inter-quartiles	0.92	$872	$51,903	$3.67
Upper Quartile	0.94	$734	$44,899	$3.18
All "Mid-Sized" Districts	0.91	$896	$53,647	$3.88

Source: ECONorthwest analysis of data from ODE and other sources

*Mid-sized districts are characterized as those with between 751 and 5,000 riders in the 2006-07 school year

Differences between the largest districts are more muted (see Table 4). This is likely due to the very small sample size (only 11 districts with more than 5,000 riders during the 2006-07 school year). Nevertheless, like the small and mid-size districts, the most cost efficient large districts have lower spending per rider, per bus, and per mile than the least cost efficient districts. The strongest correlation between the individual partial cost efficiency measures is 0.35 between spending per rider and spending per mile.

Table 4: Cost-Efficiency Characteristics of Large Districts,* 2006-07 School Year

Efficiency Grouping	Cost Efficiency	Spending Per Rider	Spending Per Bus	Spending Per Mile
Lower Quartile	0.89	$679	$69,873	$5.38
Inter-quartiles	0.91	$945	$60,403	$5.86
Upper Quartile	0.94	$627	$52,943	$3.38
All "Large" Districts	0.92	$810	$60,090	$5.10

Source: ECONorthwest analysis of data from ODE and other sources

*Large districts are characterized as those with more than 5,000 riders in the 2006-07 school year

Quantifying the Cost of Inefficiency in Student Transportation

The result of the frontier cost function can be used to examine cost efficiency at the district or aggregate level. To illustrate, Table 5 shows the total reimbursable cost of student transportation (2nd column), the estimated best practices cost (3rd column), the estimated cost of inefficiency (4th column), and the average annual cost efficiency rate (5th column) for the 1999-00 through 2006-07 school years. Over the eight-year study period, we estimate the annual cost of inefficiency in student transportation has ranged from $16.9 million to nearly $22.9 million.

Table 5: Comparison of Actual Reimbursable Transportation Cost to Estimated Best Practices Frontier Cost, Statewide

School Year	Reimbursable Cost (Actual)	Best Practices Cost Frontier	Cost of Inefficiency	Cost Efficiency Rate
1999-00	$160,368,433	$143,370,055	$16,927,478	89.4%
2000-01	$171,535,818	$153,542,798	$17,533,252	89.5%
2001-02	$179,064,926	$159,833,343	$19,467,223	89.3%
2002-03	$185,774,016	$165,243,465	$20,701,124	88.9%
2003-04	$183,944,072	$163,500,750	$20,614,831	88.9%
2004-05	$197,051,101	$175,826,665	$20,866,257	89.2%
2005-06	$214,871,695	$191,138,720	$22,886,680	89.0%
2006-07	$221,471,169	$201,248,823	$19,610,187	90.9%

Source: ECONorthwest analysis of ODE data

As the cost of student transportation grows, each percent increase (decrease) in cost efficiency increases in absolute value. For example, between the 2005-06 and 2006-07 school years, total spending increased by nearly $7 million, but the cost efficiency also increased by 1.9 percentage points resulting in a year-over-year decrease in inefficiency costs of $3.2 million (from $22.9 million to $19.6 million). Thus, the frontier model demonstrates that even as enrollment and the costs of inputs increase, districts have opportunities to increase cost efficiencies and thereby slow the overall growth in transportation spending.

Discussion

The results of the stochastic frontier cost function developed in this chapter indicate that between the 1999-00 and 2006-07 school years, student transportation in Oregon operated at approximately 90% cost efficiency. Over this same period, we estimate that on average, districts have increased their cost efficiency by approximately 2.2% per year. By doing so, districts and transportation contractors have slowed the growth in transportation spending below that which would be expected by the increase in riders and input costs over the period. The increase in cost efficiency over time represents a shifting out of the industry's cost frontier. The cost frontier embodies the best practices of student transportation operations in Oregon, not a theoretical maximum. Still, at an average relative efficiency of about 91% in 2006-07, as an industry, some student transportation operations do have room to improve cost efficiency—within the current structure of transportation funding and finance. And, because each district's estimated cost efficiency is distributed around this average, there are a few districts that have much room to improve.

The analysis presented in this paper represents a substantial step forward in analyzing school transportation funding in Oregon in three fundamental ways:

1. By developing the frontier-based cost function, we are able to estimate the best practices frontier of cost efficiency, not simply the average cost efficiency, which is all that is possible using traditional regression methods.

2. By utilizing frontier-based methods, we are able to relax the assumption that districts and contractors are successful cost minimizers in their transportation operations. Instead we assume that districts and contractors are *attempting to operate* in a cost minimizing fashion, but not all operations are likely to be equally successful.[33] Because of this assumption, we are able to estimate each operation's rate of cost efficiency.

3. Estimating the inefficiency effects equation jointly with the frontier cost function allows us to control for the key environmental factors that affect student transportation spending, but which are outside the control of the districts and contractors. By controlling for these factors, we are able to obtain cost efficiency estimates that are comparable among districts.

The frontier cost model is not without limits. Most importantly, as with any analytical method, it has substantial data needs. The data compiled in this analysis are sufficient for describing the cost structure of student transportation services in Oregon and for estimating the relative cost efficiency of districts. Because it is based on actual observable data from the districts, the frontier method is only able to develop a "relative" best practices frontier and estimate relative cost efficiencies. That is, the best practices frontier is developed and estimates of cost efficiency are derived relative to the existing system of funding transportation in Oregon. It is possible, even likely, that a different funding mechanism would yield a different frontier. A funding system with greater efficiency incentives could shift up the cost frontier as districts develop and adopt new best practices.

The frontier provides estimates of the relative cost efficiency of each district, given the environmental factors affecting it. Table 2, Table 3, and Table 4 showed that, even after accounting for differences in the environmental factors affecting each district, the high achieving districts were on average the best performers with respect to all three simple measures of cost efficiency: costs per rider, cost per bus, and cost per mile.

To fully understand the underlying factors that explain the difference in efficiency between the most and least cost efficient districts, one would need to conduct a detailed analysis of the operations and indirect cost allocations practices of the districts. An operational analysis would focus on the physical process of providing transportation services (e.g. examining the level of efficiency in routing buses and in minimizing input costs), as well as the use of and rates districts pay for drivers and other employees (e.g. do some districts pay higher than average employee compensation or allow employees to work excess overtime hours).

[33] The assumption is somewhat more complex in that we assume that districts and contractors are subject to safety, operational, and other constraints.

An analysis of indirect cost allocation practices would examine the extent to which districts allocated indirect and other administrative costs to transportation services. The approved cost method of transportation funding provides great latitude to districts to allocate indirect administrative costs to transportation functions. Certain districts may take greater advantage of this opportunity. Some of these issues can be investigated using the operational and financial information collected from the districts by ODE. Other issues may require additional information not currently collected by ODE.

Introduction

In this chapter, we present alternative methods of state funding for student transportation that the Legislature may wish to consider. For each alternative, we begin with a brief description of the method and how it would be implemented. We then discuss the practical impact the alternative is likely to have in regards to the following five goals of public finance:

- **Efficiency**. The method of revenue distribution should promote an efficient use of scarce public resources. That is, for a given level of service, delivery in a cost effective manner is preferred. The key to measuring efficiency is in knowing the desired level of service.

- **Equity**. A revenue system should distribute funds fairly across recipient agencies. Similarly-situated agencies should be treated alike. Agencies should not be penalized for factors that fall outside of their abilities to control.

- **Ease of administration, simplicity, and transparency**. All other things being equal, a revenue distribution that is relatively inexpensive to manage and administer is preferred to one that isn't. Moreover, simple and transparent distribution systems are preferred and more trusted than complex alternatives.

- **Stability and predictability**. A funding distribution that produces a stable stream of revenue with predictable cycles is generally preferred to a system with sharp increases and declines.

- **Adequacy**. A funding system should provide a level of revenue that is appropriate given the level of service that is desired by the funding agency.

For each alternative, we present estimates of how transportation funding would have been distributed among districts had that funding option been used for the 2006-07 school year. For this exercise, we assume cost neutrality of actual state funding of student transportation. That is, for each funding option, total funding across all districts will sum to actual spending, but will differ with respect to the allocation of funding across individual districts. A single table (Appendix 5) provides estimates of funding for each method for all school districts.

Options for financing

Option 1: Current Oregon System—Approved Cost

Oregon's current method of financing student transportation, approved cost, represents the baseline against which all other options are compared.

- **Efficiency**: Approved cost formulas provide weak incentives for efficiency. Under an approved cost method, school district managers to do not pay the full cost of an expansion to the transportation program or realize the full savings of a contraction. For example, districts that identify ways to deliver the same level of service, at a lower cost, are rewarded with only $0.30 for every dollar of savings they find. The state recoups the rest.

- **Equity**: A district's relative wealth and ability to fund the 30% match can determine the level of spending. Districts spending more on transportation receive greater amounts of state support.

- **Ease of administration, simplicity, and transparency**: The approved cost method is easy to administer and is familiar and transparent to the districts. In a well-run system, the administrative burden largely rests with the state. ODE must ensure that districts are submitting only reimbursable costs.

- **Stability and predictability**: Because approved cost provides funding for both variable and fixed costs facing a district, it provides a stable means of support. It is also very predicable for districts because it is based on a fixed proportion (70% or more) of their approved costs of transportation.

- **Adequacy:** As an open-ended matching program, the approved cost method scores well on the adequacy criterion. Our interviews in six districts around the state suggested that the interviewed districts were satisfied with the level of transportation service they were able to provide under the approved cost rules.

Option 2: Block Grant

Block grants represent the most general means of financing student transportation. The level of support provided through a block grant can be based on numerous different methods such as on an efficiency basis, approved cost, actual or potential riders, miles driven, etc. Regardless of the method for determining the level of support, the underlying principle of financing through block grants is that districts are largely unrestricted in how they spend the funds. Depending on how such a system is developed, block grants may provide some degree of incentive to districts to increase efficiency in transportation, thereby increasing the proportion of their costs supported by the block grant and freeing up additional resources for other uses.

To demonstrate how the block grant method may be implemented, we develop the following example to estimate the hypothetical block grant for each district for the 2006-07 school year. The process consists of three steps.

1. **Calculate Baseline Cost Per Rider:** For each district, calculate the average annual spending per rider over the 2003-04 through 2005-06 school years. These district-specific spending amounts would represent the baseline per-rider dollar amount that ODE will reimburse the districts.

2. **Calculate Input Price Inflation:** To account for changes in input prices (e.g. fuel, labor, bus, and materials costs) that districts will experience each year, we develop an inflation index of prices of the primary inputs of student transportation (wage, fuel price, and bus cost inflation), weighted by their relative contribution to total costs. Ideally, one would know with certainty how prices will change prior to the beginning of a school year. However, since this is not possible, one would develop an *ex ante* index prior to the beginning of the school year based on reasonable expectation of price inflation or deflation and then make any necessary *ex post* adjustments at the end of the school year. In our example, we do know how the prices of inputs changed during the 2006-07 school year, so there is no need to adjust.

3. **Calculate Block Grant:** To calculate the block grant for each district for the 2006-07 school year, we use the following formula:

$$BlockGrant_{2006,i} = Riders_{2006.i} * AvgSpend_i * Inflation_{2006} * 0.7$$

Where:

$BlockGrant_{2006,i}$ is the block grant amount for district *i* for 2006-07

$Riders_{2006.i}$ is the number of riders for district *i* for 2006-07[34]

$AvgSpend_i$ is the average spending per rider from the base period

[34] Note: riders would likely be estimated prior to the upcoming school year and then adjusted later based on actual counts.

$Inflation_{2006}$ is the index value of input price inflation for the 2006-07 school year

0.7 represents the reimbursement rate on transportation costs. We use 0.7 only because it is the historical rate.

The resulting block grant amounts would represent the share of each district's expected cost of transportation that the state would pay. Each district would have the incentive to reduce, to the extent practicable, their actual transportation costs and, thereby, increase the proportion of total costs paid by the state.

The expected impacts of funding student transportation using a block grant method are as follows:

- **Efficiency**: Generally, a block grant would be more efficient than the approved cost formula. Districts would keep a full dollar in savings if they identified ways to reduced costs while maintaining a constant level of service. Moreover, if costs rose though poor management of their system, the district would not receive additional matching funds.

- **Equity**: Block grants that build off of districts' historic funding levels could perpetuate inequities that exist in the current system. For example, districts that, to date, have worked hard to operate an efficient system could be disadvantaged relative to inefficient districts. That said, the state could calculate adjustments to the block grants to mitigate the inefficiencies.

- **Ease of administration, simplicity, and transparency**: Block grant systems are easy to administer and require less state oversight than the approved cost method.

- **Stability and predictability**: A block grant system is stable and predictable and would allow continued pre-payment of state support.

- **Adequacy**: From the district's perspective, the block grant system is not as flexible as the approved cost method. Therefore, the burden on district management will increase to ensure that a given level of service could be delivered for a given block grant distribution.

Change/Impact from Current Model:

The block grant would provide a very predictable dollar amount for budgetary purposes. Its ability to be an efficiency driver will depend on both the amounts selected for local support and the specificity of services required. A reduced dollar amount may be very effective in increasing local efficiencies, but only if requisite services are clearly defined and monitored. Conversely, providing a consistent support level without addressing minimum services could actually reduce efficiencies. The potential for reducing costs from the current approved cost method depends on the level of support chosen.

Table 6: Comparison of Block Grant Option to Current Funding Method

Transportation Goal	Likely Impact Compared to Current Funding System
Efficiency	Potentially increases efficiency
Equity	Could perpetuate inequities in the current system if built off of historic funding levels without adjustment; However, adjustments could be made to reward historically efficient districts.
Ease of Administration, Simplicity, Transparency	Easier to administer, simpler, and more transparent
Stability & Predictability	Increases stability & predictability
Adequacy	From the district's perspective, the method is less flexible than an open-ended match. The system would place a higher management burden on local districts to maintain a given level of service.

Source: analysis by ECONorthwest

Option 3: Average Cost Per Unit

An average cost per-unit funding formula would reimburse districts based on either an expected average cost per bus mile traveled or average cost per rider transported.[35] An average cost per-unit system is one of the simplest and most straightforward methods for reimbursement of transportation spending.

In an average cost per rider formula, districts would be reimbursed a certain dollar amount for every student transported home to school. Reimbursement rates could vary based on such factors as average time or distance traveled per rider, or number of students transported. Geographically large districts with widely distributed students and urban districts with highly congested streets may receive a higher per-rider reimbursement to compensate for greater per-rider operating costs.

Alternatively, reimbursement based on average cost per mile would, as the name suggests, compensate districts for each of the reimbursable miles traveled. Per-mile reimbursement could vary based on number of riders per mile, similar to the formula used in Arizona, or based on some measure of congestion, which adversely affects more urbanized districts. As Table 7 shows, for the 2006-07 school year, average spending per mile decreased as miles per rider increased.

[35] In fact, a per-unit formula could incorporate both costs per mile and cost per rider.

Table 7: Average Spending Per Mile For Each Quartile of Average Miles Per Rider, 2006-07 School Year

Quartile of Average Miles per Rider	Average Miles Per Rider	Average Spending Per Mile
1	173	$4.58
2	253	$3.68
3	252	$3.62
4	1,014	$2.79
All Districts	447	$3.67

Source: ECONorthwest analysis of ODE data

The districts with highest number of miles per rider tend to be rural districts and the buses tend to travel at or near free-flow speeds resulting in a relatively high number of miles traveled per hour. Comparatively, districts with relatively few miles per rider tend to be urban and the buses operate in stop-and-go traffic, resulting in many fewer miles traveled per hour. With labor cost accounting for over half of total operating costs, the result is much higher costs per mile for districts with substantial urban driving.

It is critical to note the impact transportation services for special education may have on the calculations for either cost per mile or cost per rider. Unique transportation services mandated under IDEA and Section 504 can require significant transportation expenditures on the part of an individual district. For example, one district noted for offering exceptional special needs programs estimated that 40% of its transportation resources are to fund services for students with special needs. Their data indicate approximately 10% of the students transported are receiving this specialized service. This ratio of costs to students receiving service may vary greatly between districts; however, clear and concise data are not readily available as no separate accounting for special education transportation is currently required.

Additionally, a small district with few special education resources may be forced to transport students significant distances, or purchase/lease expensive specialized vehicles that would impact local costs at a much higher rate than would be accommodated within a state average process.

The expected impacts of funding student transportation based on a per-mile method are as follows:

- **Efficiency**: If districts operated their systems below the statewide average cost, they would keep the savings. Conversely, if they ran systems above the average cost, they would bear the full additional cost. Consequently, the method would encourage more cost-efficiency than the approved cost method.

- **Equity**: If only cost per mile is used, it may provide an inequitable tool for measuring costs in urban districts where time rather than miles is the primary cost-driver. The impact of state averaging may not provide for the proper treatment of unique factors over which a local district has no control, e.g., number, location and service needs of special education students.

- **Ease of administration, simplicity, and transparency**: The system would require a validation (verification) process to insure accurate reporting, given the relationship between miles and money. Once the data collection process becomes familiar, it is replicable, easy, and transparent.

- **Stability and predictability**: If a per-rider, rather than a per-mile method is used, districts with rapidly shrinking enrollments may be penalized, regardless of required expenditures. Given the current legislative commitment to fund transportation (percentage =dollars), the leveling of state-wide averaging of operational costs could provide stability and predictability, but only if both fixed and variable costs are included.

- **Adequacy**: From the district's perspective, the system is less flexible on costs than an open-ended matching program. Moreover, this method does not address local issues that are outside the control of local districts, especially special education requirements. Additionally, it would reduce local options without a specified service waiver process that allows districts to exceed the state limits.

Change/Impact from Current Model:

Average per unit cost models can be effective tools in driving efficiencies as defined by costs, but often at the cost of inequitable distributions as the result of limited inputs. There is a potential for reducing costs from the current approved cost method as it allows a fixed cost to be identified and averaged.

Table 8: Comparison of Avg. Per-Unit Cost Option to Current Funding Method

Transportation Goal	Likely Impact Compared to Current Funding System
Efficiency	Potentially increases efficiency
Equity	Likely would reduce equity
Ease of Administration, Simplicity, Transparency	Somewhat more difficult to administer, simpler to understand, and more transparent
Stability & Predictability	Somewhat less stable & predictable
Adequacy	Less flexible than an open-ended match program from the district's perspective

Source: analysis by ECONorthwest

Option 4: Regression-based Expected Cost

The regression-based approach is one form of an efficiency-based formula and offers the opportunity to use a statistical analysis of districts' historic costs to determine the distribution of state support for pupil transportation. This approach to funding student transportation represents an increase in the level of sophistication over the options so far discussed. The regression approach would also typically have greater data requirements. For example, a theoretically consistent cost function model would ideally contain information on the most important factors affecting transportation cost, including riders transported (or miles driven) and the cost of labor, fuel, and capital. Such an empirical model would be similar to the frontier-based model developed in Chapter 4, except that it would be estimated using OLS methods and would, therefore, produce estimates of average predicted spending by district, not predicted minimum spending.

Alternatively, a simple "ad-hoc" statistical model that regresses transportation costs on riders (the primary output of student transportation) and reimbursable bus miles (the primary activity associated with student transportation) could be estimated and may be sufficient for explaining reimbursable costs of transportation spending. This simple regression model would be written as:

$$C_{it} = \beta_0 + \beta_1 Riders_{it} + \beta_2 Miles_{it} + \beta_3 Trend_{it} + \varepsilon_{it}$$

where:

C_{it} is the reimbursable cost of student transportation for the i^{th} school district in year t

$Riders_{it}$ is the number of riders for the i^{th} school district in year t

$Miles_{it}$ is the per rider wage rate of bus drivers for the i^{th} school district in year t

$Trend$ is the school year of observation (1999 = 1)

$\beta_0, \beta_1, \beta_2, \beta_3$ are regression coefficients to be estimated

ε_{it} is the symmetric random error term.

The model would be estimated based on historical data and the estimated coefficients would then be applied to the expected count of riders and number of miles for the upcoming school year. The specification of the model could be altered in a number of ways in order to account for known or likely differences between districts based on such characteristics as count of riders, rural/suburban/urban, square miles of district, number of severely disabled students (riders), etc.

The expected impacts of funding student transportation using the regression-based expected cost method are as follows:

- **Efficiency**: The method would distribute a funding amount to a district based on its characteristics, and the district would have to manage to that appropriation. Consequently, efficiency should rise.

- **Equity**: As described here, the regression method fails to consider characteristics that are unique to the district and affect costs. The system would be somewhat less equitable than the approved cost method.

- **Ease of administration, simplicity, and transparency**: Regression-based results can be opaque. It is often not easy to explain the process to either the regulator or the regulated, potentially creating a certain level of mistrust between the parties.

- **Stability and predictability**: After the initial implementation, distribution amounts would be stable and relatively easy to predict given changes in riders, wages, and fuel costs.

- **Adequacy**: From the district's perspective, the method is not as flexible as the approved cost method and would require more management from district to maintain a given level of service.

Change/Impact from Current Model:

The regression-based expected cost model has demonstrated its ability to reduce costs relative to other reimbursement models, including approved costs. However, a clear commitment to specific levels of services must be made to assure quality levels are maintained. The regression-based approach provides an opportunity for reducing costs relative to the existing approved cost method.

Table 9: Comparison of Regression-based Option to Current Funding Method

Transportation Goal	Likely Impact Compared to Current Funding System
Efficiency	Increases efficiency
Equity	As described, this simple formula does not account for a number of district-unique characteristics that affect costs; therefore, inequity rises.
Ease of Administration, Simplicity, Transparency	Relatively easy to administer, but difficult to explain to district officials
Stability & Predictability	No change in stability or predictability
Adequacy	Requires more management at district level to maintain a given level of service

Source: analysis by ECONorthwest

Option 5: Frontier efficiency formula

The frontier efficiency approach is a second form of an efficiency-based formula and is similar to the regression approach in that it is uses sophisticated statistical (or linear programming) methods to determine the level of transportation funding for each district and has significant data requirements. The frontier approach differs from the regression approach, however, in that its objective is to estimate the "frontier" performance of each district, rather than the average performance of each district.

Conceptually, the frontier performance represents the minimum cost necessary to meet a district's observed level of service (e.g. riders), given the input costs facing the district. Because the frontier efficiency model is estimated using actual data, the estimated frontier is a relative measure of efficiency in that the cost efficiency of each district is measured relative to the most cost efficient districts. The most efficient districts represent the benchmark of best practices against which other districts are compared.

A frontier efficiency model can also provide information to the districts on the impact that changes in the levels (or prices) of their inputs would have on cost efficiency. Such information can aid the districts in improving the efficiency of their operation. In addition, the model can be used to identify those districts operating under best practices. Such districts can be matched with lower-performing districts of similar characteristics (e.g. geographic size, number of riders, etc.) and, to the extent practicable, transfer the best practices to the lower performing districts.

Implementing a frontier efficiency formula that accurately accounts for the cost structure of student transportation operations and the unique environment in which each district operates would require detailed data collection on many aspects of the transportation operations of school districts. The frontier cost model presented in Chapter 4 is based on estimates of the input costs for each district, however these are generalized estimates that certainly do not account for the true distribution of costs faced by student transportation operations across the state.

The expected impacts of funding student transportation using the frontier efficiency method are as follows:

- **Efficiency**: Districts would receive a calculated dollar amount based on the known and measurable factors that drive costs. Districts that are able to deliver service below that calculated amount would keep the difference. Conversely, districts with operational costs above the calculated amount would fund the additional costs themselves. The system would encourage efficiency relative to the approved cost method.

- **Equity**: If specified correctly, the model would improve equity by recognizing—and adjusting for—the unique environmental characteristics faced by each district.

- **Ease of administration, simplicity, and transparency**: The method is relatively easy for the state to administer, but the results are difficult to explain to district officials.

- **Stability and predictability**: After the initial implementation, distribution amounts would be stable and relatively easy to predict given changes in riders, wages, and fuel costs.

- **Adequacy**: From the district's perspective, the method is not as flexible as the approved cost method and would require more management from districts to maintain a given level of service.

Change/Impact from Current Model:

The frontier efficiency model offers the greatest level of evaluation and provides opportunity to factor in multiple characteristics. It requires the greatest level of data collection, but it allows the weighting of that data to address specific site characteristics. It is difficult for many to understand but creates a dynamic target-based funding mechanism. The frontier efficiency approach provides the best opportunity for reducing costs relative to the current system, but requires close definition of mandated services to insure quality levels are maintained.

Table 10: Comparison of Frontier Efficiency Option to Current Funding Method

Transportation Goal	Likely Impact Compared to Current Funding System
Efficiency	Increases efficiency
Equity	More equitable due to accounting for environmental factors
Ease of Administration, Simplicity, Transparency	Easy for the state to administer but difficult to explain to district officials
Stability & Predictability	No change in stability or predictability
Adequacy	Requires more management at district level to maintain a given level of service.

Source: analysis by ECONorthwest

Overview

This report was charged with evaluating alternative methods of funding transportation costs for Oregon's K-12 students with a focus on reducing costs and increasing efficiency. Oregon's existing financing method—approved cost—is recognized as having weak incentives for efficiency. Districts that identify ways to deliver the same level of service, at a lower cost, are rewarded with only $0.30 for every dollar of savings they find. The state recoups the rest.

An in-depth analysis of expenditures and associated cost drivers found that the delivery of transportation has become somewhat more efficient since the 1999-00 school year. Yet, in every year examined, gaps in efficiency exist between the top and bottom performing districts. Efficiency gaps exist for all sizes of districts analyzed and generalizations regarding efficiency and operational scale cannot be made.

After having controlled for environmental factors, such as geographic size and average commute distance, we conclude the main sources of cost inefficiencies are not the relative number of buses operated by a district, nor the average distance traveled per rider; rather, it is the average cost of operation for each bus in a district's fleet. Underlying these differences may be differences in input costs and variations in indirect administration charges made to the transportation function—a practice that may differ from district to district.

The statistical model developed for this report indicates that, if all districts adopted the management practices of the most cost-efficient districts, transportation expenditures would have been about $19.6 million lower in the 2006-07 school year (a 9.0% reduction in total costs). Additional savings might accrue if districts closely examined the impact on transportation costs of the existing number and location of schools.

A change in the financing method—that resulted in districts realizing the full savings or costs of their transportation management decisions—should accelerate the move toward cost efficiency.

A Framework for a Policy Decision

A variety of policy options, outlined in Chapter 5, exist for policymakers interested in strengthening the incentives for efficiency. While efficiency is a key consideration, choosing among the options presented in Chapter 5 will require a broader decision-making framework that clarifies the goals sought for student transportation and its finance system, and then determines which options provide the best chance of meeting those goals.

Based on the information gathered in this study, a framework emerged to assist in the selection of a student transportation funding formula model. The framework consists of three steps:

1. Confirm or modify the goals sought through a funding formula.

2. Identify the finance method that helps the state and school districts meet the agreed-upon goals.

3. Communicate clearly the impact a change in the finance method would have on local school district budgets and ensure districts can maintain effective and safe operations during the implementation of the new method.

The first step, selecting goals, is critical and requires a series of questions. These include:

- Do the characteristics outlined in ORS 329.025 fully reflect policymakers' goals for the delivery of transportation services to K-12 students?

- Should those goals be expanded to address cost efficiency, funding stability, and adequacy?

- Should the system have explicit goals for the transportation of special education students?

- Should the state align its student transportation goals with its expectations for public transportation?

- Should activity transportation expenses be considered when funding school transportation as an incentive for meeting public transportation goals?

- What kind of incentives—fiscal and otherwise—could be devised to encourage districts to meet the system goals?

Upon agreement of the goals, policymakers next should select the finance method, or combination of methods, to support the goals. As an illustration, policymakers may adopt efficiency as a goal and also conclude that student transportation should be better aligned with regional public transportation plans. With those joint goals in mind, policymakers could devise a model that encourages school bus ridership among high school students and reduces general traffic in the community.

As policymakers narrow their options, they should evaluate the relative strengths and weakness of finance methods, the outcomes of similar methods, and the fiscal impact on school districts. If policymakers agree that a change in finance method is appropriate but are concerned about short-term budget impacts during a transition, they could devise hold-harmless provisions that would mitigate adverse budget impacts during a phase-in period.

Finally, the selected option and implementation process needs to be clearly communicated to the districts. Communication should clarify the goals and the changes in operational procedures and the impact on each individual district.

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