SAT and Budgets - Fairfax County vs. Other Virginia Counties   Report FAC/FCA-126

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Introduction: The purpose of this report is to compare the cost of Fairfax County governance and public schools with the costs of the other jurisdictions in the Commonwealth of Virginia. We consider the 95 counties and 39 cities. In Report -115 we compared the costs and performance of the Fairfax County schools to other schools that belong to the Washington Area Boards of Educations (WABE). Here we compare them with the schools in all of the 95 counties and 39 cities. Most of the data was arduously obtained from the on-line files of the U.S. Census Bureau. The data is from 2011 and 2012.

Summary: The cost of government in Fairfax County is high but not unreasonably so[1]. There is, however, an obvious diseconomy of scale associated with the size of the counties – not only for Fairfax County but for other counties as well. Disbursements per capita increase with population rather than decrease. The diseconomy of scale implies that the citizens would be better served if the county was divided into nine counties. The cost of government would be less and elected officials would be brought into closer contact with the citizens. The specific dividing lines between the new counties would need further study to ensure the economic viability of each new county.

The cost of living was found to increase as the population density increases[2]; therefore, land-use planners need to take the cost of living into account. Increasing the density could drive middle-class people out of the county.

A second conclusion of this study is that the differences in performance of the schools in the Commonwealth of Virginia are due almost exclusively to the differences in demographics. Those with the highest Asian and least Black ethnic content have the highest SAT scores. We make no judgment as to whether the non-Asian students can be brought up to the Asian SAT performance. We are simply showing the strong correlation with ethnic groups as they currently perform. Because "Asian" includes quite different cultures (Indian, Russian, Chinese, Pacific Rim), some distinction in reporting would be beneficial so society can learn from the various cultures.

The ethnically corrected SAT scores were found not to depend on a county's average teacher salary, which ranged from $36,000 to $70,000. The implication is that, although salaries differ among school districts, all Virginia schools have equally effective teachers – a not surprising observation because they have all been similarly educated.

The annual expenditures of the various school systems are almost directly proportional to the number of students enrolled in the schools. There is no economy of scale. In fact there is a slight diseconomy of scale. The implication is that, if economies of scale are to be achieved, they would be in the areas of expenditures for other than classroom teachers.

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[1] Data on county expenses, population, and land area was obtained from
    http://www.apa.state.va.us/APA_Reports/LG_ComparativeReports.aspx

[2] Cost of living for each Virginia county was obtained from http://www.coli.org/CountyLevelIndex.asp#Q4

Discussion:

County

We consider herein only the cost of government, not the benefits. A more extensive study might look at such items as parks, libraries, and other features of the counties to establish a benefits comparison.

To determine if the cost of Fairfax County government is excessive, we have chosen to compare Virginia counties on the basis of the number of employees (full-time equivalents, FTE) per capita (i.e., the FTE count divided by the county population) and the county expenditures per capita.

Fairfax, with an FTE per capita of 4.0%, has only slightly more than the 3.9% average number of employees per capita for all Virginia jurisdictions – counties and cities (Figure 1), so staffing levels seem reasonable.[3]
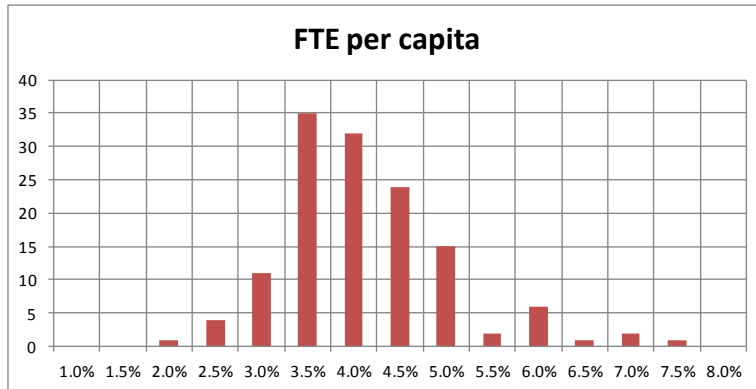

Figure 1: Count of counties with full-time equivalent (FTE) employees as a percent of the county population

The average total county expenditures per capita, including education expenditures and as adjusted to Fairfax County's cost-of-living[4], is $2,986. Fairfax County's total is $3,796, the seventh highest out of 95 counties (Figure 2). Surry County, near Williamsburg, has the highest, $4,523. The city of Emporia has even higher expenditures per capita, $5,394.
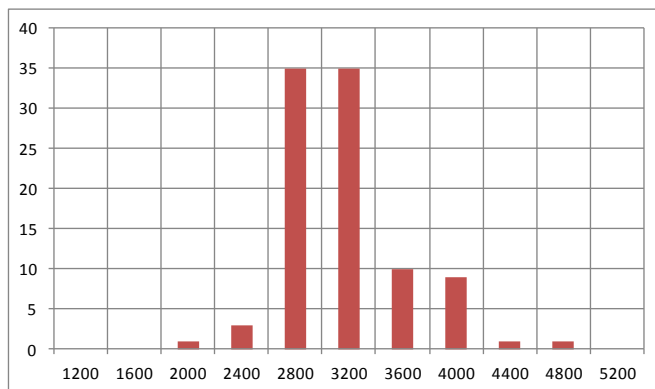

**Figure 2: Count of counties having total expenditures per capita as listed
(Values corrected for CPI of local jurisdictions)**

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[3] In this bar chart as in all others, Fairfax County is counted in the next higher value of the abscissa. For example, in Figure 1, a county with an FTE ratio of 4.1% would be counted in the 4.5% column.

[4] The local cost of living index is given approximately by the equation (density in people per square mile, per capita income in dollars per year): COLI = 86.4+2.0*density/1000+5.5*per capita income/10000

Although the Fairfax County expenditures per capita are high, its annual expenditure per capita is only 3.5% of the county's median household income ($109,383). Thus County taxes are only 3.5% of a householder's income, on average. Buchanan County, in the mountains of southwest Virginia, spends 10.8% of its median ($29,821); Goochland County, which is near Richmond, only 2.5% of its median ($82,683). The average is 5.0% (Figure 3). Fairfax County's percentage is so low because the median income, $109,383, is so high (Figure 4). Of the counties, only Loudoun ($133,050) and Stafford ($111,625) have higher medians.
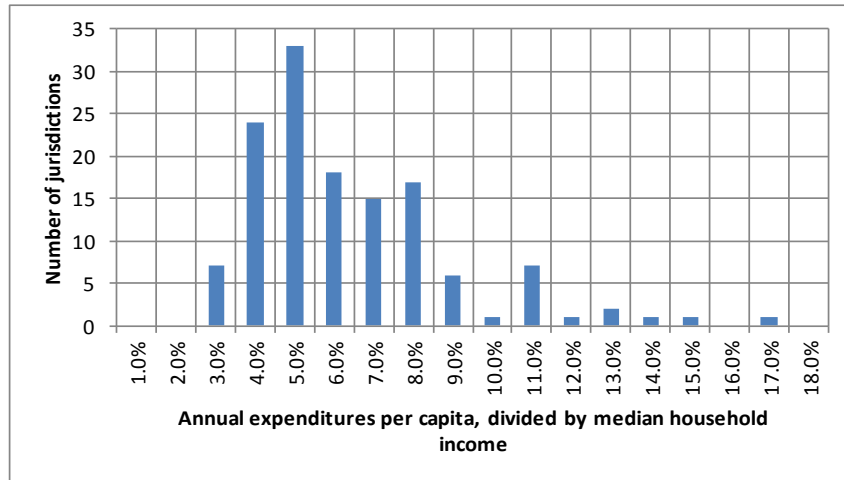

Figure 3: Number of jurisdictions having expenditures per capita at listed percent of median household income
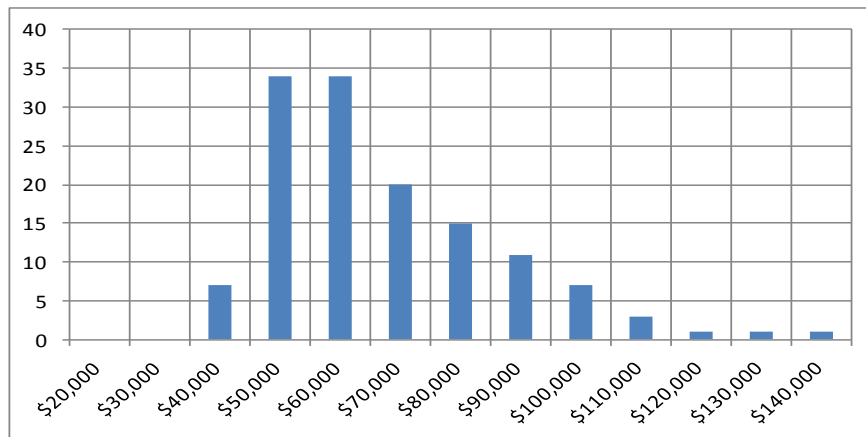

Figure 4: Median household income for Virginia jurisdictions, CPI adjusted

So it seems Fairfax County is not over-staffed and expenditures are not excessive in comparison with the median income; however, the expenditures, even corrected for the local CPI, are high per capita. The data show that the higher the county population, the higher the per-capita county expenditures – a diseconomy of scale (Figure 5). (In Figure 5, Fairfax County is shown as a red marker.) If there were an economy of scale, the trend line would slope downward, not upward. Even with the Fairfax County point removed, the same upward slope is evident.
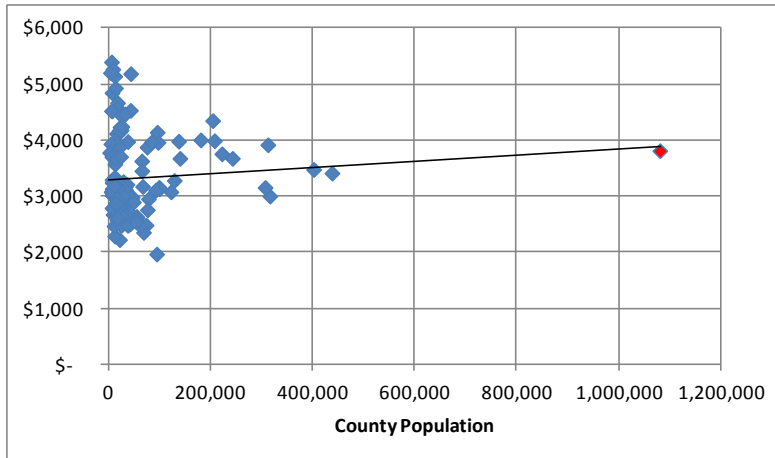
Figure 5: Per capita annual jurisdictional expenditures, corrected for local CPI

The diseconomy of scale is also evident if we examine the history of Fairfax County expenditures per capita. While the population increased by a factor of 2 from 1975 to 2013, the ratio of county employees to county population increased approximately 10%[5] -- a diseconomy --, while the inflation-corrected tax revenues per capita (and expenditures per capita) increased by a factor of almost 2 (Figure 6) – another diseconomy. Notice that this latter factor of 2 is the growth after the data has been modified to account for inflation and population growth. If there were an economy of scale, the per capita revenues would have decreased – not increased. In fact, the increase is extraordinarily large. There is a large diseconomy of scale.
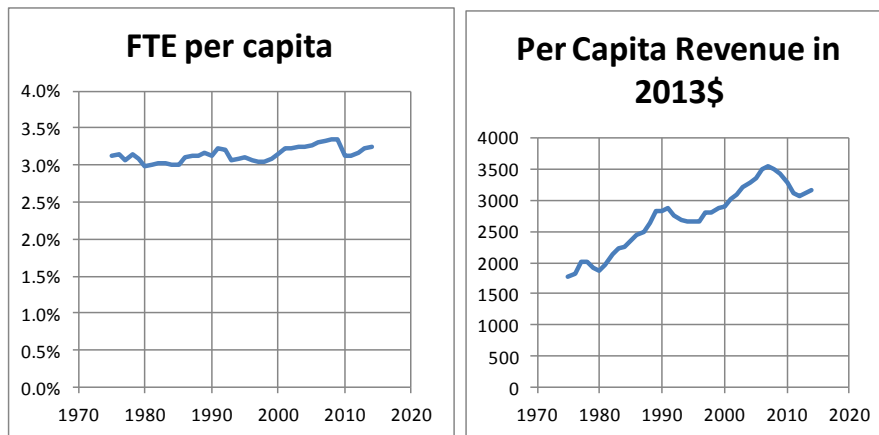

Figure 6: County Employee and Revenue Growth since 1975

We can logically ask whether government would cost less if Fairfax County were divided into several counties, perhaps one per each supervisory district. If the county were so divided, these nine counties would still be twice as large as the average Virginia county. Dividing the county into nine new counties would have the additional advantage of bringing the politicians closer to the voters. Each of the new counties might have ten members of the Board of Supervisors; therefore, instead of one elected Board member per 100,000 citizens as it is today, there would be one per 10,000 citizens. Over a four year period between elections, a politician could visit all 4,000 households by visiting 20 households per week – or holding one 20-household town-hall meeting per week. In addition, each member of the Board of Supervisors would be overseeing 11% of the number of employees they currently oversee. The size of the programs they oversee would be similarly reduced. Board members are paid little; therefore, the added cost of 80 new Board members would be little.

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[5] There is an inconsistency in the FTE per capita in the data reported by Fairfax County and the data reported by the U.S. Census. For consistency, we confine our comparisons to data obtained from a single source.

We next compare the cost and performance of the school systems for the 134 jurisdictions.

Schools

We first look at the cost of the education system. The average salary of teachers, as adjusted to the cost of living in Fairfax County, is approximately 15% higher in Fairfax County ($63,853) than in other Virginia counties. The starting salary for those with a Master's Degree ($49,433) is approximately 5% higher. Because these salaries are adjusted for cost of living, these percentages show how much more Fairfax County pays its teachers relative to those living and working in other counties (Figure 7).
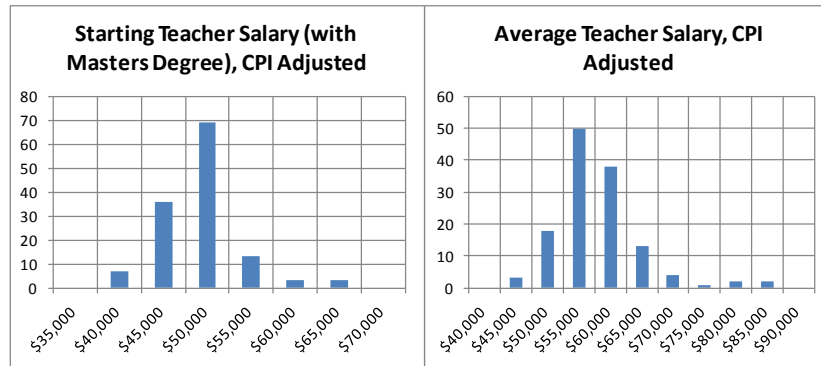

Figure 7: Teacher Salaries as adjusted to the cost of living in Fairfax County

Next we can look at school performance in terms of SAT scores. The higher pay may be justified by the better performance. The statewide average SAT score is 1429. The average for Fairfax County is 1663 – clearly on the high end (Figure 8). (In the chart, 1663 is counted in the column listed as 1700.)
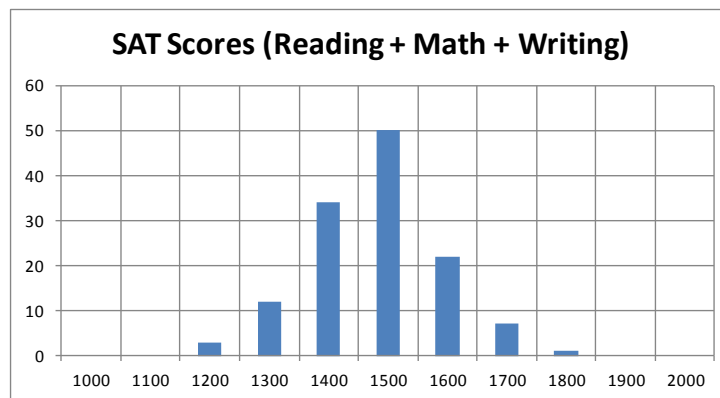

Figure 8: Number of counties with seniors having an average SAT score of that listed

Is the superior Fairfax performance due to the demographic differences, as we found in generating our Report - 122 on schools within the WABE? We examined the correlation between SAT scores and various independent variables, including the ethnicity of the county population. Three independent variables have a correlation coefficient above 0.5 (Figure 9**Error! Reference source not found.**). The correlation coefficient of 0.66 between the Asian population and the median income makes these two variables somewhat redundant. The R-squared with income and black are the independent variables is 0.65; with Asian and black, 0.71. Including all three independent variables increases the R-squared only to 0.73. The regression equation with all three independent variables is:

$$SAT = 1432 + 1300*Pct\ Asian - 432*Pct\ Black + 0.001*Median\ income\ (not\ CPI\ corrected)$$

We use this equation to correct all other schools to match the Fairfax County demographics and median income. A comparison between the regression equation and the measured SAT (Figure 10) reveals that Fairfax County (red point), with its high Asian population, is expected to have an SAT of 1748. The actual average SAT is 1663.

cross correlations		SAT	Independent variable	
		0.25	County full-time employees	
		0.26	County March Payroll	
		0.25	County FTE Employment	
		0.26	Total March Payroll	
		0.48	Average teacher salary	
		0.31	Starting teacher salary	
		0.27	Population	
		-0.12	FTE per capita	
		0.12	Annual County payroll per capita	
asian	black	0.35	Avg annual salary of County employees	
1.00	-0.09	0.51	% asian in County population	
-0.09	1.00	-0.70	% black in County population	
		0.25	% hispanic in County population	
		0.49	% white in County population	
asian	black	-0.33	% households under poverty limit	
0.67	-0.22	0.53	Median household income	
		-0.35	Employee salary/median	
		-0.39	Avg teacher/median	
		-0.49	Starting teacher salary with Masters/median	

Figure 9: Correlation coefficients between SAT scores and various independent variables
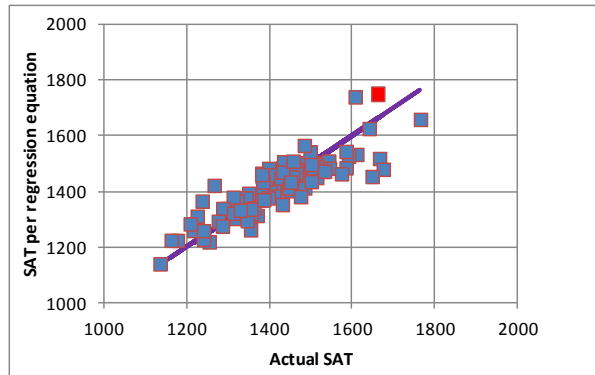

Figure 10: Comparison between the actual SAT and that computed from the regression equation

With the SAT score corrected by the correlation equation, the spread of SAT scores is much less (Figure 11). The narrower spread implies that the teachers in all jurisdictions are equally good and that the difference in outcome is due to the difference in the demographics. The Fairfax County SAT score of 1663, which is counted in the column marked 1700, is below the 1750 average for all school districts. The difference in demographics is dramatic. Fairfax County has an Asian population of 19.3%; the average for all school districts is 2.1%. Fairfax County has a Black population of 10.1%; the average for all school districts is 19.3%. Fairfax County has a median income of $109,383; the average for all school districts is $52,562.

The data show that SAT scores are higher for larger graduating classes, for the number of seniors who take the SAT, and for the percent of seniors who take the SAT. In other words, SAT scores a higher for larger school districts. On average, 51% of the graduating class takes the SAT.

Another measure of school performance is the percent of graduates that complete one year's worth of college credit hours within two years of first enrolling in college. (Having the data for the number that complete one

year's worth in one year would be better because the data would then show how well the high school prepared its students for college. Using data for two years allows for much remedial coursework in college.) Again percent Asian, percent Black, and median household income have the highest correlation with percent completing one year's worth of college credit hours. When all three are included in the regression, the R-squared is less than 0.2; therefore, the SAT scores provide a more consistent measure by which to correct the school performance for ethnicity and other factors.
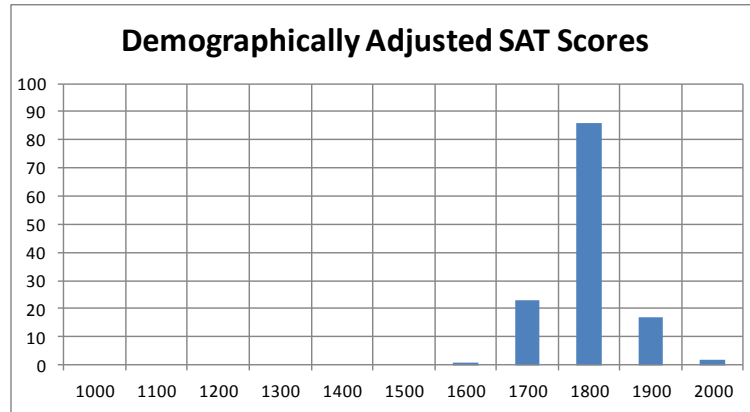

Figure 11: SAT scores adjusted to Fairfax County's demographics

We might expect that if teachers were paid more, better teachers would be attracted to Fairfax County and SAT scores would improve. Such seems not to be the case. When SAT scores are corrected for demographics and the local CPI, the scores are independent of teacher salary (Figure 12).
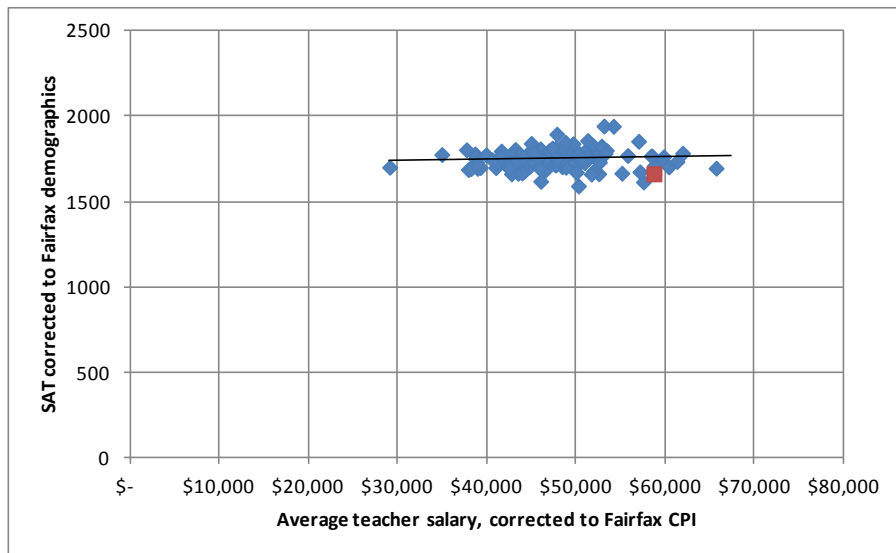

Figure 12: SAT Scores are independent of Teacher Salary