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Ample Provision: A Preliminary Study Relating Budget Composition and High School Graduation Rates in Select Washington State Public School Districts

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Central Washington University

AMPLE PROVISION:
**A Preliminary Study Relating Budget Composition and
High School Graduation Rates in Select
Washington State Public School Districts.**

Gregory Gadow

Senior Honors Thesis in Mathematics and Economics

William O. Douglas Honors College

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ABSTRACT

How to allocate scarce resources for an optimal outcome is of keen interest to those who set the budgets in public education. Simply throwing money at schools is not enough; it is important that money is spent where it will do the most good. This study considers Washington State public school districts and examines how the share of per-student expenditures in seven budget categories relates to on-time high school graduation rates. It is an investigative study, exploring whether there is enough evidence to merit further, more in-depth research. Using budget and graduation information from academic years 1997-98 through 2016-17 for a representative sample of 63 districts, I estimated several dynamic panel models. From these I identified which budget categories most heavily impact graduation rates, and over what time horizon the impacts are apparent. I found no significant correlation and concluded that this would not be a fruitful avenue for further research.

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INTRODUCTION AND LITERATURE

On 5 January 2012, the Washington Supreme Court ruled that the state was not fulfilling a constitutional mandate “to make ample provision for the education of all children residing within its borders” (Washington State Constitution, Article IX, Section 1.) The Legislature and Court went back and forth on this for several years until the matter was declared resolved on 7 June 2018. This got me thinking about how the public funding of primary and secondary education affected student outcomes, and whether “ample provision” could be objectively measured. A budget formula able to describe optimal student outcomes could be useful in making the most of a school district’s available funding.

I read several studies that looked at how spending in primary and secondary education related to student outcomes. A 2017 study in England (Gibbons, McNally, and Viareggio 2017) looked at how school funding in urban areas affected academic goals such as literacy and numeracy, and found that while there was a positive correlation between the amount of funding and desired outcomes, the allocation and timing of the expenditures were more significant. Another 2017 study (Hyman 2017) explored how variations in a funding formula implemented in Michigan in 1994 related to changes in how many high school graduates enrolled in college and later earned a postsecondary degree; they similarly found a positive correlation, but primarily within non-rural, low-poverty school that already had a track record of high achievement. Research done at Northwestern University in 2018 (Jackson, Wigger, and Xiong 2018) looked at the impact of decreased funding for public schools because of budget cuts prompted by the Great Recession of 2007-09 and found that student cohorts that experienced decreased spending had lower standardized test scores and lower graduation rates. Other studies (Roy 2011, Candelaria and Shores 2015) explored how

statewide changes in education spending equalized expenditures between poor and rich school districts, resulting in a significant improvement in outcomes in poorer districts, but the actual extent to which an increase in expenditures affected student outcomes remained unclear. It would seem that factors other than total dollar amounts needed to be considered.

One possible factor was how the money was allocated, but studies on this were difficult to find. The most recent was from 2014 (Jackson, Johnson, and Persico 2014) that focused on education finance reform: it noted how reform changed the allocation of expenditures which led to changes in graduation rates and later adult outcomes. This study found that poorer school districts saw larger increases in expenditures and a corresponding improvement in graduation rates and adult outcomes, but it was unclear whether the better outcomes were the result of more expenditures, or whether poorer outcomes prompted districts to alter their budget to improve outcomes. The only other study I was able to locate that considered budget composition was a book published 25 years ago by the Economic Policy Institute (Rothstein and Miles 1995). With apparently little research being conducted into how budget composition affects graduation rates, I decided to investigate this correlation for public school districts in Washington State.

I recognized quickly that this was an ambitious project. All of the researchers put considerable effort identifying and controlling for endogenous and exogenous variations; for example Jackson et al. (Jackson, Johnson, and Persico 2014) considered the effect of different schools in the same district implementing changes in expenditures differently (p 24) and the timing of fiscal policy changes relative to changes in the larger economy (p 25).

As a result, I decided to step back a bit from the original question. Rather than attempt to construct a model, I would take a naïve approach and investigate whether there

was enough evidence to merit a more in-depth study into the correlation of how Washington State public school districts allocate per-student expenditures and high school graduation rates.

DATA

SOURCES

Washington State law (RCW 28A.655.110) requires public school districts to provide several comprehensive reports to the state’s Office of the Superintendent of Public Instruction (OSPI), with those reports made available to the public. Data relating to total and per-student expenditures, how those expenditures were distributed, and on-time high school graduation rates were taken from these reports. Data is available from 1994 through 2016¹.

Budget data was taken from the “Percent and Per Pupil of General Fund Expenditures by Program Groups by Enrollment Groups” reports. The data are the proportions of per-student expenditures in a budget category, e.g. a value of 0.550122 in Basic Education means that 55.0122% of the per-student expenditures made in that district for that academic year went to cover programs in the Basic Education category. This removed the need to account for inflation.

The budget reports provided the per-student expenditures in ten budgetary categories. An eleventh category, “Federal Stimulus,” was added in 2008. A list of the eleven categories is given in Table 1. The constituent programs that make up each of these budget categories are given in Appendix I. From 1997 through 2002, budget data is available to four decimal places; from 2003 through 2016, budget data is available to nine decimal places.

¹ Throughout this paper, I will use the first part of an academic year to indicate the full academic year. Thus, 1994 should be read as the 1994-95 academic year.

Table 1 - All Budget Categories

Basic Education	Other Instructional
Federal Stimulus	Community Services
Special Education	Support Services
Vocational Education	Food Services
Skills Center	Transportation
Compensatory Education	

Graduation rate data was taken from the “Graduation and Dropout Statistics” reports. When different values were available, I used the adjusted 4-year cohort graduation rate given in Appendix B of the reports, which calculated graduation rate using values supplied by districts on state form P-210. Values are in the form of a percent, so 98.3 means a graduation rate of 98.3%. From 1997 through 1999, graduation data is available to two decimal places. From 2000 through 2005, graduation data is available to one decimal place. From 2006 through 2016, graduation data is available to nine decimal places. Seven graduation rates were missing from the data supplied on these reports²; five of these rates were obtained from the Washington State Report Card prepared by the OSPI to one decimal place³ (<http://reportcard.ospi.k12.wa.us>).

To get a representative sample of districts, I obtained locale data from the National Center for Educational Statistics (NCES), which categorizes Washington’s school districts into four location categories: City, Suburb, Town, or Rural. City and Suburb districts are subcategorized by size as Large, Midsize, or Small. Town and Rural districts are subcategorized by proximity to an urban block as Fringe, Distant, or Remote. The definition of these categories is given in Appendix II. A list of all Washington State public school districts and their NCES locale category is given in Appendix III.

² Creston (2014), Creston (2015), Colton (2014), Lind (2014), Grand Coulee Dam (2001), Lopez Island (2016), Palouse (2016).

³ Creston (2014), Colton (2014), Lind (2014), Lopez Island (2016), Palouse (2016).

SAMPLE SELECTION

To simplify analysis, a representative sample of school districts was used. With eleven budget categories and initially wanting to use a five period lag, I needed a sample of at least $11 * 5 + 1$, or 56, school districts.

All 296 districts were grouped into six bins according to their NCES locale subcategory (Large, Midsize, Small, Fringe, Distant, Remote) and 20% of the districts in each bin were selected. Selection was made without replacement, except that if a district did not have at least one high school during the entire 20 year period, it was replaced and another district selected instead. This resulted in 63 districts, listed in Appendix IV.

To verify that the selected districts were representative of the whole, the population of districts and the sample were separately grouped in four bins according to their NCES locale category (City, Suburb, Town, and Rural) and the proportion of the bins for the total population and the sample were compared using a two-sided proportion test. This test has a null hypothesis that the proportions are the same, and all four tests returned p-values of 1. Unable to reject the null hypothesis, I concluded that the proportions were the same and that I had a representative sample.

PREPARATION

In 1999, some data was missing for some districts; this was found by summing the budget categories and comparing them to the value 1, representing 100% of per-student expenditures. All these districts had zero expenditures in Vocational Education for that year, despite having expenditures in this category for several years before and after. I therefore took the difference from 1 and put that into Vocational Education and noted that these values were in line with expenditures in the years before and after.

Expenditures in Federal Stimulus were set by federal regulation and not by the district. Because it is not within the districts' control, it was excluded and the remaining budget categories were adjusted to compensate.

A preliminary view of the data showed that the densities for the Community Service (Figure 1), Skills Center (Figure 2) and Other Instructional (Figure 3) budget categories were highly skewed to the right. This shows that the mean value is significantly higher than the median value, i.e. that there are a small number of large outliers in the data. Just as important, the narrow width of the peaks in the Community Service and Skills Center allocations show that few districts have significant spending in these budget categories. The net result is that these factors diminish the reliability of dynamic panel model, so these categories were also omitted.

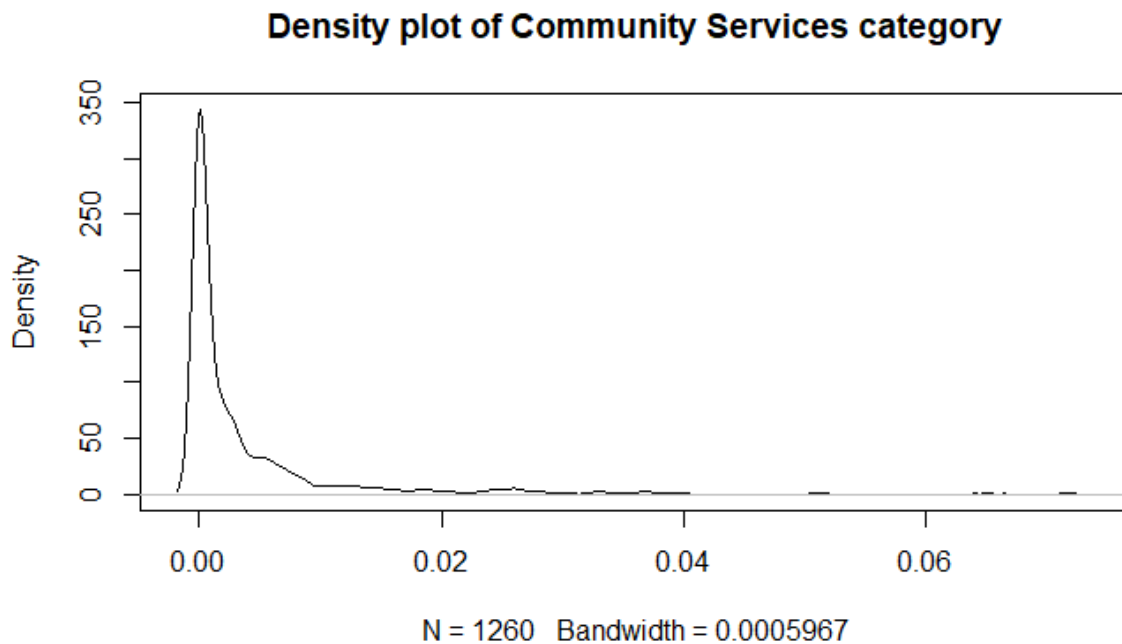


Figure 1 - Density Plot of Community Services Budget Category

Density plot of Skills Center category

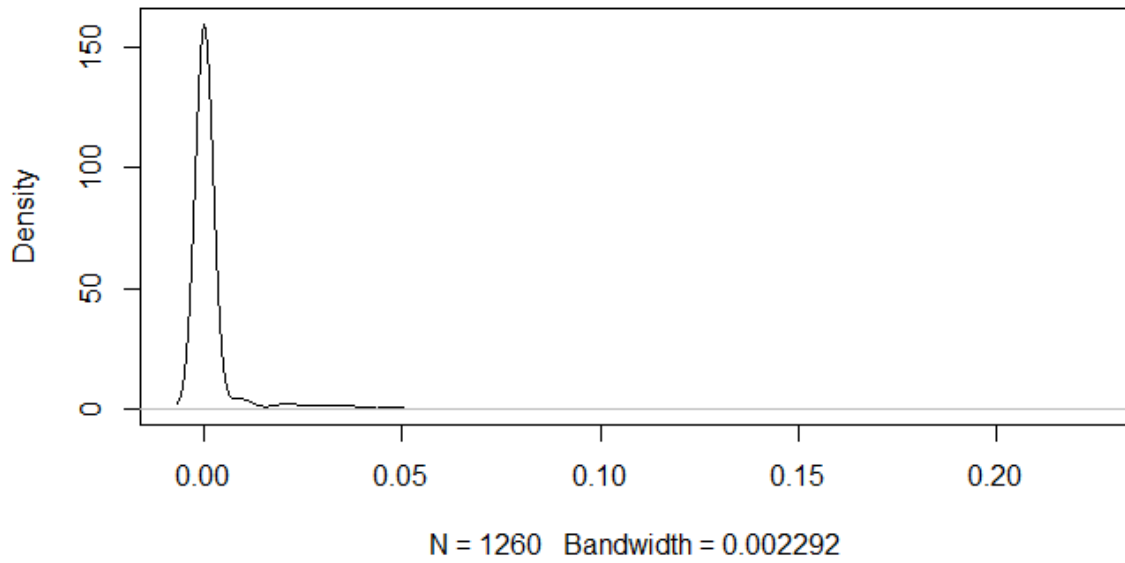


Figure 2 - Density Plot of Skills Center Budget Category

Density plot of Other Instructional category

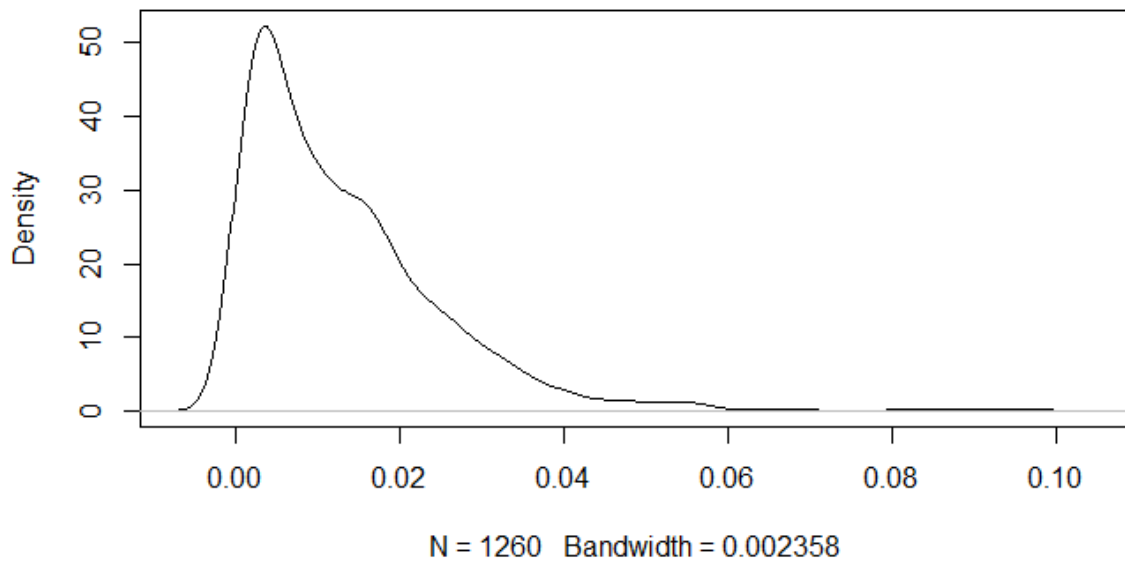


Figure 3 - Density Plot of Other Instructional Budget Category

The remaining seven budget categories that were used to investigate my question are listed in Table 2.

Table 2 - Budget Categories Used in Model

Basic Education	Support Services
Special Education	Food Services
Vocational Education	Transportation
Compensatory Education	

To illustrate the final data used the analysis, Appendix V shows the data for 2016. The column *Censored* contains the data for Community Services, Skills Center, and Other Instructional.

METHODOLOGY

The data consisted of multiple phenomena observed over time, with a lag reflecting that changes in an annual budget may affect graduation rates at some point in the future. For this type of data, the Blundell-Bond estimator method was used to find and evaluate the coefficients of the model. Analysis was done with R using the `pgmm` function from the `plm` package. Originally, the analysis was to be done with five lag periods from `lag(0)` (the current year) to `lag(4)` (the correlation of graduation rate with expenditures four years earlier.) This led to problems related to too many instruments⁴, so the number of lags was reduced to four. A p-value of 0.05 was used to evaluate the significance of the estimated coefficients. The criterion for an affirmative answer to the question was if at least one budget category showed significance over at least three consecutive lags.

⁴ “Instrument” refers to a specific variable at a specific lag.

FINDINGS

The significance of a model's coefficients is tested with a null hypothesis that there is no significant correlation between an instrument and the outcome, all other instruments being held constant. Out of 31 instruments in the model, all had p-values greater than the threshold, so this null hypothesis could not be rejected. The raw output from the analysis is given in Appendix VI.

To validate these results, several tests were conducted. The Sargan-Hansen test measures whether the instruments were overidentified, meaning that too much weight is given to their influence. It uses a null hypothesis that the instruments are not overidentified. The test returned a p-value of 1, so there was no reason to reject the null hypothesis. I concluded that the instruments are not overidentified.

The Arellano-Bond test at lags 1 and 2 was used to check for auto-correlation. Dynamic panel models have an assumption that the differences between calculated outcomes and actual outcomes are independent from one another; auto-correlation occurs when this assumption is violated, which can decrease the accuracy of the model. At lag(1), the test returned a p-value of less than 0.005, so there is solid evidence to reject the null hypothesis and conclude that there is auto-correlation from one year to the next. This is a common situation with dynamic panel models, and itself no reason to reject the analysis. The test at lag(2) is a better indication of auto-correlation within the model, and this returned a p-value of 0.27021. Here the null hypothesis cannot be rejected, and I concluded that there is no auto-correlation in the model.

The last test is the Wald test for coefficients, which evaluates the explanatory value of the model using a null hypothesis that the estimated coefficients do not have any effect on the

calculated output. This test returned a p-value of effectively zero, so there is very strong evidence to reject the null hypothesis and conclude that the estimated coefficients for the budget categories do explain graduation rates.

CONCLUSIONS

The instruments are not overidentified, there is no autocorrelation after the first lag, and the instrument coefficients explain the graduation rates, so the model is well-specified. The model shows no significant correlation between the instruments at lags 0 through 3 and high school graduation rates. Taken together, the model and the tests suggest that the composition of per-student expenditures in Washington public school districts does not correlate to high school graduation rates, and that an in-depth study of this correlation using this model is not warranted.

FURTHER RESEARCH

As noted earlier, this was a naïve analysis that used district-wide data and a sampling of all public school districts in Washington State. While censoring part of the data helped to minimize some issues, it introduced biases in the model's estimates; using the proportion of per-student expenditures gave me a consistent metric for comparing values, but having all budget categories add up to 100% introduced a level of endogeneity that makes my findings less definite. I believe it would be worth re-doing this study using inflation-adjusted dollar amounts in the various budget categories, which would fix the endogeneity and perhaps make censoring some categories unnecessary.

It may also be useful to consider a narrower focus, such as analyzing only a region or a county, or perhaps clustering districts by categories such as expenditure levels, district size,

or locale, or by demographic characteristics such as racial composition or poverty level. Such clustering would produce different models and could indicate budget categories that are more relevant for different types of districts.

Another issue is that Washington has school choice, meaning that a student can usually attend any school in the district. This muddies the picture, given that different schools within the same district typically have different budgets. It may be useful to consider only school districts with a single high school, or to consider primary, middle, and high schools separately.

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APPENDIX I – WASHINGTON STATE BUDGET CATEGORIES AND CONSTITUENT PROGRAMS

Table 3 - Budget Categories and Programs

Category	Code	Meaning
Basic Education	1	Basic education
Basic Education	2	Alternative learning experience
Basic Education	3	Dropout reengagement
Federal Stimulus	11	Title I
Federal Stimulus	12	School improvement
Federal Stimulus	13	State fiscal stabilization
Federal Stimulus	14	IDEA
Federal Stimulus	18	Competitive grants
Federal Stimulus	19	Other
Special Education	21	Supplemental - State
Special Education	22	Infants and toddlers - State
Special Education	24	Supplemental - Federal
Special Education	25	Infants and toddlers - Federal
Special Education	26	Institutions - State
Special Education	29	Other - Federal
Vocational Education	31	Basic - State
Vocational Education	34	Middle school career and technical education - State
Vocational Education	38	Federal
Vocational Education	39	Other categorical
Skill Center	45	Basic - State
Skill Center	46	Federal
Compensatory Education	51	ESEA disadvantaged - Federal
Compensatory Education	52	Other title grants under ESEA - Federal
Compensatory Education	53	ESEA migrant - Federal
Compensatory Education	54	Reading First - Federal
Compensatory Education	55	Learning assistance program - State
Compensatory Education	56	State institutions, centers, and homes - Delinquent
Compensatory Education	57	State institutions - neglected and delinquent - Federal
Compensatory Education	58	Special and pilot programs - State
Compensatory Education	59	Institutions - Juveniles in adult jails
Compensatory Education	61	Head Start - Federal
Compensatory Education	62	Math and science - professional development - Federal
Compensatory Education	63	Promoting academic success - State
Compensatory Education	64	Limited English proficiency - Federal

Category	Code	Meaning
Compensatory Education	65	Transitional bilingual - State
Compensatory Education	66	Student achievement - State
Compensatory Education	67	Indian Education - Federal - JOM
Compensatory Education	68	Indian Education - Federal - ED
Compensatory Education	69	Other
Other Instructional	71	Traffic safety
Other Instructional	73	Summer school
Other Instructional	74	Highly capable
Other Instructional	75	Professional development - State
Other Instructional	76	Targeted assistance - Federal
Other Instructional	78	Youth training programs - Federal
Other Instructional	79	Other
Community Services	81	Public radio / television
Community Services	86	Community schools
Community Services	88	Child care
Community Services	89	Other
Districtwide Support	97	Districtwide support
School Food Services	98	School food services
Pupil Transportation	99	Pupil transportation

Data obtained from the Washington State Office of the Superintendent of Public Education.

APPENDIX II – NCES LOCALE DEFINITIONS

Table 4 - NCES Locale Definitions

Location	Size/Proximity	Meaning
City	Large	Territory inside an Urbanized Area and inside a Principal City with population of 250,000 or more.
City	Midsize	Territory inside an Urbanized Area and inside a Principal City with population less than 250,000 and greater than or equal to 100,000.
City	Small	Territory inside an Urbanized Area and inside a Principal City with population less than 100,000.
Suburban	Large	Territory outside a Principal City and inside an Urbanized Area with population of 250,000 or more.
Suburban	Midsize	Territory outside a Principal City and inside an Urbanized Area with population less than 250,000 and greater than or equal to 100,000
Suburban	Small	Territory outside a Principal City and inside an Urbanized Area with population less than 100,000.
Town	Fringe	Territory inside an Urban Cluster that is less than or equal to 10 miles from an Urbanized Area.
Town	Distant	Territory inside an Urban Cluster that is more than 10 miles and less than or equal to 35 miles from an Urbanized Area.
Town	Remote	Territory inside an Urban Cluster that is more than 35 miles from an Urbanized Area.
Rural	Fringe	Census-defined rural territory that is less than or equal to 5 miles from an Urbanized Area, as well as rural territory that is less than or equal to 2.5 miles from an Urban Cluster.
Rural	Distant	Census-defined rural territory that is more than 5 miles and less than or equal to 25 miles from an Urbanized Area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an Urban Cluster.
Rural	Remote	Census-defined rural territory that is more than 25 miles from an Urbanized Area and also more than 10 miles from an Urban Cluster.

The U. S. Census defines the following terms which are used by the NCES:

- **Principal City** – The largest incorporated place within an urban block with a population of at least 10,000.
- **Rural** – Not within an urban block.
- **Urban Block** – Core census block groups, or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile.
- **Urban Cluster** – An urban block of at least 2,500 and less than 50,000 people

- **Urbanized Area** – An urban block of 50,000 people or more.

Definitions quoted from “NCES Locale Classifications and Criteria”, obtained from the National Center for Education Statistics.

APPENDIX III – NCES LOCALE DATA FOR ALL WASHINGTON PUBLIC SCHOOL DISTRICTS

Table 5 - NCES Locale Data for All Washington Public School Districts

District Name	County Name	Locale
Aberdeen School District	Grays Harbor County	Town: Remote
Adna School District	Lewis County	Rural: Distant
Almira School District	Lincoln County	Rural: Remote
Anacortes School District	Skagit County	Town: Fringe
Arlington School District	Snohomish County	Suburb: Midsize
Asotin-Anatone School District	Asotin County	Suburb: Small
Auburn School District	King County	City: Small
Bainbridge Island School District	Kitsap County	Suburb: Midsize
Battle Ground School District	Clark County	Suburb: Large
Bellevue School District	King County	City: Midsize
Bellingham School District	Whatcom County	City: Small
Benge School District	Adams County	Rural: Remote
Bethel School District	Pierce County	Suburb: Large
Bickleton School District	Klickitat County	Rural: Remote
Blaine School District	Whatcom County	Town: Fringe
Boistfort School District	Lewis County	Rural: Distant
Bremerton School District	Kitsap County	City: Small
Brewster School District	Okanogan County	Rural: Remote
Bridgeport School District	Douglas County	Rural: Remote
Brinnon School District	Jefferson County	Rural: Fringe
Burlington-Edison School District	Skagit County	Suburb: Small
Camas School District	Clark County	Suburb: Large
Cape Flattery School District	Clallam County	Rural: Remote
Carbonado School District	Pierce County	Rural: Fringe
Cascade School District	Chelan County	Town: Distant
Cashmere School District	Chelan County	Town: Fringe
Castle Rock School District	Cowlitz County	Town: Fringe
Centerville School District	Klickitat County	Rural: Distant
Central Kitsap School District	Kitsap County	City: Small
Central Valley School District	Spokane County	City: Small
Centralia School District	Lewis County	Town: Distant
Chehalis School District	Lewis County	Town: Distant
Cheney School District	Spokane County	Town: Fringe
Chewelah School District	Stevens County	Rural: Remote
Chimacum School District	Jefferson County	Rural: Fringe
Clarkston School District	Asotin County	Suburb: Small
Cle Elum-Roslyn School District	Kittitas County	Town: Distant
Clover Park School District	Pierce County	City: Small

District Name	County Name	Locale
Colfax School District	Whitman County	Town: Distant
College Place School District	Walla Walla County	Suburb: Small
Colton School District	Whitman County	Rural: Distant
Columbia (Stevens) School District	Stevens County	Rural: Remote
Columbia (Walla Walla) School District	Walla Walla County	Rural: Fringe
Colville School District	Stevens County	Town: Remote
Concrete School District	Skagit County	Rural: Distant
Conway School District	Skagit County	Rural: Fringe
Cosmopolis School District	Grays Harbor County	Town: Remote
Coulee-Hartline School District	Grant County	Rural: Remote
Coupeville School District	Island County	Rural: Fringe
Crescent School District	Clallam County	Rural: Remote
Creston School District	Lincoln County	Rural: Remote
Curlew School District	Ferry County	Rural: Remote
Cusick School District	Pend Oreille County	Rural: Remote
Damman School District	Kittitas County	Rural: Fringe
Darrington School District	Snohomish County	Rural: Distant
Davenport School District	Lincoln County	Rural: Distant
Dayton School District	Columbia County	Town: Distant
Deer Park School District	Spokane County	Rural: Fringe
Dieringer School District	Pierce County	Suburb: Large
Dixie School District	Walla Walla County	Rural: Distant
East Valley School District (Spokane)	Spokane County	City: Small
East Valley School District (Yakima)	Yakima County	Suburb: Midsize
Eastmont School District	Douglas County	Suburb: Small
Easton School District	Kittitas County	Rural: Distant
Eatonville School District	Pierce County	Town: Distant
Edmonds School District	Snohomish County	Suburb: Large
Ellensburg School District	Kittitas County	Town: Distant
Elma School District	Grays Harbor County	Town: Distant
Endicott School District	Whitman County	Rural: Remote
Entiat School District	Chelan County	Rural: Distant
Enumclaw School District	King County	Suburb: Large
Ephrata School District	Grant County	Town: Distant
Evaline School District	Lewis County	Rural: Fringe
Everett School District	Snohomish County	City: Midsize
Evergreen School District (Clark)	Clark County	City: Midsize
Evergreen School District (Stevens)	Stevens County	Rural: Remote
Federal Way School District	King County	Suburb: Large
Ferndale School District	Whatcom County	Suburb: Midsize
Fife School District	Pierce County	Suburb: Large
Finley School District	Benton County	Suburb: Midsize

District Name	County Name	Locale
Franklin Pierce School District	Pierce County	Suburb: Large
Freeman School District	Spokane County	Rural: Distant
Garfield School District	Whitman County	Rural: Remote
Glenwood School District	Klickitat County	Rural: Remote
Goldendale School District	Klickitat County	Town: Remote
Grand Coulee Dam School District	Douglas County	Rural: Remote
Grandview School District	Yakima County	Town: Distant
Granger School District	Yakima County	Town: Distant
Granite Falls School District	Snohomish County	Town: Fringe
Grapeview School District	Mason County	Rural: Distant
Great Northern School District	Spokane County	Rural: Fringe
Green Mountain School District	Clark County	Rural: Distant
Griffin School District	Thurston County	Suburb: Midsize
Harrington School District	Lincoln County	Rural: Remote
Highland School District	Yakima County	Rural: Fringe
Highline School District	King County	Suburb: Large
Hockinson School District	Clark County	Rural: Fringe
Hood Canal School District	Mason County	Rural: Distant
Hoquiam School District	Grays Harbor County	Town: Remote
Inchelium School District	Ferry County	Rural: Remote
Index School District	Snohomish County	Rural: Distant
Issaquah School District	King County	Suburb: Large
Kahlotus School District	Franklin County	Rural: Remote
Kalama School District	Cowlitz County	Rural: Fringe
Keller School District	Ferry County	Rural: Remote
Kelso School District	Cowlitz County	Suburb: Small
Kennewick School District	Benton County	City: Small
Kent School District	King County	City: Midsize
Kettle Falls School District	Stevens County	Rural: Distant
Kiona-Benton City School District	Benton County	Town: Fringe
Kittitas School District	Kittitas County	Rural: Distant
Klickitat School District	Klickitat County	Rural: Remote
La Center School District	Clark County	Town: Fringe
La Conner School District	Skagit County	Town: Fringe
LaCrosse School District	Whitman County	Rural: Remote
Lake Chelan School District	Chelan County	Rural: Fringe
Lake Quinalt School District	Grays Harbor County	Rural: Remote
Lake Stevens School District	Snohomish County	Suburb: Midsize
Lake Washington School District	King County	Suburb: Large
Lakewood School District	Snohomish County	Suburb: Midsize
Lamont School District	Whitman County	Rural: Remote
Liberty School District	Spokane County	Rural: Distant

District Name	County Name	Locale
Lind School District	Adams County	Rural: Remote
Longview School District	Cowlitz County	City: Small
Loon Lake School District	Stevens County	Rural: Distant
Lopez School District	San Juan County	Rural: Distant
Lyle School District	Klickitat County	Rural: Distant
Lynden School District	Whatcom County	Town: Fringe
Mabton School District	Yakima County	Rural: Fringe
Mansfield School District	Douglas County	Rural: Remote
Manson School District	Chelan County	Town: Distant
Mary M Knight School District	Mason County	Rural: Distant
Mary Walker School District	Stevens County	Rural: Distant
Marysville School District	Snohomish County	Suburb: Midsize
McCleary School District	Grays Harbor County	Rural: Distant
Mead School District	Spokane County	Suburb: Large
Medical Lake School District	Spokane County	Town: Fringe
Mercer Island School District	King County	Suburb: Large
Meridian School District	Whatcom County	Rural: Fringe
Methow Valley School District	Okanogan County	Rural: Remote
Mill A School District	Skamania County	Rural: Distant
Monroe School District	Snohomish County	Suburb: Large
Montesano School District	Grays Harbor County	Town: Distant
Morton School District	Lewis County	Rural: Remote
Moses Lake School District	Grant County	Town: Remote
Mossyrock School District	Lewis County	Rural: Remote
Mount Adams School District	Yakima County	Rural: Distant
Mount Baker School District	Whatcom County	Rural: Fringe
Mount Pleasant School District	Skamania County	Rural: Fringe
Mount Vernon School District	Skagit County	City: Small
Mukilteo School District	Snohomish County	Suburb: Large
Naches Valley School District	Yakima County	Suburb: Midsize
Napavine School District	Lewis County	Town: Distant
Naselle-Grays River Valley School District	Pacific County	Rural: Remote
Nespelem School District	Okanogan County	Rural: Remote
Newport School District	Pend Oreille County	Town: Distant
Nine Mile Falls School District	Spokane County	Town: Fringe
Nooksack Valley School District	Whatcom County	Rural: Fringe
North Beach School District	Grays Harbor County	Rural: Fringe
North Franklin School District	Franklin County	Rural: Fringe
North Kitsap School District	Kitsap County	Suburb: Midsize
North Mason School District	Mason County	Rural: Fringe
North River School District	Pacific County	Rural: Remote
North Thurston Public Schools	Thurston County	Suburb: Midsize

District Name	County Name	Locale
Northport School District	Stevens County	Rural: Remote
Northshore School District	Snohomish County	Suburb: Large
Oak Harbor School District	Island County	Town: Distant
Oakesdale School District	Whitman County	Rural: Remote
Oakville School District	Grays Harbor County	Rural: Distant
Ocean Beach School District	Pacific County	Rural: Distant
Ocosta School District	Grays Harbor County	Rural: Distant
Odessa School District	Lincoln County	Rural: Remote
Okanogan School District	Okanogan County	Town: Remote
Olympia School District	Thurston County	City: Small
Omak School District	Okanogan County	Town: Remote
Onalaska School District	Lewis County	Rural: Distant
Onion Creek School District	Stevens County	Rural: Remote
Orcas Island School District	San Juan County	Rural: Distant
Orchard Prairie School District	Spokane County	Rural: Fringe
Orient School District	Ferry County	Rural: Remote
Orondo School District	Douglas County	Rural: Distant
Oroville School District	Okanogan County	Rural: Remote
Orting School District	Pierce County	Suburb: Large
Othello School District	Adams County	Town: Distant
Palisades School District	Douglas County	Rural: Distant
Palouse School District	Whitman County	Rural: Remote
Pasco School District	Franklin County	Suburb: Midsize
Pateros School District	Okanogan County	Rural: Remote
Paterson School District	Benton County	Rural: Distant
Pe Ell School District	Lewis County	Rural: Remote
Peninsula School District	Pierce County	Suburb: Large
Pioneer School District	Mason County	Rural: Fringe
Pomeroy School District	Garfield County	Rural: Distant
Port Angeles School District	Clallam County	Town: Remote
Port Townsend School District	Jefferson County	Town: Distant
Prescott School District	Walla Walla County	Rural: Distant
Prosser School District	Benton County	Town: Distant
Pullman School District	Whitman County	Town: Distant
Puyallup School District	Pierce County	Suburb: Large
Queets-Clearwater School District	Jefferson County	Rural: Remote
Quilcene School District	Jefferson County	Rural: Distant
Quillayute Valley School District	Clallam County	Town: Remote
Quincy School District	Grant County	Town: Distant
Rainier School District	Thurston County	Rural: Distant
Raymond School District	Pacific County	Rural: Fringe
Reardan-Edwall School District	Lincoln County	Rural: Distant

District Name	County Name	Locale
Renton School District	King County	City: Small
Republic School District	Ferry County	Rural: Remote
Richland School District	Benton County	City: Small
Ridgefield School District	Clark County	Town: Fringe
Ritzville School District	Adams County	Rural: Remote
Riverside School District	Spokane County	Rural: Distant
Riverview School District	King County	Suburb: Large
Rochester School District	Thurston County	Rural: Fringe
Roosevelt School District	Klickitat County	Rural: Remote
Rosalia School District	Whitman County	Rural: Distant
Royal School District	Grant County	Rural: Remote
San Juan Island School District	San Juan County	Rural: Remote
Satsop School District	Grays Harbor County	Town: Distant
Seattle Public Schools	King County	City: Large
Sedro-Woolley School District	Skagit County	Suburb: Small
Selah School District	Yakima County	Suburb: Midsize
Selkirk School District	Pend Oreille County	Rural: Remote
Sequim School District	Clallam County	Town: Distant
Shaw Island School District	San Juan County	Rural: Distant
Shelton School District	Mason County	Town: Distant
Shoreline School District	King County	Suburb: Large
Skamania School District	Skamania County	Rural: Distant
Skykomish School District	King County	Rural: Distant
Snohomish School District	Snohomish County	Suburb: Midsize
Snoqualmie Valley School District	King County	Town: Fringe
Soap Lake School District	Grant County	Rural: Distant
South Bend School District	Pacific County	Town: Remote
South Kitsap School District	Kitsap County	Suburb: Midsize
South Whidbey School District	Island County	Rural: Distant
Southside School District	Mason County	Town: Distant
Spokane School District	Spokane County	City: Midsize
Sprague School District	Lincoln County	Rural: Remote
St. John School District	Whitman County	Rural: Remote
Stanwood-Camano School District	Snohomish County	Town: Fringe
Star School District No. 054	Franklin County	Rural: Distant
Starbuck School District	Columbia County	Rural: Remote
Stehekin School District	Chelan County	Rural: Remote
Steilacoom Hist. School District	Pierce County	Suburb: Large
Step toe School District	Whitman County	Rural: Distant
Stevenson-Carson School District	Skamania County	Rural: Distant
Sultan School District	Snohomish County	Town: Fringe
Summit Valley School District	Stevens County	Rural: Remote

District Name	County Name	Locale
Sumner School District	Pierce County	Suburb: Large
Sunnyside School District	Yakima County	Town: Distant
Suquamish Tribal Education Department	Kitsap County	Suburb: Midsize
Tacoma School District	Pierce County	City: Midsize
Taholah School District	Grays Harbor County	Rural: Remote
Tahoma School District	King County	Suburb: Large
Tekoa School District	Whitman County	Rural: Remote
Tenino School District	Thurston County	Rural: Distant
Thorp School District	Kittitas County	Rural: Distant
Toledo School District	Lewis County	Rural: Distant
Tonasket School District	Okanogan County	Rural: Remote
Toppenish School District	Yakima County	Town: Distant
Touchet School District	Walla Walla County	Rural: Distant
Toutle Lake School District	Cowlitz County	Rural: Distant
Trout Lake School District	Klickitat County	Rural: Remote
Tukwila School District	King County	Suburb: Large
Tumwater School District	Thurston County	City: Small
Union Gap School District	Yakima County	Suburb: Midsize
University Place School District	Pierce County	Suburb: Large
Valley School District	Stevens County	Rural: Remote
Vancouver School District	Clark County	Suburb: Large
Vashon Island School District	King County	Rural: Fringe
Wahkiakum School District	Wahkiakum County	Rural: Distant
Wahluke School District	Grant County	Rural: Fringe
Waitsburg School District	Walla Walla County	Rural: Distant
Walla Walla Public Schools	Walla Walla County	City: Small
Wapato School District	Yakima County	Town: Fringe
Warden School District	Grant County	Town: Remote
Washougal School District	Clark County	Suburb: Large
Washtucna School District	Adams County	Rural: Remote
Waterville School District	Douglas County	Rural: Distant
Wellpinit School District	Stevens County	Rural: Distant
Wenatchee School District	Chelan County	City: Small
West Valley School District (Spokane)	Spokane County	City: Small
West Valley School District (Yakima)	Yakima County	City: Small
White Pass School District	Lewis County	Rural: Remote
White River School District	Pierce County	Suburb: Large
White Salmon Valley School District	Klickitat County	Rural: Fringe
Wilbur School District	Lincoln County	Rural: Remote
Willapa Valley School District	Pacific County	Rural: Distant
Wilson Creek School District	Grant County	Rural: Remote
Winlock School District	Lewis County	Rural: Distant

District Name	County Name	Locale
Wishkah Valley School District	Grays Harbor County	Rural: Distant
Wishram School District	Klickitat County	Rural: Distant
Woodland School District	Cowlitz County	Town: Distant
Yakima School District	Yakima County	City: Small
Yelm School District	Thurston County	Town: Fringe
Zillah School District	Yakima County	Town: Distant

Data obtained from the National Center for Education Statistics. Details for Locale are given in Appendix II.

APPENDIX IV –PUBLIC SCHOOL DISTRICTS USED IN STUDY

Table 6 - List of Districts In Sample

District	County	Location	Size/Proximity
Aberdeen	Grays Harbor	Town	Remote
Adna	Lewis	Rural	Distant
Arlington	Snohomish	Suburb	Midsized
Chewelah	Stevens	Rural	Remote
Clover Park	Pierce	City	Small
Colfax	Whitman	Town	Distant
Colton	Whitman	Rural	Distant
Concrete	Skagit	Rural	Distant
Coupeville	Island	Rural	Fringe
Creston	Lincoln	Rural	Remote
Cusick	Pend Oreille	Rural	Remote
Darrington	Snohomish	Rural	Distant
Eastmont	Douglas	Suburb	Small
Edmonds	Snohomish	Suburb	Large
Entiat	Chelan	Rural	Distant
Evergreen	Stevens	Rural	Remote
Fife	Pierce	Suburb	Large
Freeman	Spokane	Rural	Distant
Grand Coulee Dam	Grant	Rural	Remote
Granite Falls	Snohomish	Town	Fringe
Highline	King	Suburb	Large
Hoquiam	Grays Harbor	Town	Remote
Kalama	Cowlitz	Rural	Fringe
Kelso	Cowlitz	Suburb	Small
Kent	King	City	Midsized
Lake Chelan	Chelan	Rural	Fringe
Lind	Adams	Rural	Remote
Longview	Cowlitz	City	Small
Lopez Island	San Juan	Rural	Distant
Lynden	Whatcom	Town	Fringe
Mabton	Yakima	Rural	Fringe
Marysville	Snohomish	Suburb	Midsized
Mead	Spokane	Suburb	Large
Mercer Island	King	Suburb	Large
Morton	Lewis	Rural	Remote
Mossyrock	Lewis	Rural	Remote
Napavine	Lewis	Town	Distant
Nooksack Valley	Whatcom	Rural	Fringe

District	County	Location	Size/Proximity
North Beach	Grays Harbor	Rural	Fringe
North Kitsap	Kitsap	Suburb	Midsized
Onalaska	Lewis	Rural	Distant
Orcas Island	San Juan	Rural	Distant
Palouse	Whitman	Rural	Remote
Pateros	Okanogan	Rural	Remote
Port Angeles	Clallam	Town	Remote
Quilcene	Jefferson	Rural	Distant
Rainier	Thurston	Rural	Distant
Richland	Benton	City	Small
Royal	Grant	Rural	Remote
Shelton	Mason	Town	Distant
Spokane	Spokane	City	Midsized
Stevenson-Carson	Skamania	Rural	Distant
Sultan	Snohomish	Town	Fringe
Sunnyside	Yakima	Town	Distant
Tekoa	Whitman	Rural	Remote
Touchet	Walla Walla	Rural	Distant
University Place	Pierce	Suburb	Large
Walla Walla	Walla Walla	City	Small
Washougal	Clark	Suburb	Large
Waterville	Douglas	Rural	Distant
Wilbur	Lincoln	Rural	Remote
Yelm	Thurston	Town	Fringe
Zillah	Yakima	Town	Distant

Details for Location and Size/Proximity categories are given in Appendix II.

APPENDIX V – DATA FOR 2016

Table 7 - 2016 Data, Part A

District	Year	Basic Education	Special Education	Vocational Education
Aberdeen	2016	0.47837053	0.13367730	0.04412136
Adna	2016	0.53976532	0.09598446	0.05157491
Arlington	2016	0.59042645	0.13560198	0.03628003
Chewelah	2016	0.52251815	0.10345640	0.04148161
Clover Park	2016	0.50007118	0.14505745	0.02806443
Colfax	2016	0.51077284	0.09043299	0.04906085
Colton	2016	0.53817967	0.06996610	0.04280385
Concrete	2016	0.49480975	0.11463425	0.01526800
Coupeville	2016	0.57655918	0.11924780	0.00949910
Creston	2016	0.50979969	0.07868765	0.01686584
Cusick	2016	0.50899832	0.07400685	0.03076869
Darrington	2016	0.47085610	0.11146947	0.02684358
Eastmont	2016	0.57378408	0.10015066	0.04650882
Edmonds	2016	0.58153782	0.15212022	0.02976176
Entiat	2016	0.55497711	0.06712825	0.01304609
Fife	2016	0.54649846	0.11939707	0.04599505
Freeman	2016	0.55131799	0.09957002	0.04893592
Grand Coulee Dam	2016	0.47867394	0.10906132	0.04477225
Granite Falls	2016	0.50911729	0.17476646	0.04130928
Highline	2016	0.53097467	0.13481061	0.02507342
Hoquiam	2016	0.48962485	0.10614338	0.04009053
Kalama	2016	0.61167802	0.10493471	0.02049098
Kelso	2016	0.55248335	0.13082450	0.03874885
Kent	2016	0.58984789	0.13221133	0.02747538
Lake Chelan	2016	0.51787757	0.08839170	0.04012785
Lind	2016	0.38890815	0.05732123	0.05170759
Longview	2016	0.52960923	0.14038477	0.02908240
Lopez Island	2016	0.56060046	0.08875679	0.00428042
Lynden	2016	0.56937334	0.15639311	0.03770414
Mabton	2016	0.47435981	0.08026664	0.04179497
Marysville	2016	0.52791320	0.13587895	0.03669091
Mead	2016	0.57832053	0.12688962	0.04548497
Mercer Island	2016	0.59885506	0.13452465	0.02209284
Morton	2016	0.42682637	0.11360159	0.06367181
Mossyrock	2016	0.49826082	0.11489302	0.04927708
Napavine	2016	0.53852353	0.15271324	0.03904519
Nooksack Valley	2016	0.55095497	0.12603952	0.02730342
North Beach	2016	0.47958420	0.12908736	0.02925805
North Kitsap	2016	0.56165925	0.13794972	0.03426982

District	Year	Basic Education	Special Education	Vocational Education
Odessa	2016	0.56202561	0.07018639	0.02816820
Onalaska	2016	0.50729816	0.13109695	0.06139497
Orcas Island	2016	0.58697594	0.11662282	0.01713876
Palouse	2016	0.55433331	0.08369355	0.05060003
Pateros	2016	0.41647883	0.07532442	0.03921105
Port Angeles	2016	0.52693566	0.13519463	0.02874055
Quilcene	2016	0.60146486	0.09867699	0.02214394
Rainier	2016	0.51615989	0.09684633	0.05641048
Richland	2016	0.60863123	0.11158942	0.02408953
Royal	2016	0.53745167	0.07448184	0.03015784
Shelton	2016	0.51905125	0.12942735	0.04204202
Spokane	2016	0.53550888	0.13150925	0.02995867
Stevenson-Carson	2016	0.54960523	0.10053118	0.02258369
Sultan	2016	0.54404550	0.14222547	0.03607756
Sunnyside	2016	0.46778847	0.10288617	0.02065040
Tekoa	2016	0.49961228	0.07709663	0.04079125
Touchet	2016	0.49475194	0.07055675	0.04096419
University Place	2016	0.59471799	0.12610102	0.02502238
Walla Walla	2016	0.53412579	0.11248117	0.02547796
Washougal	2016	0.54643197	0.13675797	0.03718435
Waterville	2016	0.55145886	0.07978242	0.01996825
Wilbur	2016	0.51348880	0.10442387	0.01362459
Yelm	2016	0.53972647	0.12943253	0.04199604
Zillah	2016	0.50940346	0.08824760	0.01816323

Table 8 - 2016 Data, Part B

District	Year	Compensatory Education	Support Services	Food Services
Aberdeen	2016	0.12697102	0.12764185	0.04402758
Adna	2016	0.05454479	0.16963406	0.03590339
Arlington	2016	0.04046253	0.11444602	0.02754496
Chewelah	2016	0.08489907	0.15469361	0.04066513
Clover Park	2016	0.08827837	0.13474646	0.03895558
Colfax	2016	0.03472183	0.21665401	0.03649603
Colton	2016	0.02203255	0.19410036	0.03184294
Concrete	2016	0.07152336	0.18771903	0.04641381
Coupeville	2016	0.05564060	0.18387477	0.02282575
Creston	2016	0.03861601	0.24837020	0.03468973
Cusick	2016	0.07210433	0.21266259	0.04047703
Darrington	2016	0.07709773	0.18722980	0.02960004
Eastmont	2016	0.07877612	0.12821815	0.03797191
Edmonds	2016	0.04789051	0.11380662	0.01965949

District	Year	Compensatory Education	Support Services	Food Services
Entiat	2016	0.06523336	0.21849702	0.03912271
Fife	2016	0.05155410	0.15631405	0.03031573
Freeman	2016	0.02816002	0.17012562	0.03646379
Grand Coulee Dam	2016	0.08875413	0.18305059	0.04101355
Granite Falls	2016	0.03550158	0.13647949	0.02891721
Highline	2016	0.09673147	0.11924178	0.03359659
Hoquiam	2016	0.07774280	0.17556799	0.04513862
Kalama	2016	0.03330712	0.15532129	0.02696777
Kelso	2016	0.05856584	0.13809301	0.04025657
Kent	2016	0.06407365	0.12155636	0.03036750
Lake Chelan	2016	0.08896547	0.16065202	0.04980481
Lind	2016	0.06592137	0.18291522	0.04780450
Longview	2016	0.06452990	0.16391262	0.03818134
Lopez Island	2016	0.04566341	0.21404234	0.03546228
Lynden	2016	0.04431167	0.12762198	0.02651890
Mabton	2016	0.12748774	0.20123002	0.05265626
Marysville	2016	0.05512766	0.12942445	0.03148584
Mead	2016	0.03464797	0.14014522	0.02902458
Mercer Island	2016	0.01776314	0.15003678	0.03058700
Morton	2016	0.06364046	0.24159074	0.04377941
Mossyrock	2016	0.07597367	0.17353529	0.03568700
Napavine	2016	0.04093949	0.16173527	0.02867222
Nooksack Valley	2016	0.05873627	0.13215041	0.03562820
North Beach	2016	0.06514197	0.18400086	0.04307191
North Kitsap	2016	0.04036114	0.13994023	0.02631392
Odessa	2016	0.04319571	0.18089676	0.03369161
Onalaska	2016	0.05711062	0.15323628	0.03655849
Orcas Island	2016	0.03355690	0.18702374	0.02702873
Palouse	2016	0.03996096	0.23369267	0.02446670
Pateros	2016	0.07044432	0.30372500	0.03864700
Port Angeles	2016	0.05924916	0.14151895	0.03304075
Quilcene	2016	0.03531582	0.16700955	0.01933465
Rainier	2016	0.04038422	0.20541883	0.04337498
Richland	2016	0.03770203	0.15759320	0.02632755
Royal	2016	0.11632795	0.15292140	0.04106706
Shelton	2016	0.07444960	0.13528248	0.03053651
Spokane	2016	0.07741547	0.12152950	0.03738443
Stevenson-Carson	2016	0.05925345	0.16215251	0.03989404
Sultan	2016	0.04514165	0.14632129	0.03463118
Sunnyside	2016	0.15323310	0.15979058	0.05983515
Tekoa	2016	0.07363796	0.19676156	0.04680407
Touchet	2016	0.06726260	0.24892751	0.05044054

District	Year	Compensatory Education	Support Services	Food Services
University Place	2016	0.03902040	0.13658286	0.03681707
Walla Walla	2016	0.08223738	0.16426067	0.03556851
Washougal	2016	0.03588338	0.15715437	0.02622791
Waterville	2016	0.05748772	0.20872158	0.03518045
Wilbur	2016	0.04859904	0.21806737	0.03138671
Yelm	2016	0.04328580	0.15617048	0.03238875
Zillah	2016	0.08628645	0.20508457	0.04463696

Table 9 - 2016 Data, Part C

District	Year	Transportation	Censored	Grad Rate
Aberdeen	2016	0.02224772	0.02294264	74.69879518
Adna	2016	0.05106652	0.00152656	96.77419355
Arlington	2016	0.04508242	0.01015561	81.66666667
Chewelah	2016	0.04989551	0.00239053	85.54216867
Clover Park	2016	0.03928918	0.02553735	88.67187500
Colfax	2016	0.05797899	0.00388245	85.71428571
Colton	2016	0.04381198	0.05726256	83.33333333
Concrete	2016	0.06337072	0.00626109	69.38775510
Coupeville	2016	0.03124563	0.00110717	96.96969697
Creston	2016	0.06116124	0.01180964	90.00000000
Cusick	2016	0.05231698	0.00866521	100.00000000
Darrington	2016	0.03772789	0.05917540	80.00000000
Eastmont	2016	0.02057095	0.01401931	87.52735230
Edmonds	2016	0.04349764	0.01172594	82.15423837
Entiat	2016	0.03266100	0.00933446	95.45454545
Fife	2016	0.04606272	0.00386283	86.28318584
Freeman	2016	0.05943028	0.00599636	92.68292683
Grand Coulee Dam	2016	0.04391745	0.01075676	69.23076923
Granite Falls	2016	0.04773370	0.02617499	74.27184466
Highline	2016	0.03002477	0.02954669	78.78554958
Hoquiam	2016	0.03507188	0.03061996	75.21367521
Kalama	2016	0.04593274	0.00136737	92.18750000
Kelso	2016	0.03340693	0.00762095	84.25414365
Kent	2016	0.03168780	0.00278009	78.76890975
Lake Chelan	2016	0.03703663	0.01714395	77.86259542
Lind	2016	0.19653469	0.00888725	61.53846154
Longview	2016	0.03173417	0.00256558	81.27572016
Lopez Island	2016	0.03772141	0.01347289	65.00000000
Lynden	2016	0.03099139	0.00708548	88.68778281
Mabton	2016	0.01489457	0.00731001	78.18181818
Marysville	2016	0.04441031	0.03906869	76.90447400
Mead	2016	0.04092986	0.00455725	91.84177998

District	Year	Transportation	Censored	Grad Rate
Mercer Island	2016	0.03749420	0.00864634	94.56193353
Morton	2016	0.04631155	0.00057808	89.65517241
Mossyrock	2016	0.05009741	0.00227571	89.47368421
Napavine	2016	0.03712610	0.00124497	90.56603774
Nooksack Valley	2016	0.04335238	0.02583484	79.79797980
North Beach	2016	0.06288743	0.00696823	78.43137255
North Kitsap	2016	0.04912902	0.01037691	88.22269807
Odessa	2016	0.07525084	0.00658489	94.73684211
Onalaska	2016	0.05208017	0.00122437	93.47826087
Orcas Island	2016	0.01799068	0.01366243	96.55172414
Palouse	2016	0.00000000	0.01325279	90.00000000
Pateros	2016	0.03886088	0.01730851	96.00000000
Port Angeles	2016	0.03233704	0.04298326	79.46127946
Quilcene	2016	0.04554600	0.01050820	69.23076923
Rainier	2016	0.03991794	0.00148734	83.33333333
Richland	2016	0.02563144	0.00843560	76.61691542
Royal	2016	0.04670737	0.00088487	80.53097345
Shelton	2016	0.04194852	0.02726228	76.20253165
Spokane	2016	0.02874498	0.03794881	85.59488692
Stevenson-Carson	2016	0.04852553	0.01745437	82.27848101
Sultan	2016	0.04954332	0.00201403	82.14285714
Sunnyside	2016	0.02985286	0.00596329	90.16018307
Tekoa	2016	0.03083338	0.03446286	85.00000000
Touchet	2016	0.02687795	0.00021853	100.00000000
University Place	2016	0.03125070	0.01048759	90.97065463
Walla Walla	2016	0.01948642	0.02636211	75.13914657
Washougal	2016	0.04497144	0.01538861	82.77511962
Waterville	2016	0.03345640	0.01394437	79.16666667
Wilbur	2016	0.06939651	0.00101311	96.55172414
Yelm	2016	0.04795131	0.00904863	77.11670481
Zillah	2016	0.02583438	0.02234336	94.49541284

APPENDIX VI – RAW OUTPUT OF ANALYSIS

Oneway (individual) effect Two steps model

Call:

```
pgmm(formula = Grad.Rate ~ lag(Grad.Rate, 1:3) + lag(Basic.Education,
  0:3) + lag(Special.Education, 0:3) + lag(Vocational.Education,
  0:3) + lag(Compensatory.Education, 0:3) + lag(Support.Services,
  0:3) + lag(Food.Services, 0:3) + lag(Transportation, 0:3) |
  lag(Grad.Rate, 2:7), data = sample, na.action = na.exclude,
  effect = "individual", model = "twosteps", transformation = "ld")
```

Balanced Panel: n = 63, T = 20, N = 1260
 Number of Observations Used: 2066

Residuals:

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-99.24860	-6.94819	0.00000	-0.08107	7.33883	96.84163

Coefficients:

	Estimate	Std. Error	z-value	Pr(> z)
lag(Grad.Rate, 1:3)1	0.0880245	0.1002077	0.8784	0.37972
lag(Grad.Rate, 1:3)2	0.0498768	0.0658797	0.7571	0.44900
lag(Grad.Rate, 1:3)3	-0.0018835	0.0593084	-0.0318	0.97467
lag(Basic.Education, 0:3)0	41.3960890	169.2046606	0.2447	0.80673
lag(Basic.Education, 0:3)1	61.4577631	170.4505611	0.3606	0.71843
lag(Basic.Education, 0:3)2	120.6424059	136.0498497	0.8868	0.37521
lag(Basic.Education, 0:3)3	-157.2770165	116.4491846	-1.3506	0.17682
lag(Special.Education, 0:3)0	-57.4630786	224.0505440	-0.2565	0.79759
lag(Special.Education, 0:3)1	63.0717883	209.7262219	0.3007	0.76362
lag(Special.Education, 0:3)2	253.1311768	218.0752852	1.1608	0.24574
lag(Special.Education, 0:3)3	-311.8715781	201.9233869	-1.5445	0.12247
lag(Vocational.Education, 0:3)0	475.2703311	355.5789630	1.3366	0.18135
lag(Vocational.Education, 0:3)1	399.8450272	419.5193583	0.9531	0.34054
lag(Vocational.Education, 0:3)2	-150.6526453	349.4380631	-0.4311	0.66638
lag(Vocational.Education, 0:3)3	-699.1151988	455.3965807	-1.5352	0.12474
lag(Compensatory.Education, 0:3)0	-71.7425916	196.7271681	-0.3647	0.71535
lag(Compensatory.Education, 0:3)1	117.7087635	209.1605053	0.5628	0.57359
lag(Compensatory.Education, 0:3)2	92.6055560	88.0357983	1.0519	0.29284
lag(Compensatory.Education, 0:3)3	-147.6369518	98.4177917	-1.5001	0.13359
lag(Support.Services, 0:3)0	81.7596539	185.8496519	0.4399	0.65999
lag(Support.Services, 0:3)1	30.6466896	171.9640857	0.1782	0.85855
lag(Support.Services, 0:3)2	194.5112346	140.1072510	1.3883	0.16504
lag(Support.Services, 0:3)3	-169.1868183	106.3026524	-1.5916	0.11148
lag(Food.Services, 0:3)0	-878.7945169	510.6275481	-1.7210	0.08525
lag(Food.Services, 0:3)1	316.3226370	743.1897549	0.4256	0.67038
lag(Food.Services, 0:3)2	704.8215654	735.3811751	0.9584	0.33784
lag(Food.Services, 0:3)3	363.2681145	511.5512440	0.7101	0.47762
lag(Transportation, 0:3)0	172.6119866	335.7743852	0.5141	0.60720
lag(Transportation, 0:3)1	-604.7016328	498.0493733	-1.2141	0.22469
lag(Transportation, 0:3)2	-122.6148794	535.9838051	-0.2288	0.81905
lag(Transportation, 0:3)3	472.3526616	449.1920609	1.0516	0.29300

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Sargan test: chisq(135) = 33.83516 (p-value = 1)
 Autocorrelation test (1): normal = -2.963875 (p-value = 0.0030379)
 Autocorrelation test (2): normal = -1.102578 (p-value = 0.27021)
 Wald test for coefficients: chisq(31) = 89830.14 (p-value = < 0.0000000000000000222)

Analysis done using R 3.5.3 (2019-03-11) and RStudio version 1.2.1335