



## **Recent Findings in the Economics of Education Reform and Prospective Work at the Jim Self Center On The Future**

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Much attention has been given to education reform at the primary and secondary level in the United States since the “Coleman Report” (Coleman et. al., 1966). Consideration by Becker, Murphy and Tumura, (1993) , of the role of education on economic growth, the lagging performance of the U.S. relative to other nations at the primary and secondary educational levels, and competition among states to attract industry with a skilled labor force all serve to liven the public policy debate on education reform. This is true both nationally and in South Carolina. The aim of this paper is threefold: (1) to provide the casual reader a review of some recent findings by leading economists in the economics of education area (2) discuss a few terms/concepts that are endemic with respect to research in this area (3) touch on continuing research efforts at the Jim Self Center On The Future (JSCF) that are focused on South Carolina’s educational concerns.

Section I presents the few terms and concepts that appear repeatedly in the articles that are surveyed in Section II. Section III discusses available data assembled at the JSCF, potential data and possible research endeavors. The last section concludes the paper.

### **I Some Key Concepts**

We discuss 5 terms in this section (1) Tiebout Choice (2) Selection Bias (3) Endogeneity (4) Instruments (5) Externality

*Tiebout choice* refers to the process by which consumers-citizens of local public goods choose the level and type of service for which they have a preference by locating in or moving to the local area that provides the service closest to their liking. According to Tiebout, (1956, p.418) “The consumer-voter may be viewed as picking that community which best satisfies his preference pattern for public goods”. In the context of education reform, Tiebout choice and the choice of a private school, together form traditional choice options facing the citizen. Non-traditional choice options are charter schools, vouchers, etc. An implication of the Tiebout hypothesis is the greater the number school districts and the greater the variance between them, the more homogeneous they each should become through self-selection.

**Selection Bias** and **endogeneity** are problems endemic in this area of empirical analysis and we motivate understanding through examples.<sup>1</sup> In almost all studies, economists are attempting to estimate a mathematical relationship, statistically (generally by regression analysis) based on a sample of data. Bias refers to the estimated parameter(s) of the equation being systematically different from the true population parameter, i.e. on average the estimated value is different from the true value.

Hence, use of the results may lead to faulty inferences. An examination of the characteristics of charter schools to determine how school choice might affect education could be problematic, because parents who place their children in charter schools probably are not representative of the general population.

Specifically, they might desire a strong arts or science program, and the school curriculum would likely reflect that. One could then make the erroneous inference that if given the choice of charter schools we would see either more arts or more science programs in the education system.

Continuing the example of charter schools, suppose the impetus for such schools was due to gang violence in the local public schools. Major concerns of the charter school founders and administrators would obviously be security and discipline. The administrator might then enact strong discipline policies with a high level of security. The introduction of charter schools in general would not necessarily imply a great deal of security or strong discipline policies. Security and discipline were *endogenous* to the startup of the charter school.

The use of **Instruments or Instrumental Variables (IV)** is a solution strategy that might be used to address an endogeneity problem. The researcher replaces the perceived causal variable with a substitute that is closely related (highly correlated with) to it, but free from the endogeneity problem. Such a variable (used in the public finance and in particular school choice analysis) is the number of rivers and streams. Such natural boundaries were instrumental in the early development of school districts and can serve as a measure of the degree of district concentration in a metropolitan area. Many natural boundaries imply many districts, which imply more (Tiebout) choice. Therefore, streams might be used as an instrument in place of the number of districts, which might be endogenous to what is being examined. For example, districts might have been consolidated by court order to solve a problem of education unbalance. So large consolidated metropolitan areas would be biased toward better performance independent of choice if one were trying to estimate the relationship between number of districts as a measure of choice and some performance variable.

The clever development of instruments is one of the factors that led to some of the more interesting findings over the last five years.

**Externalities** arise in the context of public or quasi-public goods where the actions of an individual affect others because of the joint nature of consumption. In the context of education, disruptive behavior by a student conveys a negative externality on others in the class by preventing them from learning. Conversely, diversity of ideas, and incisive questions convey a positive externality on the class. In terms of peer effects discussed below, and tracking in particular, tradeoffs may occur with offsetting net effects.

<sup>1</sup> There are various types of selection and endogeneity problems.

## II A Review of Some Recent Findings

In this section we review a few new findings in the following areas: (a) Educational Inputs, (b) School Choice, and (c) Peer Effects. Under educational inputs we look at the issues of class size, teacher pay and quality. Under school choice we review recent findings on charter schools, vouchers, and private school competition. We finally review two articles on peer effects and tracking.

### A. Educational Inputs

#### Class Size

A testable theoretical model by Lazear (1999) shows that class size matters very little with respect to educational output (academic performance) at equilibrium. The unique feature of the model is that classroom education is treated as a public good and disruptive behavior by a student is a negative externality. Disruptive behavior is the proportion of time a student prevents additional learning by other class members (by misbehaving or asking a question to which everyone else knows the answer). A very small average amount of distraction ( $d$ ), e.g.  $d=2\%$  with 25 students in a class leads to a large amount, 40%  $[1-(.98)^{25}]$ , of downtime. Given ( $d$ ), teacher salary and other costs; class size is a choice variable that varies inversely with ( $d$ ). If administrators are optimizing the use of school resources, then less disruptive behavior leads to larger class sizes. The optimal class size is also affected by teacher salary. To the extent such classes have better behaved and likely higher performing students, one might observe a positive relationship between class size and performance. Typically, Catholic schools have larger class sizes and higher academic performance compared to the average public school. They also have lower expulsion rates. The above does not imply that a reduction in class size does not improve educational output if it is applied to students at a given behavior level, i.e. holding ( $d$ ) constant. In a tracking environment (sorting by ability or discipline) reductions in class size could be efficacious.

The implications of the model are consistent with a number of observed facts a few reported in the article we list:

1. Teacher salaries are lower for kindergarten classes where class size is smaller.
2. The attention span is shorter for young children, and that implies a higher level of disruption and hence smaller class sizes.
3. Catholic schools are known for strict discipline, and that implies the larger class sizes that we observe.

Discipline is a substitute for class size, and will surely lead to higher academic performance, whereas across the curriculum reductions in class size may not lead to higher academic performance.

An ingenious empirical study by Hoxby, (2000c) of the effect of class size on achievement, finds no relationship. Endogeneity is a major problem that confronts researchers, in that reductions in class size are correlated with other factors that affect achievement, e.g. academic oriented parents, higher income families, etc. are more likely to push for smaller class sizes. Hence, estimates of class size with the above endogeneity would bias the results in the direction that class size reductions improve performance.

Other factors could produce a bias in the other direction, e.g. analysis of programs where the class size reductions are for special needs children or those with poor achievement. Two identification methods based on random population variation are used to solve the above problems. The first method removes the deterministic component of enrollment and uses the random component (residuals) to develop an instrument that is subsequently used in a two-stage regression, with class size in the first stage and achievement regressed on predicted class size as the second-stage. The second method exploits the discontinuity of large changes in class size caused by district, maximum class size rules. For example, a district might have a rule that the maximum class size is 30. A rise in enrollment to 32 would result in two classes of size 16. The factors that caused the enrollment to increase from 30 to 32 are minor, but the reduction in class size is large and exogenous, i.e. independent of class size effects. This is a clever exploitation of natural variation as an instrument.

The analyses, done using Connecticut data on all 649 elementary schools in 146 elementary districts, show no effect of class size on achievement. The results are also invariant to income and race. According to Hoxby, (2000c, p. 1276) “In summary, the estimates in Tables IV and V suggest that class size reductions are not efficacious for improving student achievement. The estimates do not confirm the hypothesis that class size reductions are more efficacious in districts that contain low income or African-American students.” For comparison purposes, the author performs an analysis of the data without the corrections mentioned above. The results from this naïve approach in many specifications give a negative and statistically significant effect of class size on achievement, i.e. reductions in class size increase standardized test scores. From earlier studies incorrect results due to biased estimation, is the source of much controversy on the value of expenditures on class size reductions.

We finally mention a survey article by Hanushek, (1998a). Looking at aggregate data on pupil teacher ratios, expenditures per student, and National Assessment of Educational Progress (NAEP) scores, the study shows a flat trend for NAEP scores, declining student/teacher ratios, and increasing expenditures per student. One argument proffered to explain the paradoxical result is that student populations have changed such that more resources are needed to achieve the same results possible in the past. Causes given for the population change are: (a) dissolution of the family due to divorce (b) increased number of special students due to the Individuals with Disabilities Act (IDEA) (c) increase in the percent of children living in poverty. If the teacher population is bifurcated between the regular and IDEA student populations, then the regular class size may not have changed. The author shows that none of the above arguments are supported by aggregate data, and that the belief smaller class sizes lead to greater achievement is unfounded. Between 1980 and 1990 the actual pupil teacher ratio fell by 10% from 19.1 to 17.2. Excluding the decline caused by the increase in special education, the ratio still would have fallen from 19.1 to 17.9.

The international evidence also draws into question the belief that size matters given the current student teacher ratio. Foreign countries generally have larger class sizes than U.S. schools and perform much better on achievement tests. The author reviewed (to 1994) 277 econometric studies reporting estimates of student teacher ratios on performance. Of the above studies, 28% reported statistically significant estimates, in which about half were of the wrong sign, i.e. 13% reported a statistically significant negative sign. These results are not unexpected given the analysis from the Hoxby article discussion above.

Finally, results from the experimental (STAR) project in Tennessee where some K-3 students were randomly assigned to either large class sizes (22-24) or small class sizes (14-18) were not favorable toward smaller class sizes beyond the kindergarten level. Hanushek (1998a, p. 27) states, “Perhaps the most standard interpretation from learning theory begins with the view that education is a cumulative process, building on past achievement. From this view, if students learn certain skills in the first grade, they tend to carry over to later grades, albeit possibly with some depreciation. According to this view, the basic evidence of the STAR study suggests that smaller classes may be important at kindergarten but have no average effect subsequently.”

### **Teachers Pay and Quality**

Teachers are the most important input in education production and arguments for higher teacher salaries to increase the quantity supplied and quality of teachers have been at the forefront of educational reform policies. It is important to consider the demand and supply movements in the teacher market, along with quality changes and incentives faced by both teachers and administrators. Hanushek (1998b) compares the growth in spending to the flat student achievement trend and notes that most of the change in spending was not due to increasing enrollment, but to per student expenditures. Between 1890 and 1980, real per student expenditures rose from \$164 to \$4,622 and teacher prices increased from \$34 per day in 1890 to more than \$177 per day in 1990. To assess the quality and price of teachers, their salaries are compared to the salaries of workers outside of the teaching profession. This gives a comparative measure of where teachers lie in the distribution of worker salaries. An increase in the percent of non-teachers earning more than the average teacher is an indicator of a decline in teacher quality compared to alternative occupations, despite the rise in teacher prices. It is shown that 16% of males earned higher salaries than teachers earned in 1940 whereas 36% earned higher in 1990. For females, 8% earned more than teachers in 1940 but 25% earned more in 1990. Pay has risen but quality has likely declined.

Across the board spending is not likely to have an impact on performance given the current incentive structure, as pay is not linked to student outcome. A policy implication of the above is that a different incentive structure is needed as good and bad personnel receive about the same compensation. “Underlying this view is a more benign opinion of school personnel. Specifically, school personnel are not just ignoring a set of policies that would lead to obvious improvements but instead are simply following existing incentives.” Hanushek (1998b, p.23).

Hoxby, (1996) studies the principal agency issue of teacher self-interest versus student achievement. Two possible models are tested. The first studied is the “Rent Seeking” model where teachers, through their unions seek more and/or a different mix of education inputs (than parents might desire) not to maximize student achievement but to maximize personal gain. The second model is the “Efficiency Enhancing” where teachers seek a different mix of resources because they have superior information about the needs of students and the education process. The study offers many interesting results. The extensive panel data set (every school district in the U.S. over 3 census periods) and solid econometric analysis produces results for which one might have a high level of confidence. Below we list a few of the results, but the finding with respect to the issue raised above is given with this quote by Hoxby (1996, pp. 708-709).

“In summary, the results indicate that teachers’ unions succeed in raising school budgets and school inputs but have an overall negative effect on student performance... It is striking that unionization is associated with both more generous school inputs and worse student achievement. This is strong evidence that teachers’ unions serve, at least in part, a rent-seeking purpose. Teachers’ unions are, indeed, a potential answer to the puzzle of increasing spending and stagnant student performance in the post-1960 period.”

- 1) During each period of analysis, spending grew faster in schools that were unionized. Per-pupil spending increases by 12.3 percent when unionization takes place. (p. 692).
- 2) Spending grows faster in states that are *passing* unionization laws. (p. 694).
- 3) Unionization generated a salary increase of 5%. (p. 694).
- 4) Unionization decreases the student teacher ratio by about 1.7 students. (p. 695).
- 5) Unionization schools have a 2.3 percentage point worse dropout rate, compared to non-unionized schools. (p. 707).
- 6) Unions are more effective at raising the per-pupil spending in metropolitan areas that are more concentrated (less school districts and/or of unequal size) and with less school choice. (p. 710).

Finally, some research has been conducted on the demand side for teachers. An interesting question addressed by Ballou (1996) is whether administrators hire the more qualified teachers when they present themselves. If administrators are passing over the most qualified candidates, then another policy concern is generated.

The author presents descriptive statistical measures on percent of graduates certified in education, percent applied for teaching jobs, and percent that accepted jobs in public education over the period 1976 to 1991. The above is also presented, stratified by the selectivity of the admissions policies of colleges from which they graduated. This is used as a measure of a prospective teacher’s academic background. Two observations are: a) the higher the quality of the undergraduate institution, the less likely is the graduate to apply for or accept a teaching job b) of those who seek teaching jobs, the higher the quality of undergraduate institution, the less likely the applicant is *offered* a job. While the supply side finding (a) was nothing new, the demand side finding (b) was new. The author is able to rule out exceptions such as more selective graduates seek higher wages, are more selective in terms of working conditions, and that such graduates come from the lower end of the graduate distribution within their selective college. Results from the econometric model developed by the author confirm what is suggested by the descriptive measures, i.e. college quality has no significant effect on job offers.

The two-equation qualitative response model where the first equation is the application equation (supply) and the second is the employment equation (demand), controls for personal characteristics, academic background quality, and subject specialties. An interesting result in term of subject specialty is that a degree in education is highly beneficial relative to a degree in the area one is preparing to teach at the secondary level. Job prospects are better with an education degree than one in subject matter such as science or math where a shortage seemingly exists. This statement from the author’s conclusion summarizes the implications of the work.

“The implications of this research are unsettling. The academic ability and cognitive skills of many of the nation’s teachers have been an object of considerable concern. It is often alleged that improvements

will require increases in teaching salaries vis-à-vis those available to talented individuals in other occupations. Yet the evidence reviewed in this paper shows that school districts do not hire the ablest candidates available even now.” Ballou (1996, p. 130).

## **B. School Choice**

Whereas the findings in the previous section deliver a bleak picture in terms of educational inputs, the school choice findings discussed here are more positive. A negative albeit non-objective review of school choice by non-economists is Good and Braden (2000). Interest in school choice by economists probably began with Milton Friedman’s (1962) argument for a voucher system. Despite general support for a voucher system by many if not most economists, this idea of Friedman’s has met resistance. We review works on the effect of school choice on curriculum, and vouchers and charter schools as school choice vehicles.

### **School Characteristics Resulting From School Choice**

An investigation was undertaken by Hoxby (1999) of the ex-post effects that school choice might have on school characteristics. Opponents and proponents of school choice disagree on the expected outcomes from choice on at least the following: 1. Whether parents become more actively involved in changing the current school’s policy or exit to another school after choice; opponents believe exit 2. Proponents argue average parents desire strong academic programs whereas opponents believe they prefer easy curricula 3. Proponents believe that the average parent desires strong disciplinary policies, while opponents feel that the average parent places more emphasis on extracurricular activities 4. Opponents believe parents may state a desire for strong disciplinary policies but that applies not to their own children.

The study corrects for several major problems (mentioned in the first section of this paper) encountered in these types of studies, i.e. selection bias, endogeneity, peer effects resulting from segregation (positive outcome of curriculum change due to sorting as opposed to choice). The empirical strategy uses Tiebout Choice for the source of exogenous variation. The story runs, given a great degree of choice in metropolitan areas that have many districts, compared to those with few districts, parents select the district with the better school. This drives down property value in the bad school districts, which in turn reduces funding for the bad schools thereby providing administrators in bad schools the incentive to be responsive to parental desires. Thus, one should expect more responsive administrators in metro areas with a high concentration of districts where parents are afforded the option to relocate, then in a district such as Miami, which has one school district. An alternative estimation methodology using instrumental variables based on natural boundaries of rivers and streams is also employed to mitigate potential endogeneity problems. The results from both methods are compared and reported.

The findings support the proponents of choice. Some key results were:

- 1) More Tiebout Choice leads to more active involvement of parents in terms of discussions with their children about curriculum, school visitations, and participation in PTA meetings. Administrators also raise their assessment of parental involvement.

- 2) A one unit increase in the choice index variable used in the analysis raises the percentage of students that take AP in the tenth and twelve grades by 35% and 20% respectively, and increases by 20% the probability that the math curriculum offers calculus in the twelfth grade.
- 3) Choice increases grade inflation (a result which supports opposition to choice), but a one unit increase in choice leads to 1.8 more hours of homework per week.
- 4) In terms of discipline, school choice increases discipline, measured by severity of disciplinary action taken against students and it leads to a more structured classroom environment.
- 5) Estimates of the effect of choice on sports and extracurricular activity are insignificant, using measures of the ratio of physical education teachers to regular teachers, number of extracurricular events, etc. A marginally significant result is that a one-percent increase in the choice index reduces by roughly 6% the percentage of students that participate in varsity sports.

### **Vouchers**

Vouchers are entitlements granted by governments to an individual (parent) to be used at the educational institution of choice. Two of the broadest voucher programs are in effect in Milwaukee and Cleveland. Epple and Romano (1998) developed a theoretical and a computational model that is calibrated to U.S. data. The computational model provides simulated results on the effects of vouchers at various levels of public and private school equilibria. The authors consider the effect vouchers would have on the mix of public and private schools, accounting for family income, student ability, and peer ability.

The benchmark results (without vouchers) give 88-90% in public schools. The actual U.S. enrollment during the period of analysis is 88%. Also, high ability students receive tuition discounts at private schools, and extremely high ability pay negative tuition. With a voucher of \$1,800, the public school sector falls to 73% and the public school quality index falls from 12.0 to 10.3. A greater graduation of private schools evolves with their quality index ranging from 18.6 to 33.1. This is compared to less types of private schools with the quality index ranging from 24.7 to 34.7 for the benchmark case. An interesting result worth noting is that school size is inversely related to quality. Other results from simulations using various voucher amounts up to the full minimum average cost of educating a student (\$4,200) are:

- 1) The distribution of ability of students shrinks as the voucher amount increases and the size of the public school sector shrinks to zero as the voucher reaches the full cost of education (p. 50).
- 2) The percentage of parents that favor the voucher increases as the voucher amount increases but never reaches a majority, i.e. the majority do not benefit from a voucher system though the net gain to society is positive. Specifically, a small number with large gains from a voucher system outweigh the large number of potential participants that would experience small losses. This finding is consistent with the lack of public political support for the voucher.
- 3) Welfare gains accrue until 80% of students are in the private sector, and academic achievement gains accrue until 47% of students are in private sector schools, then declines with additional increases in the vouchers. The tax rate to support the voucher initially declines (reductions in public school costs outweigh the cost of voucher schools) then rises sharply once the voucher reaches about \$3,200.

- 4) Increases in achievement occur as students are sorted by ability into schools with similar peer achievement levels. Overall, complete ability stratification increases achievement by roughly 5% over complete mixing of students. The losers from the voucher are those who remain in the public system, which has deteriorated (with no reduction in operating costs) as high ability students self-select into private education. Some who switch to marginal private schools also lose. The two groups just mentioned are the largest in number. The largest achievement gains go to high-ability low-income individuals, and as mentioned earlier, the magnitude of gain by the minority outweighs the small losses by the aforementioned majority.

### **Charter Schools**

Compared to voucher systems, charter schools appear to be a more viable option for choice proponents. The origin of the charter concept is not definitive see Hassel (1999, p. 4-5). A definition of a charter school is given by Finn, Manno and Vanourek (2000, p. 14) as an “independent public school of choice, freed from rules but accountable for results.” Though many states have established laws that permit charter schools, few establishment laws have come with minimal restrictions. Arizona and Michigan have led the way for environments that foster charter schools. According to Hassel (pp.18-21), states with laws that foster charter schools have the following attributes:

1. Empower groups other than local school boards to authorize charter schools
1. Permit wide variety of groups to establish charters
2. Have exemptions from many current public school regulations and policies
3. Have legal and fiscal independence from local school boards
4. Possibility for a large number of charter schools to open and be viable competitors to public schools.

Based on the momentum of the charter movement, the proliferation of charter schools over the last 10 years, and their successes in states where they are granted autonomy, it is probably safe to say that charter schools are here to stay and provide competition for traditional public schools.

If charter schools are to make a difference in terms of improved achievement, then they must do something different. Some empirical results by Hoxby (2000a) comparing teacher characteristics in charter, private, and public schools, are revealing. The selectivity of the college from which the teacher graduated is a measure of quality and the study considers quantity hired and wages paid by the three school types for various quality teachers. College rankings are based on Barron’s 1 – 9 scale college rankings, where 1 is nonselective and 9 is most selective. The regression models that produce the selected results presented here treat for the problems discussed in the first section of this paper. For teachers that graduated from competitive plus (8 on the scale) colleges, the respective percentages of charter schools, private schools, and public schools from this group are 36%, 36%, and 20%. Charter schools pay this group 6.6% more than other teachers. Private and public schools respectively pay this group 4.5% and 3.1% more. A few of the results from Hoxby’s tables are presented in the table below. The % Wage difference is the premium paid over teachers not in the selective group.

	Public School		Private School		Charter School	
	Teacher Quantity Percent	% Wage Difference	Teacher Quantity Percent	% Wage Difference	Teacher Quantity Percent	% Wage Difference
Math/Science Major	7.9	4.4	6.8	9.2	10.3	8.4
Majored in Subj. Area	36.7	4.0	41.9	7.6	56.1	6.5
	Average Number	% Wage Difference	Average Number	% Wage Difference	Average Number	% Wage Difference
Math/Science Courses Taken by Teachers	1.1	-0.05	2.0	4.0	4.2	3.2
	Qty. per Week	% Wage Change per extra hour	Qty. per Week	% Wage Change per extra hour	Qty. per Week	% Wage Change per extra hour
Extra Instructional Hours Worked	8.7	-0.05	8.7	5.8	13.4	4.9

Finally, credentials represented by Master's Degrees, Certified to Teach, and Certified in Teaching Area, are uniformly higher in the traditional public school. Compensation is also uniformly greater for each compared to the charter and private school groups. From Hoxby's study, one might conclude that Charter and Private Schools seek higher ability teachers and pay more at the margin for such individuals. Charter and private schools are also more performance and less credential oriented.

### **Catholic Schools**

We have mentioned on several occasions that Catholic school students perform better than observationally equivalent public school students. This is true based on many studies regardless of whether the performance measure is test scores, student earnings, or graduation rates. A study by Derek Neal (1997) finds that the performance superiority is primarily an urban phenomena that is most pronounced for minorities. His results differ greatly from some other studies due to a more comprehensive data set developed from the National Catholic Education Association (NCEA) school population directories and the National Longitudinal Survey of Youth (NLSY).<sup>1</sup>

Also, the use of two instruments, population density of Catholics in locality and Catholic secondary schools per square mile, address the selection bias problems.

The empirical results corrected for selection bias show no significant effect of Catholic schools on graduation rates of students in suburban areas regardless of ethnicity. However, the probability of graduating from high school in urban areas rises from 74% to 85% for white students, and from 62% to 88% for black and Hispanic students. The analysis is important for the public school reform debate because the interpretation of the results is that minorities perform better in Catholic schools because the public schools available to minorities in large urban areas are of extremely poor quality. Hence, the observed performance increase is a direct consequence of the greater disparity in school quality relative to urban public schools attended by white students. Specifically, there is

<sup>1</sup> The NLSY has been used extensively by researchers in this area.

no difference between black/white graduation rates in public schools in areas with a population less than one million. However, for populations greater than 1 million, the white graduation rate is 79% and the black and Hispanic rate is 69%. This 10% disparity is taken as indicative the inferior public schools attended by minorities in large urban areas. The author reports other results that show Catholic school students earn higher wages later on. The results are best summarized with the author's quote, "In sum, these results do not indicate that Catholic schools are superior to public schools in general. Rather, they suggest that Catholic schools are similar in quality to suburban public schools, slightly better than urban public schools that white students usually attend, and much better than the urban public schools that many minorities attend."

### **C. Peer Effects**

Several papers reviewed above have addressed peer effects but we review two here. Argys, Rees, and Brewer (1996) investigate the effect of tracking on peer achievement. The authors control for class size, teacher characteristics, etc., and this is important because there is evidence that higher tracks are assigned better teachers and more resources. As typical of the papers reviewed here, the authors control for sample selection bias that would arise if selection is based on unobservable criteria. Tracking is a contentious policy as its use as a method of school organization increased as student diversity increased over the last 40 years. Concern exists over the use of tracking as a means of maintaining segregation.

The authors use the National Educational Longitudinal Study of 1988 (NELS) on 8<sup>th</sup> and 10<sup>th</sup> graders to develop a sample of about 3,400 public school students. Based on the teacher question, results are provided on two tracks with four categories each. Track I categories are: above average, average, below average, and heterogeneous (mixed). Track II categories are: honors, academic, general, and vocational/other. Descriptive statistics support the belief that upper level classes receive better inputs, e.g. higher quality teachers. Based on the track selection model of the two-stage procedure, some findings are: 1. Initial track placement (8<sup>th</sup> grade) has an effect on remaining in the track at 10<sup>th</sup> grade, independent of performance on the 8<sup>th</sup> grade achievement test 2. Socioeconomic status influences placement with better background students placed in higher tracks 3. Holding socioeconomic status constant, race is not a good predictor of track placement. Based on the achievement equation, some findings are: 1. Teacher experience has little positive effect on achievement 2. Teacher certification in math leads to a 13.5% increase in student math test scores 3. Being taught by a substitute teacher reduces math test scores, by about 8 and 21 percentage points respectively, for both general and heterogeneous tracks. This is significant since substitute teachers are more likely assigned to lower track classes and this exacerbates the poorer performance of this group.

The general findings on tracking are that it has a meaningful effect on student achievement, and it is symmetrical. Placing a student in the above average or average class as opposed to the heterogeneous class increases performance by 5% and 2% respectively. Placing a student in an honors class compared to an academic level or general level class raises performance by 10% and 6% respectively. The effect of detracking is that students enrolled in below level classes benefit from detracking, while those in homogeneous upper level classes are harmed. Based on estimates, the net effect is a 1.5% decline in math test scores as the heterogeneous mean test score is 63 and the overall mean score is 64.5. Hence, detracking is Pareto inefficient since winners cannot compensate losers.

The author notes that on Rawlsian grounds the policy is good and may lead to less crime, increase economic mobility, etc. in the long run as the more disadvantaged benefit at a cost to the more advantaged.

The last article we discuss is Hoxby (2000b). This work offers one of the most meticulous treatments of selection bias in the estimation of peer effects. Peer effects include knowledge spillovers between students with different knowledge bases, behavioral effects possibly caused by environmental differences, e.g. disruptive behavior or disability effects that might absorb more of a teacher's time thereby detracting from other students. Peer effects might be generated by negative feelings, or negative expectations toward an ethnic group by a biased teacher. Selection bias is a problem in a comparison between schools because of the Tiebout effect. It is a problem in a comparison between classrooms because schools might sort by ability or behavior, or parents may seek a class that has a particularly good teacher.

The empirical strategy exploits idiosyncratic variation in gender and racial composition between adjacent cohorts within a grade within a school to develop instruments. Key adjustments to account for linear trends (48,000 regressions run for these instruments) in the data and year specific anomalies, as well as non-linearity tests, are also made. Some key results of the study are:

1. Both female and male test scores improve by increasing the share of females in a class, but the increases are so large, that it cannot be explained by higher average peer achievement alone, i.e. being around a person with a 1% higher achievement leads increases in achievement up to 7% in math. Hence, peer effects do not operate solely through mean achievement as other studies (baseline model) have indicated.
2. Blacks, Hispanics, and whites all tend to do worse in reading and math when they are in classes with a larger share of black students, and the effect is greatest intra-racially, i.e. blacks have a more negative effect on other black students. Since blacks have the lowest scores on average, the above result is mostly a mean peer achievement effect.
3. For every 10% point change in the share of their class that is Asian, white 5<sup>th</sup> and 6<sup>th</sup> graders score 0.07 and .20 points higher respectively in math. This also is in line with mean peer achievement effects as Asian students have higher average math scores.
4. The analysis of idiosyncratic variation based on changes in residuals between cohorts

(empirical strategy 2) shows that achievement in math and reading is positively correlated by gender and race. The racial origin of peer achievement is unimportant. Specifically, if due to random variation, a class experiences an influx of higher achieving students, then that affects the class positively in terms of achievement regardless of origin of ethnicity, i.e. higher achieving blacks have a positive effect on lower achieving whites, higher achieving Native Americans have a positive effect on lower achieving Hispanics, etc. The results of the analysis are cycled through all four ethnic groups (Hispanic, white, black, Native American) in the tables provided by Hoxby.

An implication of 4 is that improving educational production across the board has positive cross effects by gender and race.

### III

## JSCF Research Prospects

Most of the studies in this review article used national data sets for their analysis, but the findings are generally applicable. Work by Lanier and Salzman (1999) is in line with the studies reviewed here, and their findings on South Carolina school districts are consistent with many of the results reported. It might be useful to employ some of the empirical strategies presented in the above studies on South Carolina data. Also while most of the studies analyze data at the school *district* level, interesting results might be forthcoming from analysis at the *school* level. Descriptive statistics on school level data raise a number of flags such as: 1. great variance in performance among schools in the same district 2. seeming geographic anomaly of lower performance by schools along the I-95 corridor in South Carolina 3. systematic lower performance by schools with a high percentage of black students.

It might be useful to develop a rank order assessment of every school in the state and associate and track administrative/school performance and regime changes. Such additional panel data information would enhance further research. Such information would be useful for parental decision-making with respect to school choice. Such a rank ordering might raise accountability. Ideal would be a system that would allow researchers to track cohorts through their academic career or individual students through nondescript identification.

From the studies reviewed above, a number of questions arise. A few are:

1. How important is Tiebout Choice in South Carolina, and what effect has it had on the composition of schools and districts?
2. What effect if any are charter schools having on educational achievement in South Carolina and traditional public education?
3. What effect has traditional choice had on inter and intra district school composition and performance?
4. What is the impact of Catholic schools on public education in the large urban areas of South Carolina?
5. How significant is tracking and what are its effects at the district and school level in South Carolina?
6. To what extent does disruptive behavior pose a problem and what effect does it have on academic achievement, class size, and school organization, i.e. tracking?

A number of states, e.g. The Star Program in Tennessee, The Texas School Project, have developed experimental programs to evaluate reform policies that might be efficacious. A number of researchers at Clemson are independently working in the area of the economics of education and education reform. A joint interdisciplinary experimental project with state educators, academics, and interested stakeholders might be a fruitful venture.

Finally, we have not reviewed the literature on school finance and in particular recent findings on school finance equalization. However, with the implementation of the South Carolina Lottery for educational funding and budget cuts due to a revenue shortfall from traditional sources, recent findings on school finance and findings reported in this review on the effectiveness of certain types of spending on achievement, should be given careful attention.

## Conclusion

The articles reviewed present some new findings on educational production and school choice. New results are forthcoming because of the researchers' careful control for statistical biases that have plagued earlier studies and innovative econometric empirical strategies. It is shown that peer effects have a significant effect on achievement and such effects can be negative or positive. On the positive side, higher idiosyncratic performance increases peer performance and this is true regardless of ethnicity, i.e. higher achievement by individuals of any ethnic group in a cohort leads to higher achievement by others in any ethnic group. On the negative side, lower average achievement by a group leads to lower achievement of peers. Therefore detracking reduces performance and harms higher level tracks but increases performance and benefits lower tracks. The above is all based on performance as measured by test scores which we believe is a valid and the best objective measure of educational achievement. However, interpersonal skills and social awareness acquired by mixing are also valuable skills that are important in the labor market and such effects are not the focus of the articles reviewed.

Disruptive behavior might be the key factor for the poor academic achievement in the U.S. The article by Lazear shows that a little disruptive behavior leads to a large amount of learning downtime. Casual observation leads one to conclude that many urban schools have lost control of discipline particularly since the 1960's. Disciplinary policies changed over the last 40 years due to law changes and disciplinary methods and ideas purveyed by some sociologists and psychologists. Issues of attracting and retaining good teachers, teachers pay, and teacher performance (which is criticized to a great degree above) are all related to child discipline. Solving the discipline problem should have a positive effect teaching. Any serious educational reform policies need to address the issue of disruptive behavior and discipline prior to pouring additional funds at a lost cause (at least from an efficiency point of view) in many urban schools.

All of the articles reviewed here show that increased school choice should be beneficial. Catholic schools have a comparative advantage in urban areas particularly with respect to minorities because urban schools are so much worse for such groups compared to suburban schools. Catholic schools maintain strict discipline with lower expulsion rates and something might be learned from their model. Both vouchers and charter schools should have a positive effect on academic achievement both directly and through competition that would motivate a change in behavior of traditional public schools that are lackluster. However, given the general sentiment to the voucher system, charter schools are more likely the vehicle for introducing more school choice.

Finally, it might be useful to develop to develop interdisciplinary experimental projects in an effort to enhance educational production in South Carolina. This is so because of the number of independent researchers at Clemson, JSCF, S.C. Dept. of Education, etc. who are working in this area.

## References

- Argys, Laura M., Daniel I. Rees, Dominic J. Brewer, "Detracking America's Schools: Equity at Zero Cost?" *Journal of Policy Analysis & Management*, Vol. 15, No. 4 (Fall 1996), 623-45.
- Ballou, Dale, "Do Public Schools Hire the Best Applicants?" *Quarterly Journal of Economics*, Vol. 111, No. 1 (February, 1996), 97-133.
- Becker, Gary S., Kevin M. Murphy, Robert Tamura, "Human Capital, Fertility, and Economic Growth" in Gary S. Becker, *Human Capital*, 3<sup>rd</sup> ed. Chicago: Univ. of Chicago Press, 1993.
- Coleman, James S., Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Weinfeld, Robert L. York. *Equality of Educational Opportunity*. Washington, D.C.: U.S. Government Printing Office, 1996.
- Epple, Dennis, Richard E. Romano, "Competition Between Private and Public Schools, Vouchers, and Peer-Group Effects," *The American Economic Review*, Vol. 88, No. 1 (March 1998), 33-62.
- Finn, Chester E., Bruno V. Manno, Gregg Vanourek. *Charter Schools in Action*. Princeton, N.J.: Princeton University Press, 2000.
- Friedman, Milton, Rose Friedman. *Capitalism and Freedom*. Chicago: University of Chicago Press, 1962.
- Good, Thomas L., Jennifer S. Braden. *The Great School Debate: Choice, Vouchers, and Charters*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc., 2000.
- Hassel, Bryan C. *The Charter School Challenge: Avoiding Pitfalls, Fulfilling the Promise*. Washington, D.C.: Brookings Institution Press, 1999.
- Hanushek, Eric A., "The Evidence on Class Size," W. Allen Wallis Institute of Political Economy Occasional Paper No. 98-1, (February 1998a), 1-40.
- Hanushek, Eric A., "Conclusions and Controversies about the Effectiveness of School Resources," Federal Reserve Bank of New York Economic Policy Review, (March 1998b), 11-27.
- Hoxby, Caroline M., "How Teachers' Unions Affect Education Production," *The Quarterly Journal of Economics*, Vol. 111, No. 3 (August 1996), 671-718.
- \_\_\_\_\_, "The Effects of School Choice on Curriculum and Atmosphere," in Susan Mayer and Paul Peterson, *Earning and Learning: How Schools Matter*. Washington, D.C.: Brookings Institution Press, 1999.
- \_\_\_\_\_, "Would School Choice Change The Teaching Profession," National Bureau of Economic Research Working Paper No. 7859, (May 2000a), 1-52.

Hoxby, Caroline M, "Peer Effects in the Classroom: Learning From Gender and Race Variation," National Bureau of Economic Research Working Paper No. 7867, (August 2000b), 1-54.

\_\_\_\_\_, "The Effects of Class Size on Student Achievement: New Evidence From Population Variation," *The Quarterly Journal of Economics*, Vol. 115, No. 4 (November 2000c).

Lanier, Louis R., Ellen Weeks Saltzman. *Public Education and Greenwood County: A Benchmarking Tool*. Clemson, S.C.: Strom Thurmond Institute, 1999.

Lazear, Edward P., "Educational Production," Working Paper, (April 1999), 1-48.

Neal, Derek, "The Effects of Catholic Secondary Schooling on Educational Achievement," *Journal of Labor Economics*, Vol. 15, No.1, part 1 (January 1997), S98-123.

Tiebout, Charles M., "A Pure Theory of Local Expenditures," *Journal of Political Economy*, Vol. 64, No.5 (October 1956), 416-24.