

**Assessment-To-Sales Ratio Study
for Division III Equalization Funding:
1999 Project Summary**

prepared for the

**State of Delaware
Office of the Budget**

by

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Background

The goal of this study is to estimate the current assessment-to-sales ratio for real property in each of the State's school districts. These ratios will allow the State of Delaware to properly allocate Delaware's Division III funds according to the equalization formula described in the provisions of Title 14, Chapter 1707(b)(5), Delaware Code.

The assessment-to-sales ratio is a critical variable in the formula that allocates Division III funds to school districts in Delaware. The growing importance of these funds to the State's school districts is illustrated in Table 1. Division III moneys have risen from \$7.7 million in the 1983-84 school year to \$53.8 million in the 1999-2000 school year. As a result, Division III as a percentage of total state educational appropriations has risen from 3.1% to 8.1% by the 1999-2000 school year, although it is currently less than its peak in 1992-1993. Given the large growth in Division III over the past few years, it is incumbent on the State of Delaware to use accurate assessment-to-sales ratios in the formula that distributes these equalization funds.

Table 1
Division III and Total
State Educational Budget
(in Millions of Dollars)

Fiscal Year	Division III Budget	Total Budget	Percent of Total
1983-1984	7.7	247.3	3.1
1984-1985	13.2	265.7	5.0
1985-1986	16.1	293.1	5.5
1986-1987	21.7	309.7	7.0
1987-1988	24.1	329.9	7.3
1988-1989	25.1	358.5	7.0
1989-1990	29.2	377.4	7.7
1990-1991	32.7	401.1	8.2
1991-1992	36.0	422.8	8.5
1992-1993	39.1	431.4	9.1
1993-1994	41.1	457.6	9.0
1994-1995	42.1	475.9	8.8
1995-1996	44.0	530.1	8.3
1996-1997	46.5	554.8	8.4
1997-1998	49.1	609.6	8.1
1998-1999	51.6	637.5	8.1
1999-2000	53.8	666.7	8.1

Source: Budget of the State of Delaware

The assessment-to-sales ratios provided by this research will be used to determine the "total full valuation" of real property within each of the State's sixteen regular school districts and three vocational districts. The total full valuation of real property is an important ingredient in the Division III equalization formula.

The Delaware Code defines "total full valuation" as the total assessed valuation of taxable real property divided by the most current assessment-to-sales price ratio. The State Budget Office is charged with conducting, in accordance with nationally accepted standards and practices, an assessment-to-sales ratio study by school district every year in order to establish the most current ratios.

Having accurate measures of the assessment-to-sales ratios for each school district is critical since those school districts that have a lower "total full valuation" of property compared to the others in the state (other factors held constant) receive larger Division III allocations. The nominal assessment-to-sales ratios are 1.0, 0.60, and 0.50 for New Castle, Kent and Sussex County school districts respectively. However, these ratios do not reflect changes in property values since the last complete reassessments. In the ratio study conducted in 1999, the aggregate estimated ratios were 0.49, 0.35, and 0.14 for New Castle, Kent and Sussex County, respectively.

The methodology underlying this study follows nationally accepted procedures. To obtain valid assessment-to-sales ratios it was necessary to analyze official records of property assessment and property transfers maintained by each county.

a. The sales data were screened using statistical procedures to eliminate transactions that did not take place at the true market value.

b. For all districts, the assessment-to-sales ratios were estimated for each of four types of property namely residential, business, farmland, and residential unimproved (vacant lots). An aggregate ratio for each school district was calculated by weighting the four ratios by the percentage of total assessments represented by that type of property. Adjustments were also made for districts where the boundaries crossed county lines.

c. The sales data used in the study included property transfers occurring during the period January 1, 1998, to June 30, 1999. As a result, the assessment-to-sales ratios are centered in September of 1998.

d. Sample sizes were sufficiently large to obtain statistical significance at conventionally accepted 95% confidence level.

Methodology

The goal of this study is to estimate the *average* assessed-to-sales ratio for selected classes of property in each school district. There is no attempt to assign a specific value to any particular piece of property. To derive the average ratio, an estimate is required for the current market value of property and the current assessment of the same property.

There are three basic ways to value real property, namely cost of construction, comparable sales, and income. The latter applies only to business property. The cost and income methodologies are required for a full reassessment such as those conducted in Kent County in 1986 and New Castle County in 1983. During a full reassessment, all three methods are used where appropriate, and a new market value is assigned to every piece of property in the jurisdiction. The current study employs only the comparable sales approach, since the other methodologies were not required to satisfy the intent of the legislation.

The data elements required for this study are drawn from two sources. The first source is the database of property transfers. Data elements used include the sales price, school district, type of property, and the date of the transfer. The date of transfer is used to identify those transfers that occurred during the study period.

The second source is the county assessment file. It contains a record for each property located in the county. The key data extracted from this database are the school district, type of property, and assessed value for all properties regardless of whether the property was sold during the time period. The sales data coupled with matching records from the assessment file are used to develop the average assessment-to-sales ratios. The primary use of the assessment file is to correctly weight the ratios by property class.

Many property transfers are not "arm's length transactions." That is, they occur at prices unrelated to their market values, e.g., \$1, \$10, or \$100. These are obviously not market transactions and are excluded in order to satisfy the specific requirements of the study. Unfortunately, there are other transfers (some not so easily identified), that also do not take place at the true market value of the property. Since the sales database contains 42,245¹ transactions during the reference period of the study, it is not practical and it is not cost-effective to interview all parties involved in the transaction to determine whether

¹Kent County – 5,137; New Castle County – 24,096; Sussex County - 13,012.

the price reported was full-value. (This problem was addressed by the Assessment Practices Review Committee created by the General Assembly.) Thus, a statistical approach, taken from the field of exploratory data analysis, is used to identify aberrant values coupled with a careful examination of the excluded transactions.

The screening procedure begins by identifying extreme values. In this instance, property transfers with calculated sales ratios of greater than 200.0 were considered extreme. A sales ratio of 200.0 occurs when the market value obtained from the assessment database was 200 times larger than the stated sales price. For example, a property selling for \$100 that has an assessed value of \$20,000 according to the assessment file, would have a sales ratio of 200. All of these transactions were automatically excluded. In the second phase, the median sales ratio for each property class was calculated. The median is that value that lies at the center of the ordered set of ratios, i.e., 50% of the ratios are higher and 50% are lower than that value. It is a measure of central tendency that is unaffected by extreme values.

In addition, the quartiles were located. The lower quartile is that ratio where 25% of all the ratios are lower than its value. The upper quartile is that ratio where 25% of all transaction are higher than its value. Fifty percent of all transactions are contained in the h-spread, the distance between the lower and upper quartiles, with the median at the center. If the median sales ratio was .6 and the 25th percentile was .2 and the 75th percentile was .9 then the h-spread is .7.

The "step size" is defined as 1.5 times the h-spread. Any observation that is less than the lower hinge or quartile (25%) minus one step was considered an outlier and was rejected. Furthermore, any value that was greater than the upper hinge (75%) plus one step was also targeted for exclusion. The boundaries were calculated separately for each county and property type. The end result of this screening process produced files with 12,452, 1,781, and 4,731 observations for New Castle, Kent, and Sussex counties respectively². The screened data sets were then analyzed using a number of statistical procedures to determine the most appropriate model for use in deriving the final ratios.

²Other cases were excluded where the transaction was clearly an error or was due to a data processing problem. For example, there were multiple reports of transactions at the same price when a single property was transferred and was subsequently subdivided. The sales price was carried with each sub-divided property.

The data were also analyzed to determine if the transactions in one district might be unduly weighted to one side or the other of the center of the eighteen month period. An analysis of the timing of the transfer showed differences between the districts to be of less than a month on the average.

An analysis of variance procedure was used to test the hypothesis of no difference in the ratios between school districts of a county for a given property type. If there was a difference, other analyses were performed to decide whether to use the estimated ratio for each school district and property type or the county-wide average. Each sales ratio was tested for the existence of a statistical difference between the calculated ratio for each school district and that for the county for each property type. If there was no difference, the county-wide average was used for that district.

Since the estimates at the county level are much more stable, in particular for property types other than residences, a different procedure was used to provide more stability in the ratios where the ratio was statistically different from the county mean. If the mean for the property type-district was below the 95% confidence interval for the property type-county and the two confidence intervals did not overlap, the upper end of the district's confidence interval was used in the calculations. If the two confidence intervals overlapped, the lower end of the county interval was used.

If the mean for the property type-district was above the 95% confidence interval for the property type-county and the two confidence intervals did not overlap, the lower end of the district's confidence interval was used in the calculations. If the two confidence intervals overlapped, the upper end of the county interval was used.

This procedure has several advantages. First, it takes into account the small sample sizes and resulting standard errors for the smaller districts. Second, it makes maximum use of information at the largest relevant geographic jurisdiction and consequently minimizes changes in ratios generated by short term variations in market prices. Third, it still captures value changes in individual districts.

Results

Table 2 shows the estimates produced by the sales ratio study. Included in Table 2 are the estimated assessment-to-sales ratios for each school district. These total ratios are derived by weighting the separate ratios calculated for each class of property by the proportion of assessed value in that class.

Table 2
Assessment-to-Sales Ratios
by School District

School District	Assessed Value 9/98	Old Ratio	Old Full Value	New Ratio	New Full Value
New Castle County					
Appoquinimink	\$708,891,478	0.452	\$1,568,343,978	0.432	\$1,640,626,570
Brandywine	\$3,123,086,328	0.524	\$5,960,088,412	0.474	\$6,595,082,168
Christina	\$4,807,359,700	0.515	\$9,334,679,029	0.496	\$9,693,298,859
Colonial	\$2,187,507,633	0.516	\$4,239,355,878	0.487	\$4,490,918,081
Red Clay	\$4,825,144,587	0.533	\$9,052,804,103	0.509	\$9,471,320,199
Total	\$15,651,989,726	0.519	\$30,155,271,400	0.491	\$31,891,245,878
Kent County					
Caesar Rodney	\$439,445,000	0.362	\$1,213,936,464	0.360	\$1,219,836,650
Capital	\$888,687,200	0.371	\$2,395,383,288	0.388	\$2,290,831,450
Lake Forest	\$281,619,900	0.353	\$797,790,085	0.340	\$828,607,151
Milford Total					
Kent	\$161,290,100	0.368	\$438,288,315	0.372	\$433,806,084
Sussex	\$82,646,141	0.150	\$550,974,273	0.133	\$620,994,290
Smyrna Total					
New Castle	\$80,018,420	0.451	\$177,424,435	0.430	\$186,003,914
Kent part	\$232,023,700	0.356	\$651,751,966	0.356	\$651,609,856
Total	\$2,165,730,461	0.348	\$6,225,548,827	0.348	\$6,231,689,394
Sussex County					
Cape Henlopen	\$572,007,642	0.148	\$3,864,916,500	0.136	\$4,195,235,034
Delmar	\$32,582,104	0.152	\$214,355,947	0.123	\$263,925,032
Indian River	\$768,398,271	0.157	\$4,894,256,503	0.137	\$5,589,194,977
Laurel	\$83,667,179	0.153	\$546,844,307	0.128	\$652,434,953
Seaford	\$152,474,132	0.154	\$990,091,766	0.129	\$1,181,797,756
Woodbridge Total					
Kent	\$23,992,100	0.316	\$75,924,367	0.320	\$75,062,621
Sussex	\$68,207,660	0.147	\$463,997,687	0.118	\$576,109,453
Total	\$1,701,329,088	0.154	\$11,050,387,078	0.136	\$12,533,759,826

Source: Center for Applied Demography & Survey Research, University of Delaware

Also, for Smyrna, Milford, and Woodbridge, those school districts that cross county lines, two assessment-to-sales ratios are presented; the assessment-to-sales ratio for each of the two counties in which the district is located.

The changes in ratios from 1998 to 1999 were larger than usual with the average ratio changing by about .015. The largest changes occurred in Brandywine (.05), Colonial (.029), Delmar (.029), and the Sussex County portion of Woodbridge (.029). The average shift in New Castle County was 0.028 with Sussex County districts averaging 0.018. Overall, the Kent County ratio remained unchanged. These results continue to support the reasoning for completing this study annually. It also shows how economic conditions are largely responsible for these shifts and those will always be subject to both upturns and downturns. These larger shifts reflect an increase in commercial values and farmland particularly in Sussex County. Sussex County is by far the fastest growing county.

It should also be noted that the impact of the changes in ratios measured by this study are tempered by requirements of the enabling legislation. No district can suffer more than a 5% decrease and no district can receive more than a 20% increase as a result of this study. Since some districts are likely to be affected by these limits, the adjustment process will continue in the years to come.

Housing markets in Delaware do not necessarily move together. Thus, there is no guarantee that the allocation formula will be affected in the same way every time. This argues for keeping the adjustment process as flexible and continuous as possible. Further, the districts should be encouraged to use the 95% rule in forecasting their allocations for future years.

The ratios estimated over the last seven years are shown in Table 3. The column labeled 9/86 contains the values being used in the formula without benefit of a ratio study. These were corrected by the first study that used information centered on

September, 1987. The major effect of that work was felt in New Castle County where the ratio declined from 1.0 to 0.635. The changes in Kent and Sussex were significantly less.

Table 3
Assessment-to-Sales Ratios
1986-1998

School District	9/86	9/87	9/90	9/92	9/93	9/94	9/95	9/96	9/97	9/98
New Castle County										
Appoquinimink	1.000	0.643	0.434	0.515	0.508	0.481	0.476	0.473	0.452	0.432
Brandywine	1.000	0.623	0.512	0.568	0.554	0.529	0.536	0.519	0.524	0.474
Christina	1.000	0.640	0.527	0.531	0.594	0.547	0.530	0.511	0.515	0.496
Colonial	1.000	0.626	0.508	0.603	0.606	0.534	0.544	0.511	0.516	0.487
Red Clay	1.000	0.642	0.543	0.586	0.564	0.550	0.545	0.529	0.533	0.509
Total	1.000	0.635	0.523	0.565	0.574	0.540	0.536	0.517	0.519	0.491
Kent County										
Caesar Rodney	0.600	0.583	0.418	0.430	0.408	0.392	0.391	0.368	0.362	0.360
Capital	0.600	0.588	0.461	0.466	0.431	0.416	0.409	0.370	0.371	0.388
Lake Forest	0.600	0.676	0.444	0.424	0.399	0.383	0.371	0.347	0.353	0.340
Milford Total										
Kent	0.600	0.624	0.442	0.452	0.420	0.423	0.408	0.353	0.368	0.372
Sussex	0.251	0.223	0.175	0.170	0.148	0.162	0.145	0.154	0.150	0.133
Smyrna Total										
New Castle	1.000	0.629	0.519	0.485	0.500	0.474	0.468	0.489	0.451	0.430
Kent	0.600	0.611	0.405	0.431	0.399	0.377	0.364	0.352	0.356	0.356
Total	0.600	0.567	0.418	0.421	0.392	0.383	0.371	0.348	0.348	0.348
Sussex County										
Cape Henlopen	0.251	0.205	0.169	0.174	0.157	0.159	0.159	0.165	0.148	0.136
Delmar	0.251	0.234	0.192	0.161	0.154	0.163	0.169	0.155	0.152	0.123
Indian River	0.251	0.223	0.174	0.172	0.160	0.163	0.162	0.157	0.157	0.137
Laurel	0.251	0.234	0.168	0.167	0.157	0.154	0.156	0.153	0.153	0.128
Seaford	0.251	0.252	0.192	0.175	0.168	0.173	0.181	0.165	0.154	0.129
Woodbridge										
Kent part	0.600	0.617	0.507	0.424	0.377	0.364	0.340	0.325	0.316	0.320
Sussex part	0.251	0.234	0.187	0.162	0.163	0.159	0.173	0.155	0.147	0.118
Total	0.251	0.222	0.176	0.174	0.161	0.163	0.164	0.161	0.154	0.136

Source: Center for Applied Demography and Survey Research, University of Delaware

The study centered on September, 1990 showed further declines in the ratios but, this time they were seen in all three counties. This time period corresponded with the peak of the real estate boom accompanying the economic expansion of the 1980's. By the time the next study was undertaken, New Castle County had suffered through a significant down turn in real estate prices, particularly in commercial real estate, but also in

residential prices as well. Losses exceeding 20% of 1990 purchase prices were not uncommon. According to local real estate professionals the market is only now beginning to recover, and the ratios reflect those market conditions. This year for the first time this decade, New Castle County properties have regained the levels that existed in 1990 at the peak of the last economic expansion. This is now true for all districts in New Castle County. In Kent County, which is growing at the slowest rate, prices in 1998 have remained stable as they have been for three years. There is some variation among the districts with gains in some districts offsetting losses in others. Sussex County real estate prices had been stable for nearly four years but have increased steadily for the last two years.

The estimates provided in Table 3 could lead one to conclude that there are "winners and losers" when the formula is updated. However, it is very much like the outcome of a reassessment. If the property was undervalued prior to the reassessment, taxes will rise to the proper level. If the property was overvalued prior to the reassessment, taxes on that property will fall. If the property was fairly valued, there will be no change. In a like manner, districts that are now receiving less have received "over-payments" in the past. Those receiving new funds were certainly under allocated funds in the past.

The legislation that required the conduct of this study recognized that distortions would occur in one of the main factors of the formula, the total full-value of real estate. This distortion would become worse with time and only with periodic updates would the formula produce the intended distribution of funds. Thus, the results should not be cast in terms of "winners and losers," but in the restoration of an equitable distribution of Division III funds as intended by the General Assembly.

APPENDIX A

APPENDIX B