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ABSTRACT

This paper examines consumer education choices over variables affecting the quality and the costs of differing educational outcomes. For ten years, the city of Milwaukee, Wisconsin, has pursued a policy of open enrollment. Transfer figures for the 1974-75 school year at the city's 15 high schools are analyzed according to schoolwide racial data, street mile distances, percent of black students in each school, average class size, percent of teachers having M.A. degrees, and tenth-grade math scores. A separate regression was run for each school, with the percentage of students transferring as the dependent variable and the five selected characteristics of the other schools as independent variables. The following tentative conclusions emerge: (1) it is appropriate to conceive of a school system as a market; (2) families do take distance costs into account in making educational purchases, but less than they do benefits from such school attributes as student test scores; and (3) no strong support for racial prejudice controlling educational purchases of either race could be found. (Author/MLF)

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Open Enrollment:

A Study in Revealed Preferences for Educational Outcomes in a Big City School System

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Introduction

This paper examines consumer education choices over variables affecting the quality and the costs of differing educational outcomes.

For ten years the city of Milwaukee school system has pursued a policy of open enrollment. By filling out a single page form parents can enroll their child in virtually any school in the city having his grade. They do not have to provide a reason for transfer. The form does not ask for any socioeconomic characteristics of the family. The transfers are made impersonally and are approved routinely except in those few cases where a school has been certified as full. As with families with children attending neighborhood schools, families with transferring students must provide transport for their children to the selected school. (The Milwaukee public transit is used extensively by school children, at a discount fare.)

Milwaukee's open enrollment program has steadily grown over the ten years until it now involves over 20,000 students, or about 15% of total enrollment at the elementary, junior high and senior high levels. Information about the program is widespread. The differing characteristics of the different schools, including racial balance, are well known. Both city newspapers annually publish an extensive series of comparative data on all schools, including 10th and 12th grade reading and math test scores, average class sizes, attendance percentage, percent of over-age pupils, and the percent of teachers who have B.A.'s only, M.A.'s, one year experience, 2-5 years experience, and six or more years of experience. (See Appendix C).

Policy Significance

Much of the recent thinking about how to improve public schools, especially in large urban areas where the problems are severe, has centered around mechanisms which would imbue the school system with features found in an economic market. The ability of the consumer to choose among competing and varying products is one of the key features of a well functioning market. School vouchers is but one device suggested for obtaining consumer choice, and other features, for the education market.

An open enrollment school system in fact provides a sort of quasi market in which families can purchase different educational experiences for their children by expending different levels of transport costs. These different educational experiences will be the result of different bundles of attributes offered by each school, including the composition of the student body and the quality of the teachers. The transport costs will include the time of the commuting children and the parents' possible disutility of having their children further from home during the day. (Naturally school quality, however defined by a family, would not rise monotonically with transport cost over all possible schools, but it would over a family's efficient choice set of schools.)

How useful it is for actual policy reform to treat an educational system as a market will depend on two empirical questions. First, how coherent is observed consumer behavior?

That is, when confronted with given stimuli do education consumers act in a jumble of random and idiosyncratic ways, or is there a strong central tendency? (Statistically, is the variance sufficiently small to give us confidence in the estimated coefficients?) This coherency will determine the predictability of consumer response to particular policy changes.

Second, are education consumers' reactions to given stimuli consistent with the a priori expectations we would have for a market? That is, does a higher quantity, or quality, at a given price induce them to purchase more? And does a higher price or cost induce them to purchase less? Again, the answer will determine the usefulness of predicating educational policy changes on the market paradigm.

It is also worth testing whether open enrollment program of the type found in Milwaukee--as distinct from a voucher-type of open enrollment--offers a real degree of effective consumer choice. If the practical and physical impedences to transferring seem to families to be extremely large then it does not. So it is important to test whether the distance between schools is a significant factor impeding transfers.

Finally, it is important to observe racial preferences under a quasi market school system. It is often alleged that a voucher plan would enable families to act on their racial prejudices and thus result in more school segregation than we have currently. Once the choice of school is detached from choice of residence we need to know to what extent transferring blacks

and transferring whites are responding to school quality and to what extent to racial composition of the student body. (There is a desire in Milwaukee to avoid the sort of violent confrontations accompanying forced racial busing recently experienced in Boston--a city not unlike Milwaukee in terms of occupation and ethnic mix--and it is hoped that open enrollment will provide a politically and legally acceptable alternative to court-ordered busing.)

The Data

The basic data in this study consist of, first, the flows of new transfers from each of 14 city high schools to each of the other 13 high schools (plus one non-neighborhood school, Milwaukee Tech, which as a specialized trade and technical school has no 'home' attendance district and thus imports but does not export students). Only new transfer figures for school year 1974-75 were available as of November 1974, rather than continuing transfers, but the two data series would be expected to be closely collinear and should not significantly affect the results of the particular econometric specification which was employed. Unfortunately, the race of the transferees was not available, so conclusions about racial preferences have to be inferred from schoolwide rather than individual racial data.

The second basic data are the street mile distances (Dij) between each pair of the 15 schools. (Travel time costs were also calculated between each pair but were almost 100% collinear with distance, and hence were not used.) Dij represents the impedence cost of transferring between school i and school j.

The third data series are the various characteristics of the schools which are published annually in the newspaper. Those selected for the regression estimates were (1) average class size, (2) percent of teachers having M.A. degrees, and (3) tenth grade math scores. The final data series used was the percent of black students in each school.

Also available from the newspaper were (4) absenteeism, (5) percentages of teachers having six or more years experience,

(6) percent of over-age pupils, and (7) schoolwide tenth grade reading scores. These data were not included in the basic regressions because of the high collinearity between each of them and one or more of the included variables. The correlation coefficient between absenteeism and percent black was .915. Between percent over-age pupils and percent black it was .842. The correlation coefficient between percent of teachers having six or more years of experience and percent having M.A.'s was .658. Percent black was chosen over either absenteeism or over-age pupils due to the stronger policy interest in the effect of race, but conclusions drawn from the econometric study must recognize the entangled causal relations between these three variables. Percent black in effect represents all three variables.

The schoolwide math test scores are published in three parts for each grade tested: (1) the percent of students who scored above the score interval designated as the national average, (2) the percent who scored within that interval, and (3) the percent who scored below that interval. (The national norm is 23% above the interval, 54% within, and 23% below.) Thus the public is given an idea of the spread of a school's performance, and not just the mean. Reading scores are presented the same way and, like math, cover both the 10th and 12th grades. Math and reading scores are closely correlated obviously. (Math-high and Read-high at .962 and Math-low and Read-low at .975.) But, interestingly, math scores are somewhat less correlated with race than reading scores. The correlation coefficient between

Read-low and percent black was .907, but between percent black and Math-low it was .887. Between Read-high and percent black it was -.850 while between Math-high and percent black it was -.729. (It may be that math skills are less a product of a disadvantaged home environment than reading skills and that math scores provide a better reflection than reading scores of the effectiveness of schooling.) To reduce multicollinearity between race and scores, and to better isolate school effectiveness math scores rather than reading scores were used in the regressions.

The Model

Since data on transfers, distance, etc. was available on only a schoolwide basis, the regression equations had to be set up this way as well. A separate regression was run for each school, with the percentage of students transferring as the dependent variable and the five selected characteristics of the other schools--distance, percent black, class size, percent M.A. teachers and math scores--as independent variables. (This regression format conforms to standard econometric work in migration research. See for example Sjaastad[11].) Two regression models were used. The Export model was:

(1) $Nij = a + b_1Dij + b_2PBj + b_3CSj + b_4MAj + b_5MHj + ei$

where Nij is a vector of the percent of sending school i's population (enrollment) transferring to schools j, Dij is a vector of distances to schools j, and PBj, CSj, MAj and MHj are vectors of, respectively, percent black, average class size, percent M.A. teachers, and percent scoring above average interval in math (Math-high) at schools j. This model explains exports from sending school i in terms of the attracting power of the receiving schools. (Hence it used the high rather than the low math scores of schools j.)

The Import model explains the imports to school j from schools i in terms of the repelling power of the sending schools:

(2) $Nji = a' + b_1'Dji + b_2'PBi + b_3'CSi + b_4'MAi + b_5'MLi + ej$

where the terms have the same meaning as above and MLi is the percent of students who scored below the national average interval in math (Math-low).

To avoid constraining the error terms, ei and ej to the interval from zero to one--since these are the lower and upper limits of the percentages Nij and Nji--a logarithmic transform was taken of the left hand variable:

(3) $\overset{*}{N}ij = \text{Log}\left(\frac{Nij}{1 - Nij}\right)$

This converted the limits of the error term from $-\infty$ to $+\infty$ and hence permitted it to have the normal distribution properties assumed by the standard significance tests.

There were 14 separate regressions under the export model, one for each sending school. Under the import model there were 15 since there is one more high school receiving than sending students (Tech).

Since we are primarily interested in the relative strengths of the different explanatory variables it is appropriate to examine the ratio of the coefficients obtained from regressing $\overset{*}{N}ij$ and $\overset{*}{N}ji$, rather than to anti-log and solve them. The equilibrium relationships between the right-hand terms are obtained by taking the total differential:

(4) $d\overset{*}{N}ij = dDij \frac{d\overset{*}{N}ij}{dDij} + dPBj \frac{d\overset{*}{N}ij}{dPBj} + dCSj \frac{d\overset{*}{N}ij}{dCSj} + dMAj \frac{d\overset{*}{N}ij}{dMAj} + dMIj \frac{d\overset{*}{N}ij}{dMIj} = 0$

$= dDijb_1 + dPBjb_2 + dCSjb_3 + dMAjb_4 + dMIjb_5 = 0$

Or

(5) $\frac{dPBj}{dDij} = \frac{-b_1}{b_2}$. This ratio expresses the relative effect of milage distance to schools j and percent blacks at schools j on the propensity to transfer to schools j. Similarly with other pairs of export model terms, and similarly when analyzing import model terms.

The Results

The regression results are as follows, with the signif[illegible] level in parentheses under the coefficients. The schools are arranged in reverse order of percent black, with Bay View being 99% white and North being 99% black.

School	a	D_{ij}	PB	CS	MA	Math	R^2
		- - - Export - - -				MH	
Bay View	- 3.527 (.87)	-1.880 (.01)	- .256 (.55)	.000 (.10)	- .081 (.71)	29.341 (.13)	.7920
South	-48.885 (.05)	-2.724 (.01)	- .138 (.75)	1.929 (.03)	- .064 (.77)	15.933 (.60)	.8394
Juneau	3.744 (.86)	-1.380 (.03)	.014 (.97)	-.716 (.62)	.110 (.62)	17.162 (.26)	.5692
Pulaski	- 4.911 (.82)	-1.833 (.01)	- .227 (.61)	-.104 (.89)	.072 (.74)	12.843 (.56)	.7975
Hamilton	- 8.712 (.69)	- .928 (.04)	.422 (.34)	-.327 (.68)	.039 (.85)	41.080 (.02)	.6859
Marshall	- 8.895 (.63)	-2.063 (.01)	-1.126 (.01)	.491 (.53)	- .093 (.62)	-14.827 (.28)	.8507
Madison	- 7.215 (.84)	- .485 (.50)	.298 (.66)	-.233 (.85)	.094 (.80)	15.403 (.59)	.1821

School	a	D_{ij}	PB	CS	MA	Math	R^2
			- - - Export - - -			MH	
Custer	-62.150 (.05)	- .705 (.19)	- .538 (.32)	.184 (.09)	- .001 (.99)	30.743 (.13)	.6506
Washington	- 7.385 (.29)	- .144 (.55)	.023 (.84)	.163 (.51)	- .069 (.31)	5.389 (.24)	.3852
Riverside	-42.273 (.13)	305 (.69)	.957 (.10)	.959 (.33)	.131 (.65)	97.376 (.63)	.3786
West	-14.186 (.61)	.731 (.51)	.319 (.51)	.333 (.73)	.181 (.51)	-32.111 (.17)	.4667
Lincoln	-22.979 (.25)	-1.121 (.17)	.054 (.88)	.579 (.57)	.195 (.34)	16.751 (.92)	.4418
King	-13.245 (.04)	.083 (.57)	.130 (.28)	.363 (.10)	- .032 (.59)	.449 (.90)	.4780
North	-12.759 (.01)	.133 (.25)	.213 (.01)	.317 (.03)	- .044 (.21)	-3.404 (.22)	.8001

School	a	D_{ij}	PB	CS	MA	Math	R^2
		- - - Import - - -				ML	
Tech	-46.282 (.01)	-1.132 (.01)	-7.309 (.05)	.650 (.15)	34.337 (.01)	25.863 (.01)	.8294
Bay View	-74.422 (.01)	- .581 (.05)	-6.493 (.18)	1.524 (.01)	43.218 (.01)	39.287 (.01)	.9205
South	-71.511 (.02)	.276 (.65)	-14.345 (.11)	1.528 (.10)	19.955 (.56)	45.671 (.01)	.7271
Juneau	2.553 (.94)	-1.675 (.06)	2.598 (.77)	.176 (.88)	-27.077 (.56)	8.488 (.57)	.5219
Pulaski	-30.470 (.18)	-1.502 (.0')	1.448 (.82)	.744 (.31)	9.676 (.63)	17.305 (.12)	.8266
Hamilton	-44.744 (.10)	- .369 (.55)	-5.886 (.53)	.996 (.26)	16.353 (.52)	25.993 (.04)	.5577
Marshall	-12.572 (.72)	-1.130 (.12)	9.666 (.65)	.154 (.89)	5.847 (.86)	- 6.046 (.72)	.4924
Madison	-44.511 (.09)	-1.742 (.01)	8.180 (.24)	.816 (.32)	56.359 (.04)	3.907 (.73)	.8034
Custer	-28.266 (.08)	-1.411 (.01)	9.851 (.04)	.908 (.09)	-6.711 (.64)	.051 (.99)	.9237
Washington	-7.077 (.80)	-1.881 (.04)	-2.666 (.45)	.263 (.98)	-4.944 (.85)	15.223 (.24)	.6883
Riverside	-25.252 (.65)	- .616 (.61)	13.974 (.10)	.845 (.34)	-24.150 (.61)	-4.745 (.66)	.7732
West	-26.258 (.60)	.510 (.58)	4.884 (.53)	.441 (.67)	-19.194 (.52)	17.551 (.19)	.7048
Lincoln	-38.956 (.14)	.202 (.75)	16.833 (.02)	.840 (.33)	-5.210 (.82)	.580 (.82)	.7967
King	-49.085 (.01)	.088 (.82)	17.035 (.01)	.856 (.11)	17.806 (.22)	3.566 (.58)	.9204
North	-24.083 (.58)	- .958 (.63)	8.515 (.65)	.904 (.34)	-36.502 (.19)	-1.478 (.90)	.7139

It is probable that the many nonsignificant coefficients result from enlarged standard errors caused by collinearity between the included right-hand variables. The last equation in the import results for example has the classic earmarks of multicollinearity: reasonably high R^2 but virtually no significance of individual coefficients. Another clue is the high simple correlation coefficients between the explanatory variables. It was mentioned earlier that percent black is correlated with Read-low at .887 and with Read-high at -.729. Percent black is correlated with Class size at -.443 (classes are smaller in the predominately black schools), and with percent M.A. teachers at -.521. An additional problem for applying usual significant level tests is the very small number of degrees of freedom. With only 13 observations in the export model and six right-hand variables including the constant we are down to seven degrees of freedom and this raises the computed significance level still further. In the Import model we are only slightly better off with eight degrees of freedom. For these reasons it is probably preferable to apply a considerably looser standard of statistical significance than one ordinarily would - using, say, a 20% significance cut-off -- and attempt to get an overall picture from studying broad patterns in the results.

In the second section above, we posed four related questions: (1) How coherent is the revealed consumer behavior in purchasing schools, i.e., are there evident central tendencies? (2) Is this behavior consistent with a priori expectations of market-type behavior? (3) Actually how sensitive to distance costs are families under the open enrollment set up? (4) What can we say about revealed preferences by race, i.e. to what extent are white and black students responding to differences in schools' racial make up and to what extent to other school characteristics?

There does seem to be some coherency in response to the five explanatory variables tested in the regressions. The most obvious of these is the distance variable, which will be discussed below. Class size would be expected to have a negative sign in the export model -- the larger a receiving school's class size the lower school i's propensity to send students to it -- and positive in the import model. Only five of the export model's 14 class size coefficients are negative (none of these are significant). It should be remembered that class size is negatively correlated with two presumably desirable school characteristics -- percent M.A. teachers at .127 and Math-high at .455 -- as well as percent white. Nonetheless, all 15 of the import model's coefficients are positive (only four of these are significant). Taking the full results, smallness of class size does seem to be desirable.

The percent of teachers having M.A. degrees, which is one frequently cited index of teacher quality, seems to provide no coherent explanatory power. In each of the two regression models the signs are approximately evenly divided between negative and positive, with only a handful being significant either way. (This result may say more about M.A.'s as a valid index of teacher quality than about the coherency of education consumers' preferences).

Math scores do appear to produce a coherent response among consumers. Assuming that greater Math-high scores in schools j raise the propensity to transfer from school i, and greater Math-low scores in schools i raise in-migration to school j, the math score coefficients should have a positive sign in both the export and import models. Eleven out of 14 do in the former and 12 out of 15 do in the latter. Two of the six total sign reversals are by the very highest scoring school -- Marshall -- and two by one of the worst

scoring schools -- North. (It might be that students transfering to a very high scoring school or from a very low scoring school might not wish to "jump" too far along the achievement ladder, but might instead prefer to move incrementally. This would raise transfer propensities between scholastically adjacent schools and lower it between scholastically distant schools and reverse the coefficient sign. Students transfering from a high scoring school or to a low scoring school would probably be doing so for non-academic reasons, e.g. sports or music, and this too would throw off the expected results.) Only the two sign reversals of one school, West, are statistically significant.

The second question posed above is whether observed school choice selection is consistent with a priori expectations for market-type behavior. The results on math scores does seem to indicate that higher quality increases demand and lower quality reduces it. Results on class size and teacher characteristics -- particularly the latter -- were less clear, but this raised the question of these variables as valid indices of quality. With the distance term however there is no such ambiguity. School distances impose direct financial and disutility costs on families, and these costs rise continuously with distance. Schools further away are always more expensive than nearer schools. For both exporting and importing schools we would, therefore expect D_{ij} to have a negative sign. In 10 out of 14 export equations the distance coefficient is negative. Eight of these 10 are statistically significant while neither of the two positive coefficients are. In the import equations 11 out of 15 are negative, and of these all but three are significant. None of the positive distance coefficients are significant.

Looking more carefully at the export equations and consulting the map at Appendix A, one sees that students from both of the two schools with negative coefficient values, North and Riverside, must travel effectively

past schools that score extremely poorly in math (and reading) scores -- Lincoln, West and King -- in order to transfer to schools that do better. Students from North or Riverside who want a substantially more balanced racial mix must also travel past these three surrounding schools which are 82, 69 and 99% black, respectively. (See Appendix B.) It may be that the combined force of these two influences, and others, overcomes the influence of distance in the context of these small sample equations. It is the same three low scoring and highly black schools which show the distance coefficient sign reversal in the import equations. With these several exceptions, the distance variable performs very well in conforming to our a prior market expectation: higher transfer costs result in lower transfer demand.

The third question posed earlier related to the strength, rather than just the sign or reliability of the distance coefficient. Applying the method of equation (5) for estimating the relative influence of distance and math scores on transfer behavior -- dividing only coefficient values which are statistically significant -- we find that it takes between .006 miles (Bay View) and .087 miles to have an equal effect on transfer propensity as a one percent point change in math scores. In a marginal product sense, and at these specified units, distance is only between 0.6 and 8.7% as powerful as scores. (Intermediary values were 2.3% for Hamilton and Custer in the export equations and 4.4% for Tech in the import equations.) This would seem to indicate that distance is not an overwhelming impedence compared to the benefits which it can provide.

The last question to answer concerns differing preferences by race. The first subquestion here is: Does each student have a positive preference for their own race when transfering? Such preferences would indicate that for white students the percent black coefficient would be negative in the export equations and positive in the import equations. For black-prefering black students the opposite would be true. But here it is important to

specify the racial composition of the export or import school in question. It makes no sense to say that a white student is more apt to transfer to an all black school the more black his home school is, or that a black student is more apt to transfer to an all white school the more white his home school is. We need to look at students transfering to or from racially mixed schools to make sensible inferences. But not having data on the race of the transferees themselves we can be fairly sure of transferee race only in the case of transfers from nearly all white or all black schools. Under these circumstances it makes sense to analyze the exports from single race schools and the imports to racially mixed schools.

Of the transfers from the five white schools -- Bay View, South, Juneau, Pulaski, and Hamilton -- all with about 99% white enrollment -- the percent black of receiving schools had a positive coefficient for two: Juneau and Hamilton. Their coefficients were insignificant, but so were the other three schools. Only Marshall of the next three schools with 15% or less black students had a negative coefficient for percent black. When we look at export schools with nearly all black students -- Lincoln (82%), King (99%), and North (99%) -- we find that all three do have positive coefficients for percent black, indicating positive racial preference for blackness. (Only one of the three is statistically significant.) It is interesting that Madison with only 5% black students, Custer with 15%, Washington with 46% and Riverside with 56% also all have positive percent black coefficients in the export equations. However only Riverside's coefficient is significant of these four schools. Although we don't know the race of the transfering students, they do not seem to be prejudiced against blackness.

When we look at the import equations for these same four racially mixed schools we see that a higher percent of black students in the sending schools

is associated with a greater propensity to transfer into these mixed schools except in the case of Washington whose coefficient is insignificant. (Two of the other three coefficients are significant, and the third is not insignificant by much.) Even Marshall with 3% black students, and West with 69% black, which bracket the four schools in racial percentages, have positive -- although insignificant -- percent black coefficients in the import model. Even Juneau and Pulaski, each with 99% white students, have positive import coefficients for percent black (also insignificant). Again, the results from the five schools with substantially mixed racial composition do not bear out a hypothesis of strong racial auto-preferences. However, three schools at each end of the racial spectrum -- Tech, Bay View and South at 99% white and Lincoln, King and North at 82 and 99% black -- do seem to indicate such preferences since the percent black import coefficients tend to reinforce their current racial balance.

It is interesting however to try to measure the magnitude of whatever racial preference may be present in these six schools. Using again the relative magnitude measure of equation 5, dividing the statistically significant percent black coefficient by the statistically significant math score coefficient, we find that a one percent point change in blackness has only 28% as much effect on transfer propensity as a one percentage point change in math scores for students transfering to Tech, 17% for students transfering to Bay View and 31% for students transfering to South. Unfortunately comparable comparisons can't be made for Lincoln, King, or North since their math score coefficients are not significant. (However, comparing Lincoln and King's statistically significant percent black coefficient with West's significant math score one might guess that the two influences may be of roughly comparable strength.) In any event, racial prejudice does not seem to be the controlling, or even strongest, motive behind observed transfer behavior. This is consistent with a non-econometric study made in 1972 by the Milwaukee School System [8].

Conclusions

Under the handicap of a small sample of 15 high schools and a good deal of apparent collingarity between the explanatory variables we have attempted to analyze several questions regarding the appropriateness of applying market paradigms to education systems, the apparent family sensitivity to distance costs under an open enrollment program, and the difference between racial groups in school preferences, especially preferences for schools' racial composition itself. Due to the data and statistical handicaps we have tried to infer broad patterns from the regression results rather than apply strict hypothesis-testing significance criteria.

The tentative conclusions that emerge are:

(1) It is apparent that it is appropriate to conceive of a school system as a market, subject to the usual effects from the usual market stimuli such as changes in cost and in quality.

(2) Families do take distance costs into account in making educational purchases but the subjective magnitude of these costs appears to be considerably less than the benefits from such school attributes as higher scores.

(3) No strong support for racial prejudice controlling educational purchases of either race could be found.

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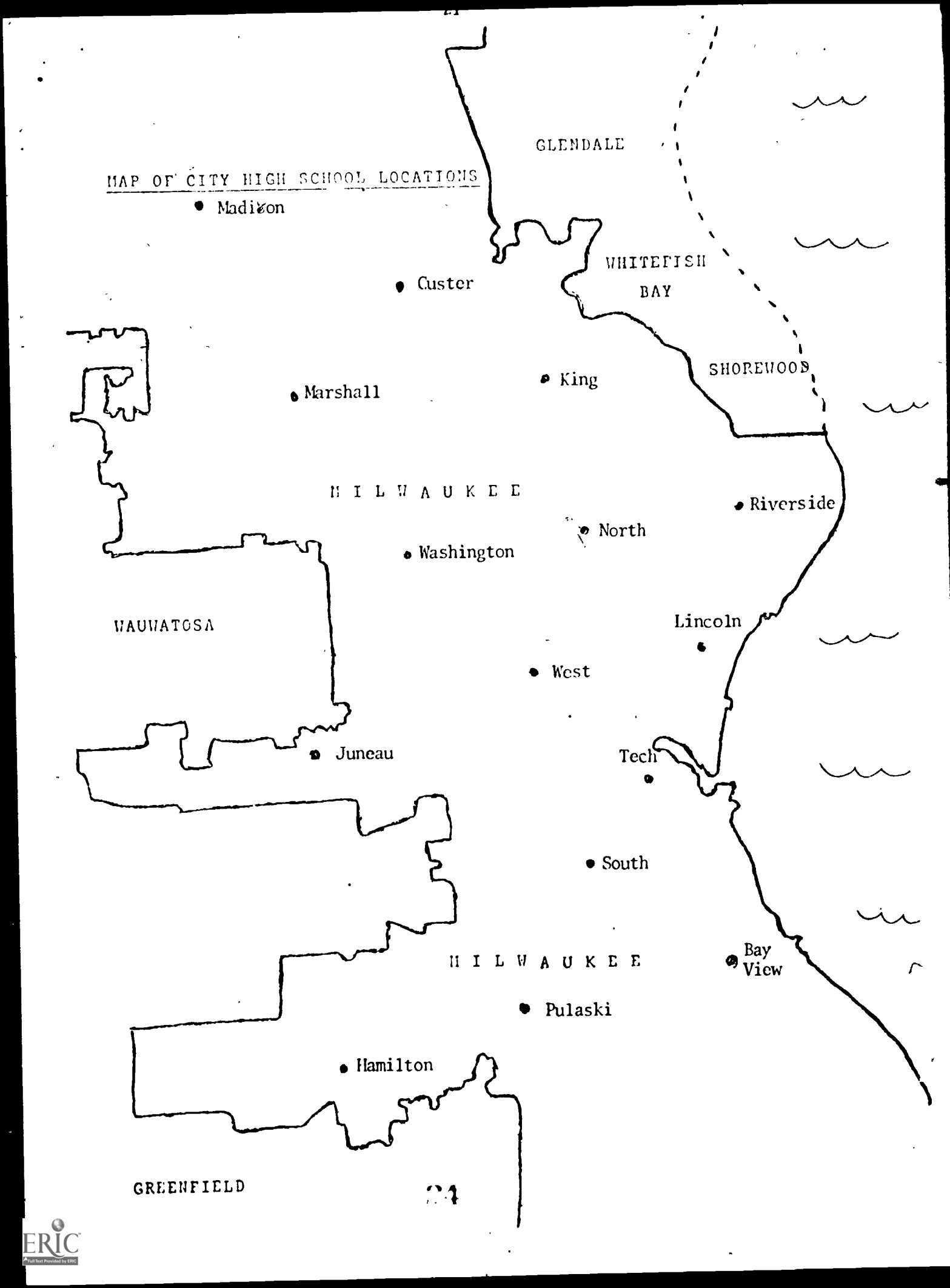
MAP OF CITY HIGH SCHOOL LOCATIONS
Madison
Custer
Marshall
King
North
Washington
Riverside
Lincoln
West
Juneau
Tech
South
Bay View
Pulaski
Hamilton
GLENDALE
WHITEFISH BAY
SHOREWOOD
MILWAUKEE
WAUWATOSA
MILWAUKEE
GREENFIELD

APPENDIX B

Selected Characteristics of Milwaukee Public High Schools
1973

	School	Enrollment	Black %/100	City-wide Rank, 10th Grade Math Scores	
				Math-high	Math-low*
1.	Tech	2533	.01	3	2
2.	Bay View	2152	.01	8	8
3.	South	1785	.01	11	10
4.	Juneau	1159	.01	7	3
5.	Pulaski	2492	.01	6	7
6.	Hamilton	2669	.01	3	5
7.	Marshall	3190	.03	1	1
8.	Madison	3212	.05	4	4
9.	Custer	2758	.15	5	6
10.	Washington	2595	.46	10	11
11.	Riverside	1530	.56	9	9
12.	West	1365	.69	12	12
13.	Lincoln	1159	.82	14	14
14.	King	1786	.99	13	15
15.	North	1524	.99	15	13

*In reverse order, with school scoring the smallest percentage below the national average interval ranked first. "Math-high" and "Math-low" explained in text.

Source of columns 1 and 2: Milwaukee Public Schools

Source of columns 3 and 4: Appendix C

Test Scores

First columns, show percent of students doing above average, average and below average work in reading and mathematics. Other columns show some factors affecting learning.

Sr. High School		Reading +	Reading AV	Reading −	Mathematics +	Mathematics AV	Mathematics −	Class size	% Stability	% Attendance	% New pupils	% Over age pupils	% Teachers (BA)	% Teachers (MA)	% Teachers (1 yr.)	% Teachers (2.5 yrs.)	% Teachers (6 + yrs.)
City Results	10th	11	53	36	15	53	32										
	12th	11	51	38	21	55	24	29.2	88.3	84.3	1.7	20.7	66.4	31.6	7.4	23.2	64.4
Bay View	10th	11	54	35	12	59	31										
	12th	15	59	26	27	45	28	28.1	87.4	91.7	3.0	15.7	64.2	35.8	6.3	17.9	75.8
Custer	10th	11	60	29	16	60	24										
	12th	11	49	40	20	57	23	28.8	87.3	87.1	1.8	14.1	67.7	30.8	2.3	27.7	70.0
Hamilton	10th	14	62	24	24	55	21										
	12th	17	65	18	29	56	15	26.7	92.0	93.4	1.6	10.5	65.9	31.5	4.8	23.4	71.8
Juneau	10th	13	62	25	14	72	14										
	12th	10	59	31	17	67	16	25.0	90.1	87.7	2.5	20.8	62.5	37.5	6.3	20.3	73.4
King	10th	0	16	84	0	19	81										
	12th	0	27	73	4	41	55	28.2	79.0	88.8	1.7	37.9	69.8	27.5	18.6	47.1	34.3
Lincoln	10th	0	21	79	0	24	76										
	12th	0	26	74	0	50	50	29.4	79.8	74.8	7.6	31.8	78.7	23.3	16.4	31.5	52.1
Madison	10th	14	64	22	21	59	20										
	12th	17	52	31	23	58	19	26.9	83.6	89.0	0	13.9	71.7	27.5	4.1	24.8	71.1
Marshall	10th	21	65	14	32	57	11										
	12th	21	41	38	27	59	14	26.8	92.8	92.2	2.0	12.5	81.2	26.2	2.8	17.1	80.3
Milw. Tech	10th	13	68	19	22	69	12										
	12th	11	69	20	32	62	6	25.4	93.3	95.5	0	15.4	80.7	30.4	3.7	23.9	67.4
North Division	10th	0	27	73	0	27	73										
	12th	0	39	61	0	48	52	24.6	70.4	68.6	0	40.4	89.4	27.1	10.6	34.1	55.3
Pulaski	10th	12	59	29	15	68	27										
	12th	7	56	37	17	61	22	26.8	90.2	91.2	1.8	11.7	82.7	34.7	5.9	27.1	67.0
Riverside	10th	8	49	45	8	48	48										
	12th	10	39	51	10	58	32	25.6	82.6	74.3	2.3	25.3	85.4	43.4	0	28.9	71.1
South Division	10th	5	47	48	2	43	55										
	12th	3	40	57	11	66	23	24.1	82.3	81.2	0	32.2	66.3	33.7	3.2	36.8	60.0
Washington	10th	5	32	63	5	47	48										
	12th	5	48	47	17	52	31	28.1	81.3	72.9	1.9	27.1	69.8	28.7	14.0	33.3	52.7
West Division	10th	1	26	73	2	35	63										
	12th	0	28	72	0	30	70	27.6	78.5	68.8	8.2	37.3	74.4	24.4	16.7	30.8	52.5

City-National Comparison		Reading +	Reading AV	Reading −	Mathematics +	Mathematics AV	Mathematics −	Class size	% Stability	% Attendance	% New pupils	% Over age pupils	% Teachers (BA)	% Teachers (MA)	% Teachers (1 yr.)	% Teachers (2.5 yrs.)	% Teachers (6 + yrs.)
National Results		23	54	23	23	54	23										
City Results	4th	11	58	31	17	56	27										
	6th	7	49	44	5	49	46	30.1	87.1	92.3	2.2	15.5	75.6	23.4	7.5	27.6	64.7
City Results	8th	7	46	47	7	49	44	28.2	80.7	86.0	2.1	29.6	73.5	25.4	11.2	29.6	59.2
City Results	10th	11	53	36	15	53	32										
	12th	11	51	38	21	55	24	29.2	88.3	84.3	1.7	20.7	66.4	31.5	7.4	28.2	64.4