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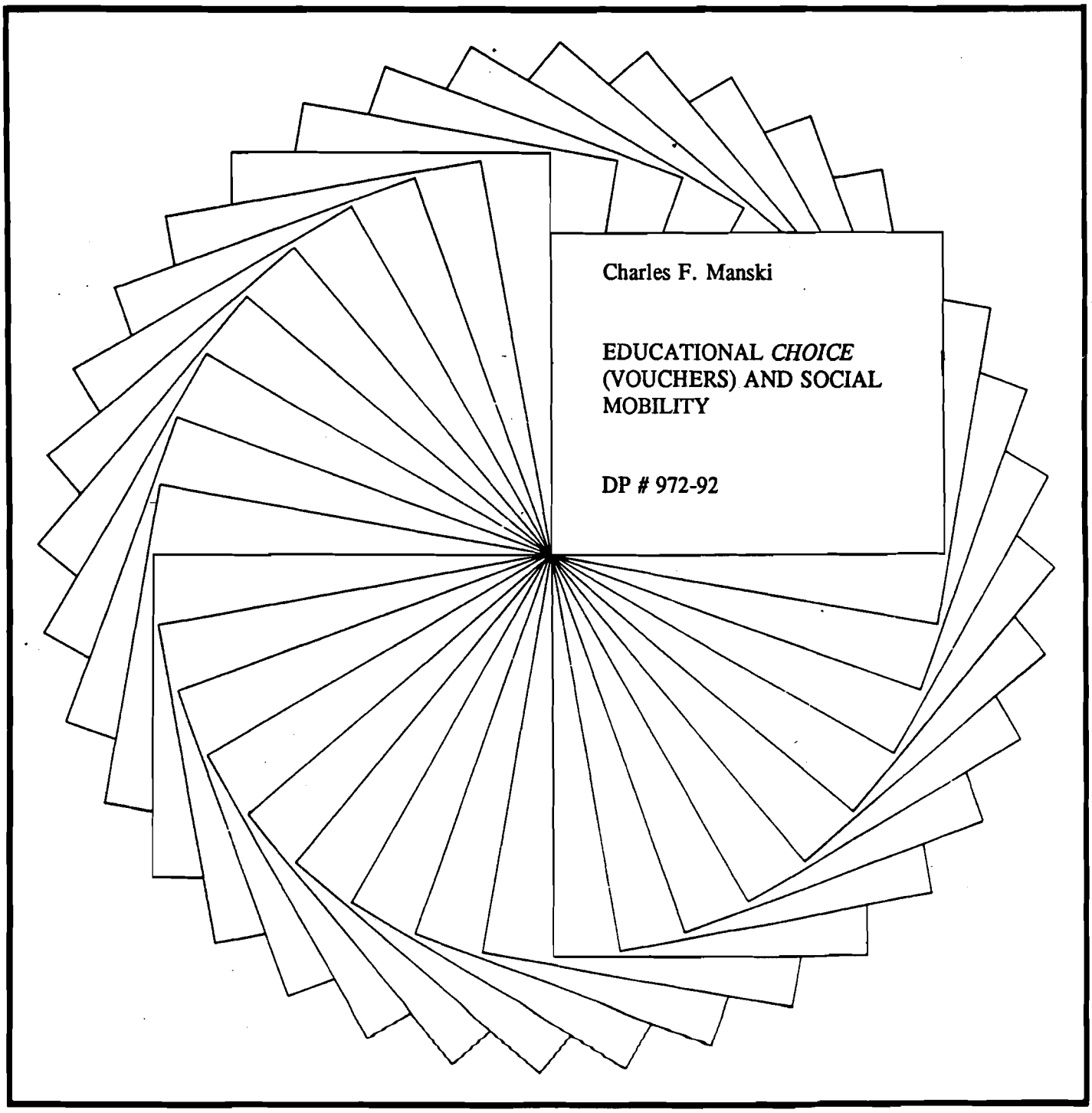

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EDUCATIONAL *CHOICE* (VOUCHERS) AND SOCIAL MOBILITY

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Educational *Choice* (Vouchers) and Social Mobility

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Abstract

Advocates of school *choice* argue that tax support of public schools distorts the incentives faced by both the consumers and producers of schooling. They recommend removing this distortion by providing vouchers to subsidize students should they choose to attend private schools. Some reformers see vouchers as a panacea, which will not only enhance the opportunities of poor youth by enabling them to choose better schools but will also improve the public-school system by forcing it to compete for students.

A quantitative approach to this question is thought to yield more meaningful results than theoretical arguments. This paper makes use of a model of the behavior of youth and schools to simulate the effects of vouchers of varying sizes on students in different income categories, living in three communities--poor, average, and wealthy--under two assumptions about how public schools spend their resources. The first assumption is that public schools minimize their offerings to individual students (i.e., maximize their surplus) in order to further objectives not valued by students. The second assumption is that public schools act as competitive firms, maximizing their educational offerings to individual students.

Findings from the simulation are neither uniformly positive nor negative. They do not support the argument that poor youth will be better off with a voucher system. Even in the most favorable case--when public schools maximize surplus--a systemic *choice* system would not come close to equalizing educational opportunity across income groups.

Educational *Choice* (Vouchers) and Social Mobility

1. EDUCATION AS AN INSTRUMENT OF SOCIAL MOBILITY

Today, as in the past, education policy is seen as an appealing instrument for enhancing social mobility. The appeal arises from the conjunction of institutional and empirical facts.

The essential institutional fact is that schooling is the main point of contact between government and children. Almost all children in the United States are subject to compulsory schooling laws in effect throughout the nation. The great majority of American children obtain their education in public schools.

The empirical basis is the association between schooling and life outcomes, both within a generation and from one generation to the next. A strong positive association exists between a person's education and his or her subsequent socioeconomic status (see, for example, Murphy and Welch, 1989). There is also a strong positive association between a person's education and that of his or her children (see, for example, Manski et al., 1992).

The empirical association between education and life outcomes suggests that education policy can influence mobility both within and across generations. A child growing up in a low-income family is, if educated, more likely to become a high-income adult. And an educated child is more likely, as an adult, to see that his or her children are well educated.

Of course, the use of education to increase social mobility presumes that two conditions hold. First, the empirical association between education and outcomes must be structural; we must have reason to believe that the observed associations will persist if education policy is changed. Second, we must possess effective policies, ones capable of influencing the education that youth receive.

Belief that education really does affect social mobility is widespread and will not be questioned here. This paper is concerned with the effect of policy on the education of disadvantaged youth.

1.1. Targeted Programs

Education policy in the United States has explicitly sought to influence social mobility through numerous programs targeted at disadvantaged youth. Current federal programs range from the Chapter One grants to school districts with high rates of enrollment of low-income students (U.S. Department of Education) to the Headstart program offering preschool education (U.S. Department of Health and Human Services) to the Pell Grant program offering college scholarships for low-income students (U.S. Department of Education). States have long subsidized school districts with low tax bases and some have recently begun to enact "learnfare" programs, which withhold welfare payments from families whose children fail to meet attendance requirements. Local school districts, which bear most of the responsibility for elementary and secondary education in the United States, undertake a host of classroom, extracurricular, and social-service activities aimed at disadvantaged youth. Private groups sponsor an eclectic array of programs.

Most targeted programs attempt to improve the prospects of disadvantaged youth while intervening as little as possible in the schooling of other youth. (Some impact on other youth is inevitable because resources allocated to programs for disadvantaged youth are then unavailable for other purposes.) One important class of targeted programs, however, necessarily affects the schooling of both advantaged and disadvantaged youth. These are the integration programs placing youth from different racial or socioeconomic groups in the same schools and classrooms. To be effective, an integration program must intervene in the schooling of a spectrum of youth.

1.2. Systemic Reform Proposals

Targeted programs may improve the education received by disadvantaged youth, but the general structure of our education system is the primary determinant of educational opportunity. This structure was put in place in the 1800s, when the states enacted compulsory schooling laws and established systems of locally controlled public-school districts providing free education from kindergarten through grade twelve. Since then, the American education system has remained basically unchanged, except for the elimination of de jure racial segregation in the 1950s.

Because the general structure of American education has so long remained unchanged, social policy has typically sought to improve the educational prospects of disadvantaged youth by grafting targeted programs onto an education system thought to be fixed in place. Recent events, however, call into question whether our education system will remain fixed in the future.

It has become increasingly common for educators and public officials to bemoan the perceived inadequacy of American education and to call for "systemic" reform, "restructuring" the schools, and the like. President Bush, in his April 1991 speech unveiling the Administration's new America 2000 education strategy, declared: "For the sake of the future, of our children and of the nation's, we must transform America's schools. The days of the status quo are over." He went on to say, "there will be no renaissance without revolution" (U.S. Department of Education, 1991, pp. 2 and 3).

Criticism of the organization of public-school systems has become especially prominent. It is widely held that decision making in these systems is too concentrated in school district administrations, that teachers and principals lack the incentives and authority to perform their jobs effectively. Agreement on the existence of a problem does not, however, imply consensus on its solution. Some advocate transfer of decision-making power from central administrations to school principals, while others recommend transfer of power from administrators and principals to classroom teachers or to

parents. Some see the need for greater concentration of decision making rather than less, through the establishment of a national curriculum and/or a national student-testing system.

Of all the proposals in the air, the Bush administration's call for systemic *choice* seeks the most radical change in the existing education system and has generated the greatest controversy. The term *choice* has sometimes been used to describe various modest ideas, including open-enrollment plans within existing public-school systems and private-school scholarships limited to low-income youth. But the administration's proposal would drastically change our system of school finance. Instead of providing institutional support to public schools, the government would subsidize the enrollment of all students at "all schools except where the courts find a constitutional bar" (U.S. Department of Education, 1991, p. 41). The intention clearly is to subsidize enrollment at secular private schools and, courts permitting, at religiously affiliated schools as well.

1.3. What Would *Choice* Do?

Among the proposals for systemic educational reform, *choice* would seem to have the greatest potential to substantially affect the education of disadvantaged youth, whether for good or for bad. As this paper is written, it does not seem likely that *choice* programs will be enacted by the states in anything like the form advocated in America 2000, if at all. Opposition to public subsidization of private schools is strong, and the inertia of the established education system makes radical change hard to bring about. But because the systemic *choice* idea has rhetorical support and intellectual appeal, it must be considered seriously. The administration's present push for *choice* may fail, but proposals will undoubtedly resurface in the future.

Unfortunately, consideration of *choice* to date has been anything but serious. The policy debate has been long on advocacy and short on analysis. As matters stand, we know very little about

the educational consequences, for disadvantaged youths and for others, should a systemic *choice* proposal be adopted.

There is a pressing need to move the *choice* debate away from advocacy and towards analysis. The educational prospects of disadvantaged youth could, in principle, be more affected by the outcome of this debate than by any plausible change in targeted programs. So I have chosen to focus this paper on systemic *choice* and its implications for social mobility.

Section 2 summarizes the theoretical and empirical arguments made by the proponents of systemic *choice*. Section 3 reconsiders the classical economic thinking that provides the intellectual basis for *choice* advocacy. Section 4 develops a model of equilibrium in the market for schooling and uses the model to predict the implications of some specific *choice* proposals. Section 5 draws lessons for education policy.

2. THEORETICAL AND EMPIRICAL ARGUMENTS FOR *CHOICE*

2.1. Educational Alternatives in the Established System

The present American educational system offers substantial choice among educational alternatives. First, families choose public-school districts through their selection of residences. Second, compulsory schooling laws do not require a youth to attend a public school in his or her district of residence. One may enroll in a private school and, in some areas, one may enroll in an out-of-district public school or be educated at home. In 1988, about 12% of American students in elementary and secondary education were enrolled in private schools (National Center for Education Statistics, 1991, Table 2).

Third, a range of schooling alternatives is typically available within each public-school district. Some districts permit students to enroll in any high school in the district, conditional on

meeting school-specific academic requirements and, possibly, racial integration criteria. Within high schools, students routinely select among curricular tracks and choose among elective courses within each track. The range of formal options is typically more limited at the elementary and middle school levels, where neighborhood schools prevail and where elective courses are less common. But elementary schools often informally permit parents to request specific teachers for their children. And some districts operate district-wide "magnet schools" as well as neighborhood schools.

Fourth, and perhaps most important in the long run, institutional barriers do not usually stand in the way of the creation of new educational alternatives. The states, which provide the legal foundation for schooling, typically permit local public-school districts to reconfigure their school systems as they deem appropriate. And the states do not make it overly difficult to establish new private schools or shut down old ones. In the language of industrial organization, the private-school industry is characterized by relatively free entry and exit.

2.2. School Finance and Classical Economics

Although the American educational system offers many alternatives and is open to the creation of new ones, proponents of systemic *choice* argue that our school-finance policy effectively limits the available options and impedes the development of superior educational alternatives. Government support of public schools, they say, should be replaced by educational vouchers permitting students to choose among any public or private school meeting specified standards.

The voucher idea has a long history. Tom Paine proposed a voucher plan in 1792, in The Rights of Man (see the discussion in West, 1967). The awakening of modern interest is usually credited to Friedman (1955,1962), followed by Jencks (1966), Levin (1968), Coons and Sugarman (1978), and others. Eventually, advocacy of vouchers was recast as a broader call for educational *choice*.

The theoretical argument for *choice*, as stated by Milton Friedman and as espoused today, is a straightforward application of elementary principles of classical economics: Tax support of public schools distorts the incentives faced by both the consumers and producers of schooling. Consumer incentives are distorted because the residents of a given school district are encouraged to enroll their children in that district's public schools rather than in private schools or out-of-district public schools, where they may have to pay fees of several thousand dollars per year. Producer incentives are distorted because the price differential between a district's public schools and other educational alternatives gives the public schools local monopoly power over district residents; hence, the public schools can attract students even if they do not provide the type and quality of education that families want.

The textbook solution to these problems is to eliminate the distortion of incentives. Assuming that society wishes to fund schooling at all, replacement of public-school support with a voucher system would achieve this solution. The argument for vouchers applies in principle in all settings, but the proponents of *choice* maintain that it holds especially forcefully when applied to school districts with high poverty rates. Under the present system, the poor are particularly limited in their educational options, because private-school enrollment and change of residence to other public-school districts are not feasible financially. Hence, the public schools in poor districts have especially great monopoly power over their populations and, consequently, the least incentive to respect consumer preferences. The America 2000 Sourcebook states:

> Rich parents, white and non-white, already have school choice. They can move, or pay for private schooling. The biggest beneficiaries of new choice policies will be those who now have no alternatives. With choice they can find a better school for their children or use that leverage to improve the school their children now attend. (U.S. Department of Education, 1991, p. 41)

2.3. Empirical Evidence

To Milton Friedman, the theoretical argument for vouchers was sufficiently compelling to make empirical evidence unnecessary. But not everyone views classical economics as a sufficient basis for radical revision of our system of school finance. So recent proponents of *choice* have sought to bring to bear empirical evidence as well.

The absence of data makes impossible a direct empirical comparison of *choice* and the current system of public-school finance. An experimental voucher plan was designed in the late 1960s by the U.S. Office of Economic Opportunity but was not carried out in the intended form. (See Center for the Study of Public Policy, 1970, for the original design, and Witte, 1990a, for a discussion of the implementation.) More recently, the state of Minnesota has initiated a program subsidizing the enrollment of at-risk youth in out-of-district public schools, and the city of Milwaukee has begun an experiment with vouchers usable by low-income youth at private schools. These efforts have not been in place long enough for conclusions to be drawn. More important, they are too small in scale and restricted in scope to yield significant lessons about the operation of a systemic *choice* policy.

Lacking direct empirical evidence, *choice* proponents have argued indirectly, from empirical studies comparing the achievement of students in public and private schools. During the 1980s, a series of studies from Coleman, Hoffer, and Kilgore (1982) through Coleman and Hoffer (1987) and Chubb and Moe (1990a) have interpreted available achievement data as showing that private schools, especially Catholic ones, do a better job of educating their students than do public schools. The validity of this interpretation has certainly not been accepted universally. (See, for example, Cain and Goldberger, 1983, and Witte, 1990b.) Nevertheless, *choice* proponents have accepted it as fact and have concluded from it that a voucher system would improve educational outcomes by inducing more students to enroll in private schools.

2.4. The Rhetoric of *Choice*

To proponents of *choice*, the foregoing theoretical and empirical arguments lead to definitive policy conclusions. President Bush, in his America 2000 speech, stated: "The concept of choice draws its fundamental strength from the principle at the very heart of the democratic idea. Every adult American has the right to vote, the right to decide where to work, where to live. It's time parents were free to choose the schools that their children attend." A President may, perhaps, be excused for hyperbole, even if he appears to consider public-school finance a form of enslavement. But what of the political scientists Chubb and Moe who, in an article titled "Choice Is a Panacea," wrote: "Of all the reforms that attract attention, only choice can address the basic institutional problems plaguing America's schools" (Chubb and Moe, 1990b, p. 7). Such is the present rhetoric of *choice*.

3. THE ECONOMICS OF *CHOICE* RECONSIDERED: HOW RELEVANT IS CLASSICAL THINKING?

During the past thirty years, the basic intellectual argument for systemic *choice* has not notably advanced beyond the classical economic ideas sketched by Friedman (1955,1962). If anything, recent writing advocating *choice* views the matter more simplistically than did Friedman. It seems enough today to declare that *choice* promotes "consumer sovereignty" and "competition."

It may be that recent *choice* advocacy reflects conservative values more than concern with economic distortion. Nevertheless, the economic merits of *choice* warrant careful consideration. The first question is whether classical economics provides a reasonable basis for the formation of education policy. After all, classical economics does not say that markets always optimize social welfare. It says only that a market system can achieve a social optimum if production technologies, consumer preferences, social objectives, and the information available to the relevant economic actors

satisfy certain conditions. So we must ask whether the situation of education is adequately approximated by these classical conditions.

At a qualitative level, it is easy enough to raise doubts about the fit between classical economics and education. Section 3.1 summarizes information issues that have figured prominently in critiques of *choice*. Section 3.2 discusses student interactions in the production of education.

3.1. Informational Issues

A market for schooling cannot be expected to perform as promised by advocates of *choice* unless society and families are adequately informed about the education provided by the schools. If collection and transmission of such information is costly, then the superiority of a market system relative to public provision of schooling is not clear-cut. Two separate but related potential problems are described here. (For further discussion of these informational questions, see Levin, 1991.)

Public Monitoring of the Social Interest in Schooling. Advocates of *choice* must agree with proponents of public-school finance that society's interest in education goes beyond the interest felt by individuals. For suppose that society felt no need for education beyond that which individuals are willing to purchase on their own; that is, suppose that the social returns to education were the same as the private returns. Then there would be no reason to recommend that the government should fund education at all, whether through vouchers or through the public schools.

Classical economics argues that an effective way for society to express its interests is for the government to subsidize the price of education that is socially desired but would not be purchased by families in the absence of subsidies. Given such subsidies (i.e., vouchers), the market can be counted on to produce socially optimal educational outcomes. There is no need for the government to produce education itself. That is, there is no need for public schools.

But the classical prescription presumes that society can costlessly monitor the use of its price subsidies. This assumption does not seem realistic when applied to schooling, whose content may be

rather difficult to monitor from a distance. If public monitoring of the educational content of schooling is costly, then the superiority of a voucher system to public-school finance is not obvious. Should society implement a voucher system and not monitor the use of its subsidies, then students and schools can subvert social objectives by using the subsidies to further their own private interests. Should society pay the cost of monitoring, then it must ask whether these costs exceed whatever benefits private schooling offers relative to direct public production of education, through the public schools. So the social choice between vouchers and public-school finance depends on the magnitude of monitoring costs and on the efficiency of private relative to public schools in producing education.

Some *choice* advocates argue that the government does not need to monitor educational content because parents and students, acting in their own self-interest, will make appropriate schooling decisions. For example, Chubb and Moe (1990b) state:

> The state will not hold the schools accountable for student achievement or other dimensions that call for the assessment of the quality of school performance. When it comes to performance, schools will be held accountable from below, by parents and students who directly experience their services and are free to choose. (p. 11)

This statement, which denies the presence of any deviation between the public and private interest in schooling, is inconsistent with advocacy of *choice*. As pointed out above, there is no economic argument for subsidizing schooling if public and private interests coincide. (There may, however, still be an economic argument for the government to offer student loans if the private capital market does not operate efficiently.)

Consumers' Knowledge of the Educational Content of Schooling. The classical argument for market allocation of goods supposes that consumers and firms have full information about the product in question. Modern economic theory extends the argument to situations in which consumers and firms have incomplete but identical product information. The merits of markets relative to other

allocation mechanisms are not clear-cut if consumers have less information than do firms. Then competition does not ensure that firms produce the goods that consumers want.

It is not reasonable to assume that the consumers of schooling have the same information as do its producers. Asymmetric information seems inherent to education in general and to schooling in particular. The traditional economic prescription for solution of asymmetric information problems is for the government to provide consumers with the information they lack and let the market do the rest. This is what *choice* proponents recommend in the case of schooling; for example, Chubb and Moe (1990b) propose the establishment of "Parent Information Centers." I have, however, pointed out that public monitoring of the content of schooling is likely to be costly. It is also costly for the government to transmit its accumulated information to youth and their families. Hence public provision of information in a market for schooling may or may not be preferable to public production of schooling.

Critics of *choice* see it as particularly problematic to transmit schooling information to disadvantaged youth. The concern is that ill-educated parents may not be able to properly interpret information on schooling alternatives. If so, then youth from families with ill-educated parents would themselves tend to make poor schooling choices. (See the discussion in Levin, 1991.)

3.2. Student Interactions in the Production of Education

Classical economics is concerned with a world in which individual consumers interact through their joint determination of market-clearing prices but are otherwise unconnected. Consider, however, the manner in which schools produce education.

The prevailing technology of production places a teacher in a class of students who may interact strongly with one another through their participation in classroom activities and through their relationships outside of the classroom. Even if the students in a class do not interact directly, they interact indirectly whenever the teacher takes the composition of the class into account in making

instructional decisions. These intra-classroom interactions among students are enhanced by further direct and indirect interactions at the school level. For example, the course offerings at a given school and the quality of the teachers who choose to work there may depend in part on the composition of the student body. Thus, interactions among students appear to pervade the production of education in the schools.

The study of student interactions forms an important focus for research in the sociology of education and in educational psychology (see, for example, Gamoran, 1992; and Reuman, 1989). From the perspective of economics, student interactions generate "external" effects; that is, they make the social returns to schooling differ from the private returns. Friedman (1962) refers to these as "neighborhood effects."

Students pursue their private interests and cannot be expected to make schooling decisions that take into account the effects of their behavior on other students. Society's problem is to design an educational system that does recognize these external effects. The present system of public-school finance provides society a means, albeit imperfect, of internalizing the external effects produced by student interactions. By supporting the direct cost of public schooling, society gives students an incentive to enroll in the public schools rather than in private alternatives where they would have to pay tuition. Students who accept society's offer of free public schooling in return give society some control over their placement in specific classes and schools. Society then uses this control to establish policies promoting student interactions thought to be socially beneficial, from ability tracking to mainstreaming disabled students to racial and socioeconomic integration.

The reason why the public-school system is only an imperfect mechanism for promoting beneficial student interactions is, ironically enough, that society permits youth and their families to choose whether they will or will not enroll in the public schools. If a public-school district adopts policies that a given family perceives as insufficiently in line with their private interests, then the

family chooses not to accept the district's offer of free schooling and instead moves to another district or enrolls their children in a private school.

Could society promote socially beneficial student interactions through a voucher system? It might in principle be possible to establish a system that gives incentives for students to interact voluntarily in a socially desired manner. But this system could not simply grant all students a uniform voucher level. Society would have to set up a voucher schedule in which the grant a given student receives varies with the composition of the school in which he enrolls and the classes he attends. Moreover, the specifics of this voucher schedule may have to vary across students, depending on the manner in which they interact with others.

4. QUANTITATIVE ANALYSIS OF SCHOOL-FINANCE POLICY

4.1. The Need for Quantitative Analysis

The foregoing discussion makes clear that qualitative analysis of a matter as complex as the design of our educational system does not carry one very far. *Choice* advocates can argue that a voucher system is inherently superior, on economic grounds, to public-school finance only if they presume that education approximately fits the assumptions of classical economics. Once this assumption is questioned, possible advantages for public-school finance emerge and we are in the messy real world of trade-offs.

In the world of trade-offs, qualitative analysis does not suffice to choose an education policy. We need to pin down magnitudes. How difficult is it for the public to monitor educational content at a distance? What information can students and families be expected to possess about the characteristics of their educational alternatives? How do students interact in the production of education? How do families decide among the educational options presently available and how would they decide under a

voucher system? How efficiently do public and private schools now produce education and how would the move from public-school finance to vouchers affect the efficiency of production?

It is disappointing and frustrating that serious attention has not been given to these questions of magnitudes during the thirty years in which *choice* has been actively debated. We have no means of forecasting the new educational equilibrium that would follow introduction of a voucher system. In the absence of quantitative analysis, rhetoric reigns.

There are two complementary ways to learn what *choice* would really do. One is to experiment with voucher systems and observe the outcomes. If such experiments should be attempted, it is crucial that they be carried out on something like the scale of contemplated operational systems. *Choice* proponents argue that voucher finance would provide public schools with the incentive to operate more efficiently. *Choice* opponents argue that vouchers would exacerbate the racial and socioeconomic segregation of our schools. These claims cannot be evaluated in small-scale experiments, which provide schools with little incentive to change their behavior and which can have at most minor impacts on enrollment patterns. (See Garfinkel, Manski, and Michalopolous, 1992, for discussion of the general problem of using small-scale experiments to learn the full-scale effects of social policies.)

The second approach is to develop plausible models of the behavior of the relevant actors, namely youth and schools. This done, one may simulate alternative school-finance policies and forecast their impacts on school enrollments and productivity. Simulations cannot, of course, be definitive, but they can suggest the direction and magnitude of the impacts to be expected from policy changes. Moreover, the very process of developing and applying formal models has value, as it forces one to come to grips with issues that may be only vaguely perceived in qualitative policy discussions.

In this section, I specify behavioral models for youth and schools and then simulate the operation of particular public-school finance and voucher systems. I hope most readers will feel that the specified models and school-finance options are sufficiently realistic for them to learn something from the policy simulations. At the same time, I anticipate that most readers will also wish to know what happens under behavioral and institutional assumptions different from those imposed here. I clearly cannot report in this paper all the simulations that may potentially be of interest. But I can help readers to perform their own simulations. The documented computer program (Manski and Shen, 1992) developed for this study is available for general use. The program, which may be obtained through the Institute for Research on Poverty, can be applied to simulate the market for schooling in communities of different socioeconomic compositions under a range of behavioral assumptions and school-finance policies.

The remainder of this section presents the models and findings. Section 4.2 introduces the models, specifies functional forms up to a set of parameters, and characterizes equilibrium in the market for schooling. Section 4.3 specifies plausible values for the input variables and model parameters. Section 4.4 reports findings.

4.2. Model Specification

I shall assume that a population of N youth must choose between public schooling (s=0) and private schooling (s=1). In reality, various public and private schooling options may be available; if so, a youth may be interpreted as choosing between the best option of each type. Although I refer to the youth as the decision maker, the reader may equally well think of parents as making the schooling choices. It does not matter as long as the family acts as a unit.

I first define the basic characteristics of youth, schools, and school-finance policy, including those that are exogenous (i.e., inputs to the model) and those that are endogenous (i.e., determined

within the model). I then specify the behavioral models that yield values for the endogenous variables. This done, I characterize equilibrium in the market for schooling.

While the model is explained easily, several aspects particularly relevant to the *choice* debate warrant special attention:

(a) I assume that the schooling industry includes a dominant public-school sector and a private sector comprising a set of small firms. The private schools behave competitively, taking the actions of the public sector as given. The public sector recognizes its monopoly power, as discussed in Section 2.2. In particular, the public-school sector decides how much of its revenues to expend in ways that are valued by students and how much to expend for other purposes that may have social value but are not valued by students.

(b) I assume that students differ in their motivation and interact in the production of education, as discussed in Section 3.2. In particular, the achievement of a youth enrolled in a given school sector increases with the fraction of highly motivated students in that sector.

(c) I assume that youth correctly perceive the characteristics of their schooling options. Thus, the model neglects the informational issues discussed in Section 3.1. These issues are potentially important but are too complex to address adequately here.

(d) I treat school-finance policy as exogenous rather than endogenous. That is, I do not model the political process generating actual school-finance policies. Recently, Roemer (1992) and Witte (1992) have speculated that the introduction of private-school vouchers might reduce the willingness of communities to fund the existing public-school system through taxes. The model does not address this possibility.

Student Characteristics. I assume that youth n has four attributes. The first three are exogenous to the model and the fourth endogenous:

(a) family income, y_n.

(b) motivation, h_n: a binary variable measuring a youth's (or his parents') concern with achievement; $h_n = i$ denotes high motivation and $h_n = j$ denotes low motivation.

(c) private-school preference, p_n: a continuous variable measuring the strength of a youth's preference for private-school relative to public-school enrollment, holding fixed the tuition costs and the achievement levels associated with enrollment in the two sectors. The magnitude of p_n can reflect various forces: preference for religious relative to secular schooling, the time required to commute to a private school relative to a public school, etc.

(d) school choice, c_n: a binary variable, with $c_n = 0$ if youth n chooses public schooling and $c_n = 1$ if he chooses private schooling.

Values for the exogenous variables $[(y_n,h_n,p_n),n=1,...,N]$ will be set in Section 4.3.

School Characteristics. School sector s has three attributes:

(e) tuition per student, T_s: Public schools charge no tuition so T_0 always equals zero. Private-school tuition T_1 is endogenous.

(f) expenditures valued by students, E_s: The amount (per enrolled student) that sector s chooses to expend for purposes valued by its students.

(g) fraction of high-motivation students, H_s: that is,

(1) $H_s \equiv (\Sigma_n 1[h_n=i,c_n=s])/(\Sigma_n 1[c_n=s])$,

where 1[.] equals one if the condition inside the brackets holds and zero otherwise. Observe that the fraction (1) of highly motivated students in each sector depends on youths' schooling choices.

The variables T_1, (E_0,E_1), and (H_0,H_1) are endogenous.

Observe that the definitions of T, E, and H permit these variables to vary with s but not with n. This means that each school sector treats all of its students homogeneously. I ignore private-school scholarships that may make T_1 vary across students and "special needs" programs that may

make E_0 or E_1 vary across students. The model can be generalized to permit each school sector to treat its students in heterogenous fashion, but doing so complicates the problem of characterizing and finding equilibria.

School-Finance Policy. School-finance policy is expressed through

(h) voucher level, V_{ns}: the subsidy the government provides to school sector s if youth n enrolls there.

A central feature of the model is that it characterizes voucher systems and public-school finance in common terms, through V_{ns}, rather than as qualitatively different entities. In the current system of public-school finance, ($V_{n1} = 0$, n=1,...,N), and V_{n0} is the government funding received by the public schools if youth n enrolls there. In a *choice* system, both V_{n0} and V_{n1} would be positive for at least some youth. A systemic *choice* system would make V_{n1} the same for all youth while a targeted system would make V_{n1} vary with n. For example, the voucher programs discussed by Coons and Sugarman (1978) make V_{n1} fall as family income y_n rises.

Student Behavior. I assume that each youth knows the school-sector attributes (T_s,E_s,H_s), s = 0,1 and treats them as fixed. Youth n assigns utilities to the two sectors and chooses the preferred alternative. Thus,

(2) $c_n = 1$ if $U_{n1} > U_{n0}$,

where U_{n0} and U_{n1} are the utilities that youth n assigns to public and private schooling respectively.

I assume that the utility of private-school enrollment decreases as the tuition level T_1 rises. All else equal, the utility of enrolling in sector s increases with E_s and H_s, the two variables that determine achievement in sector s. The importance a youth attaches to achievement depends on his own motivation, students with high motivation being more concerned with achievement than are those with low motivation. The importance of cost varies with family income, students with low income being more concerned about cost than are those with high income.

To give these assumptions explicit form, I assume that

$$(3a)\quad U_{n0} \equiv 1[h_n=i](\alpha_i \log E_0 + \beta_i H_0) + 1[h_n=j](\alpha_j \log E_0 + \beta_j H_0) + \gamma \log(y_n)$$

and

$$(3b)\quad U_{n1} \equiv 1[h_n=i](\alpha_i \log E_1 + \beta_i H_1) + 1[h_n=j](\alpha_j \log E_1 + \beta_j H_1) + \gamma \log(y_n - T_1) + p_n.$$

Here $(\alpha_i, \alpha_j, \beta_i, \beta_j, \gamma)$ are parameters and 1[.] again denotes the indicator function equaling one if the expression in brackets holds and zero otherwise. The assumptions of the model imply that $\alpha_i \geq \alpha_j > 0$, $\beta_i \geq \beta_j > 0$, and $\gamma > 0$ but do not pin down the magnitudes of the parameters. This will be done in Section 4.3.

Private-School Behavior. The private-school sector sets a tuition level T_1 and expenditures-per-student E_1. I assume that the private sector is free to set any tuition it wishes. This is the current situation, and it would persist under any voucher system permitting private schools to supplement their voucher revenues with "add-on" tuition revenue.

Because entry into and exit from the private-school industry is not very costly, it seems realistic to assume that the private sector acts competitively. This implies that private schools must, in equilibrium, use all their revenues for purposes valued by students rather than for other purposes. So I impose the zero-surplus condition

$$(4)\quad \Sigma_n c_n(T_1 + V_{n1} - E_1) = 0.$$

This reduces the private-sector problem to determination of T_1.

I assume that, given the actions of the public sector, competition among private schools drives the tuition level to a value that maximizes private-sector enrollments. Thus, the private-sector tuition solves the problem

$$(5)\quad \max_{T_1} \Sigma_n c_n,$$

subject to the relationships specified in (1) through (4).

I should point out that it is unnaturally restrictive to assume that there can be only one private-school tuition level in equilibrium. A more realistic model would permit private schools to set different tuition levels, with associated differences in the quality of the schooling that they offer. Unfortunately, the greater realism of a differentiated-product model carries with it greater complexity in characterizing and finding equilibria.

Public-School Behavior. Public schools differ from private ones in two respects. First, they are not allowed to charge tuition. Second, they are local monopolists and so need not expend all of their revenues $\Sigma_n(1-c_n)V_{n0}$ in ways valued by students. In particular, the public sector can set E_0 so as to yield a positive surplus $\Sigma_n(1-c_n)(V_{n0}-E_0)$.

How do public schools actually set E_0? This is a central question in the *choice* debate. As I interpret them, *choice* advocates argue that the public-school sector chooses E_0 to maximize the surplus available for furthering objectives not valued by students. That is, the public sector solves the problem

(6) $\max_{E_0} \Sigma_n (1-c_n)(V_{n0}-E_0)$,

subject to the relationships specified in (1) through (5). *Choice* proponents claim that the public-sector surplus $\Sigma_n(1-c_n)(V_{n0}-E_0)$ is "bureaucratic waste." Assumption (6) does not, however, imply that this assertion is true. The public schools could use their surplus to achieve goals that are socially desired even if not valued by individual students.

Assumption (6), with surplus interpreted as waste, makes the strongest possible case for *choice*. In contrast, the *choice* argument is weakest if the public sector sets

(7) $\Sigma_n(1-c_n)(V_{n0}-E_0) = 0$,

as would a competitive firm. Assumption (7) says that *choice* advocates are factually incorrect when they claim that public schools operate less efficiently than do private schools. A plausible argument for competitive public-school behavior might run as follows: Public schools view socioeconomic integration as vital to their social mission. Integration requires that the public schools enroll as many high-income students as possible. Public schools act competitively in order to maximize their enrollments of high-income students.

Because I do not want to take a stand on the controversial question of public-school behavior, I report policy simulations under both assumptions (6) and (7).

Equilibrium. Suppose that values are specified for the parameters $(\alpha_i,\alpha_j,\beta_i,\beta_j,\gamma)$ of the utility function, for the exogenous variables $[(y_n,h_n,p_n),n=1,\ldots,N]$ characterizing youth, and for the school-finance policy $(V_{n0},V_{n1},n=1,\ldots,N)$. Then an equilibrium occurs when the endogenous variables satisfy (1) through (5) and, as the case may be, (6) or (7). It is useful conceptually and computationally to think of the determination of an equilibrium in three stages, as follows:

1. Inner equilibrium (student behavior): Given values for T_1 and E_0, determine values for H_0 and H_1 that solve equation (1), subject to the relationships specified in (2), (3), and (4).

2. Middle equilibrium (private-school behavior): Given a value for E_0, determine a value for T_1 that solves (5). From a computational perspective, this requires finding an inner equilibrium at different trial values of T_1.

3. Outer equilibrium (public-school behavior): Determine a value for E_0 that solves (6) or (7), as the case may be. In the former case, this requires finding a middle equilibrium at different trial values of E_0. In the latter case, we need find a middle equilibrium at only one value of E_0.

Thus, finding equilibria requires solution of the nonlinear equations (1) and the optimization problems (5) and (6). The complexity of these conditions makes it impossible to obtain closed-form solutions. On the other hand, given specified values for the exogenous variables and parameters, it is

easy enough to search numerically for equilibrium values of the endogenous variables. In the simulations reported below, I have always found a unique equilibrium.

4.3. Specification of Exogenous Variables and Parameter Values

The software developed for this study simulates equilibrium in the market for schooling given specified values for $(\alpha_i,\alpha_j,\beta_i,\beta_j,\gamma)$, $[(y_n,h_n,p_n),n=1,\ldots,N]$, and $(V_{n0},V_{n1},n=1,\ldots,N)$. The next section reports findings from a small set of simulations intended to be empirically plausible and instructive. The present section describes the choices made and the reasoning. In what follows, all monetary quantities in the model (i.e., V, T, E, y) are measured in thousands of 1988 dollars.

Community Types. I perform simulations of school-finance policies in three communities with varying income distributions and public-school funding levels. These are

A. Poor Community - 30% of families are low income, 30% lower-middle, 20% middle, 10% upper-middle, and 10% high income. The public-school funding level is $4000 per student ($V_{n0} = 4$).

B. Average Community - 20% of families are low income, 20% lower-middle, 20% middle, 20% upper-middle, and 20% high income. The public-school funding level is $6000 per student ($V_{n0} = 6$).

C. Wealthy Community - 10% of families are low income, 10% lower-middle, 20% middle, 30% upper-middle, and 30% high income. The public-school funding level is $10,000 per student ($V_{n0} = 10$).

The five income groups are defined as follows, in 1988 dollars: low ($0-$21,000), lower-middle ($21,001-$32,000), middle ($32,001-$44,000), upper-middle ($44,001-$63,000), high ($63,001-$100,000). These intervals are chosen because, in 1988, each interval contained approximately 20% of all American families with children; for simplicity, I assume that income is distributed uniformly within each interval. The three public-school funding levels (i.e., $4000, $6000, and $10,000) are

chosen to correspond to the public-school funding levels typically found in American communities of varying prosperity.

The simulations are carried out under the assumption that each community contains 2000 youth. The structure of the model is such that community size per se plays no role; in particular, there are no economies of scale in the production of education. So N only need be set high enough to yield stable numerical results. It was found that N = 2000 more than suffices.

Voucher Levels. This paper is primarily concerned with systemic *choice* systems, which would make vouchers available to all youth. So I simulate policies in which V_{n1} does not vary with n. It would also, of course, be of interest to simulate targeted *choice* systems, wherein V_{n1} does vary with n.

Let V_1 denote the uniform (across youth) voucher level of a systemic *choice* policy. The simulations vary the government subsidy of private-school enrollment from zero ($V_1 = 0$) to \$2000 per student ($V_1 = 2$) to \$4000 per student ($V_1 = 4$). The lower end of this range expresses current school-finance policy. The upper end considers a voucher larger than those enacted in recent experiments. For example, the voucher offered by the city of Milwaukee in 1992 was \$2500.

Distribution of Student Motivation and Private-School Preference. Whereas it is relatively easy to specify communities with plausible income distributions and school-finance policies, it is not clear how values should be set for the distribution of motivation and private-school preference among the youth in these communities. In the absence of data, I impose a set of simple assumptions that may or may not be realistic.

I assume that y, h, and p are distributed independently of one another within the population of each community. I let h = i with probability 1/2 and h = j with probability 1/2, so half the population has high motivation and half, low motivation. I let p be distributed normal. To normalize

the scale of the utility function specified in (3), I set the variance of p equal to one. The mean of p, denoted μ, is a parameter determined below.

Parameters. Now consider the utility function parameters $(\alpha_i,\alpha_j,\beta_i,\beta_j,\gamma)$ and the private-school preference parameter μ just defined. Ideally, one would estimate these parameters from data on the actual enrollment decisions made by youth facing actual schooling options. I have previously analyzed postsecondary schooling decisions in this manner (see Manski and Wise, 1983). Unfortunately, data permitting a comparable empirical analysis of elementary and secondary school enrollment decisions are not available. (See Lankford and Wyckoff, 1992, for a recent review of the empirical literature analyzing school enrollments.) In the absence of empirical estimates of the utility-function parameters, I make do with an informal approach combining a bit of data and much speculation.

The assumptions of the model imply that $\alpha_i \geq \alpha_j > 0$, $\beta_i \geq \beta_j > 0$, and $\gamma > 0$. In particular, I set $\alpha_i = 5$, $\alpha_j = 2.5$, $\beta_i = 2$, $\beta_j = 1$, and $\gamma = 25$; some reasoning for these choices will be given below. I set μ so that the fraction of youth predicted to enroll in public school under the current school-finance policy approximates the actual public-school enrollment rate in the United States; the result is $\mu = -0.5$. So the specified utility function is

$$(8a)\quad U_{n0} = 1[h_n=i](5\log E_0 + 2H_0) + 1[h_n=j](2.5\log E_0 + H_0) + 25\log(y_n)$$

and

$$(8b)\quad U_{n1} = 1[h_n=i](5\log E_1 + 2H_1) + 1[h_n=j](2.5\log E_1 + H_1) + 25\log(y_n-T_1) - 0.5 + \delta_n,$$

where δ_n is a random variable distributed standard normal.

One way to assess the plausibility of the specified parameter values is to determine the equilibria they imply under the present school-finance policy. The simulations reported in Section 4.4

predict private-school tuition levels and enrollment patterns by income group broadly similar to those found in actual American communities.

A second way to assess the parameter values is to determine the trade-offs they imply. A revealing exercise is to consider how the utility of private schooling varies with tuition. By (4), competitive private schools set $E_1 = V_1 + T_1$. This and (8) imply that

$$(9)\quad U_{n1} \equiv 1[h_n=i]\{5\log(T_1+V_1)+ 2H_1\} + 1[h_n=j]\{2.5\log(T_1+V_1)+H_1\} + 25\log(y_n-T_1) - 0.5 + \delta_n.$$

For a student with high motivation, the derivative of (9) with respect to tuition is $5/(T_1+V_1) - 25/(y-T_1)$, so the optimal tuition level is $(y-5V_1)/6$. For a student with low motivation, the derivative is $2.5/(T_1+V_1) - 25/(y-T_1)$, so the optimal tuition level is $(y-10V_1)/11$. Thus, in the present school-finance system where $V_1 = 0$, the utility of private schooling to a student with high (low) motivation rises with tuition until the tuition level reaches 1/6 (1/11) of family income.

The above calculations hold fixed the fraction of private-school students with high motivation. But the derivative of (9) with respect to tuition is larger for high-motivation students than for low-motivation ones, so H_1 and H_0 generally change with T_1. It is difficult to analyze the manner in which the equilibrium values of (H_0,H_1) change with T_1. On the other hand, it is easy to characterize how much students are willing to pay to have more high-motivation schoolmates. Inspection of (8) shows that, if offered the opportunity to move from a school with average motivation level H to one with H + 0.5, a high-motivation student would be willing to decrease his net income by approximately 4%, from y-T to 24(y-T)/25. A low-motivation student would be willing to decrease net income by approximately 2%, to 49(y-T)/50.

4.4. Policy Simulations

Table 1 reports two versions of each simulation. In one version, the public-school sector maximizes surplus as assumed in (6). In the other version, the public-school sector behaves competitively, as assumed in (7). Table 1A presents results in a typical poor community; 1B in an average one; and 1C in a wealthy community.

The table presents a rich set of outcomes for each simulated equilibrium. These include the basic endogenous variables characterizing the behavior of schools and youth: expenditures valued by students, private-school tuition, and the fraction of youth enrolled in public school. Also reported are statistics describing the equilibrium composition of the public and private schools: the fraction of high-motivation students in each sector and the income distribution of the enrollment in each sector. Finally, I report two measures of spending per youth, averaged over public- and private-sector enrollments: expenditures valued by students and total schooling costs per youth.

The discussion of findings is in three parts. First I call attention to a number of qualitative outcome patterns that persist under essentially all of the school-finance policies and public-school behavioral assumptions considered in the simulations. Next I describe the community-wide effects of varying the private-school voucher level. Finally, I examine the effect of school-finance policy on low-income youth.

Persistent Outcome Patterns. The following persistent patterns are noteworthy.

*** Expenditures valued by students are almost always higher in the private sector than in the public sector.** The difference $E_1 - E_0$ lies between \$1000 and \$6000 in every simulation except one.

The one exceptional case occurs for the wealthy community (Table 1C) when the public-school sector is assumed to behave competitively and $V_1 = 0$. Here $E_1 - E_0 = -1$ in equilibrium. Inspection of this simulation shows that less than 0.5% of all youth enroll in private schools. Thus,

TABLE 1A

Simulated Effects of Alternative School-Finance Policies: Poor Community

	Public Schools Maximize Surplus			Public Schools Act Competitively		
Size of Voucher to Private School	0	2	4	0	2	4
School attributes						
Private-school tuition	5	1	0	8	5	1
Expenditures valued by students						
Public school (E_0)	2	2	3	4	4	4
Private school (E_1)	5	3	4	8	7	5
Fraction of high-motivation students						
Public school (H_0)	.36	.26	.08	.46	.44	.38
Private school (H_1)	.80	.64	.56	.90	.84	.68
Family income distribution						
Students in public school						
Low (0-21)	.44	.55	.32	.33	.35	.44
Lower middle (21-32)	.35	.25	.32	.33	.35	.28
Middle (32-44)	.14	.12	.17	.21	.19	.15
Upper middle (44-63)	.04	.05	.09	.08	.07	.06
High (63-100)	.02	.04	.09	.05	.04	.06
Students in private school						
Low (0-21)	.00	.14	.30	.00	.00	.10
Lower middle (21-32)	.19	.33	.30	.00	.03	.32
Middle (32-44)	.32	.25	.20	.04	.23	.27
Upper middle (44-63)	.22	.13	.10	.29	.29	.15
High (63-100)	.27	.14	.10	.67	.45	.16
Fraction of youth enrolled in public school						
All youth	.68	.38	.13	.92	.85	.59
By family income						
Low (0-21)	1.00	.71	.14	1.00	1.00	.87
Lower middle (21-32)	.80	.32	.14	1.00	.98	.56
Middle (32-44)	.49	.22	.11	.99	.83	.45
Upper middle (44-63)	.31	.19	.12	.77	.57	.38
High (63-100)	.13	.14	.12	.47	.34	.34

table continues

TABLE 1A (continued)

Size of Voucher to Private School	Public Schools Maximize Surplus 0	2	4	Public Schools Act Competitively 0	2	4
Average expenditures valued by students						
All youth	2.96	2.62	3.87	4.31	4.44	4.41
By family income						
Low (0-21)	2.00	2.29	3.86	4.00	4.00	4.13
Lower middle (21-32)	2.60	2.68	3.86	4.00	4.05	4.44
Middle (32-44)	3.53	2.78	3.89	4.06	4.52	4.55
Upper middle (44-63)	4.09	2.82	3.88	4.90	5.28	4.62
High (63-100)	4.63	2.86	3.88	6.10	5.98	4.66
Average schooling cost						
Paid by government	2.72	2.77	4.00	3.69	3.70	4.00
Paid by families	1.60	0.62	0.00	0.62	0.74	0.41

Notes: A "poor" community provides a public-school subsidy of $4000 per student ($V_0 = 4$) and has the following income distribution: low 30%, lower-middle 30%, middle 20%, upper-middle 10%, high 10%. All monetary figures are in thousands of 1988 dollars. For a full explanation of the table, see text.

TABLE 1B

Simulated Effects of Alternative School-Finance Policies: Average Community

	Public Schools Maximize Surplus			Public Schools Act Competitively		
Size of Voucher to Private School	0	2	4	0	2	4
School attributes						
Private-school tuition	7	3	2	10	8	5
Expenditures valued by students						
Public school (E_0)	3	3	4	6	6	6
Private school (E_1)	7	5	6	10	10	9
Fraction of high-motivation students						
Public school (H_0)	.38	.34	.34	.48	.46	.44
Private school (H_1)	.80	.72	.68	.94	.90	.82
Family income distribution						
Students in public school						
Low (0-21)	.27	.35	.37	.21	.22	.24
Lower middle (21-32)	.27	.27	.24	.21	.22	.24
Middle (32-44)	.23	.19	.17	.21	.22	.22
Upper middle (44-63)	.15	.12	.12	.21	.20	.18
High (63-100)	.08	.08	.09	.16	.14	.13
Students in private school						
Low (0-21)	.00	.01	.01	.00	.00	.00
Lower middle	.00	.11	.15	.00	.00	.00
Middle (32-44)	.13	.22	.23	.00	.00	.09
Upper middle (44-63)	.34	.30	.29	.03	.16	.32
High (63-100)	.53	.36	.32	.97	.84	.59
Fraction of youth enrolled in public school						
All youth	.73	.57	.53	.96	.92	.84
By family income						
Low (0-21)	1.00	.99	.97	1.00	1.00	1.00
Lower middle (21-32)	1.00	.76	.64	1.00	1.00	1.00
Middle (32-44)	.83	.53	.46	1.00	1.00	.93
Upper middle (44-63)	.54	.34	.32	.99	.94	.75
High (63-100)	.30	.22	.25	.79	.66	.53

table continues

TABLE 1B (continued)

	Public Schools Maximize Surplus			Public Schools Act Competitively		
Size of Voucher to Private School	0	2	4	0	2	4
Average expenditures valued by students						
All youth	4.07	3.86	4.94	6.18	6.32	6.48
By family income						
Low (0-21)	3.00	3.03	4.06	6.00	6.00	6.00
Lower middle (21-32)	3.02	3.48	4.73	6.00	6.00	6.01
Middle (32-44)	3.68	3.93	5.08	6.00	6.00	6.22
Upper middle (44-63)	4.83	4.31	5.35	6.03	6.25	6.76
High (63-100)	5.80	4.56	5.50	6.86	7.36	7.40
Average schooling cost						
Paid by government	4.40	4.27	5.06	5.73	5.68	5.68
Paid by families	1.87	1.29	0.94	0.44	0.64	0.79

Notes: An "average" community provides a public-school subsidy of \$6000 per student ($V_0 = 6$) and has the following income distribution: low 20%, lower-middle 20%, middle 20%, upper-middle 20%, high 20%. All monetary figures are in thousands of 1988 dollars. For a full explanation of the table, see text.

TABLE 1C

Simulated Effects of Alternative School-Finance Policies: Wealthy Community

	Public Schools Maximize Surplus			Public Schools Act Competitively		
Size of Voucher to Private School	0	2	4	0	2	4
School attributes						
Private-school tuition	10	7	6	9	12	10
Expenditures valued by students						
Public school (E_0)	4	5	6	10	10	10
Private school (E_1)	10	9	10	9	14	14
High-motivation students						
Public school (H_0)	.34	.38	.36	.48	.46	.46
Private school (H_1)	.90	.86	.84	1.00	1.00	.98
Family income distribution						
Students in public school						
Low (0-21)	.13	.13	.14	.10	.10	.10
Lower middle (21-32)	.13	.13	.14	.10	.10	.10
Middle (32-44)	.26	.25	.26	.20	.20	.20
Upper middle (44-63)	.30	.30	.29	.30	.30	.31
High (63-100)	.17	.18	.18	.30	.29	.28
Students in private school						
Low (0-21)	.00	.00	.00	.00	.00	.00
Lower middle (21-32)	.00	.00	.00	.00	.00	.00
Middle (32-44)	.01	.02	.05	.00	.00	.00
Upper middle (44-63)	.30	.30	.32	.00	.00	.02
High (63-100)	.69	.68	.64	1.00	1.00	.98
Fraction of youth enrolled in public school						
All youth	.75	.77	.74	1.00	.99	.98
By family income						
Low (0-21)	1.00	1.00	1.00	1.00	1.00	1.00
Lower middle (21-32)	1.00	1.00	1.00	1.00	1.00	1.00
Middle (32-44)	.99	.97	.94	1.00	1.00	1.00
Upper middle (44-63)	.75	.77	.72	1.00	1.00	1.00
High (63-100)	.43	.47	.44	1.00	.96	.93

table continues

TABLE 1C (continued)

Size of Voucher to Private School	Public Schools Maximize Surplus 0	2	4	Public Schools Act Competitively 0	2	4
Average expenditures valued by students						
All youth	5.48	5.93	7.06	10.00	10.04	10.09
By family income						
Low (0-21)	4.00	5.00	6.00	10.00	10.00	10.00
Lower middle (21-32)	4.00	5.00	6.00	10.00	10.00	10.00
Middle (32-44)	4.05	5.11	6.25	10.00	10.00	10.00
Upper middle (44-63)	5.48	5.92	7.12	10.00	10.00	10.01
High (63-100)	7.41	7.12	8.25	10.00	10.15	10.30
Average schooling cost						
Paid by government	7.54	8.13	8.41	9.99	9.91	9.86
Paid by families	2.46	1.63	1.59	0.00	0.13	0.23

Notes: A "wealthy" community provides a public-school subsidy of $10,000 per student ($V_0 = 10$) and has the following income distribution: low 10%, lower-middle 10%, middle 20%, upper-middle 30%, high 30%. All monetary figures are in thousands of 1988 dollars. For a full explanation of the table, see text.

the public schools are so attractive that a private-school sector is essentially not viable. (Those few youth who do enroll in private school are ones whose private-school preference p is so strong that they prefer private schooling even though the public schools are less costly and spend more for purposes valued by students.)

* **The fraction of high-motivation students in the private sector is always well above that in the public sector.** The difference $H_1 - H_0$ lies between .30 and .54 throughout the simulations.

The qualitative finding that H_1 is greater than H_0 is related to our finding that E_1 is greater than E_0. Among youth with the same family income y and private-school preference p, those with high motivation are more willing to pay private-school tuition in return for larger valued expenditures. Given that motivation is assumed to be distributed independent of y and p, the private schools attract more high-motivation youth than do the public schools.

* **Within each community, the fraction of youth enrolling in public school almost always decreases as family income rises.** The only exceptional case is a corner solution. Consider the poor community with a surplus-maximizing public sector and the private voucher set at $V_1 = 4$. The equilibrium private-school tuition is zero, so the public-sector enrollment rate does not vary with income.

* **Youth perceive that the quality of schooling, both public and private, is generally lowest in the poor community and highest in the wealthy community.** In our model, the quality of schooling is synonymous with the achievement of the enrolled students. The achievement of youth enrolled in school sector s increases with expenditures valued by students (E_s) and with the fraction of high-motiation students (H_s). The simulations show that (E_0,E_1) and (H_0,H_1) are generally lowest in the poor community and highest in the wealthy one.

*** Government, rather than families, consistently pays the largest share of schooling costs.** In these simulations, the fraction of schooling costs paid by government ranges from 63% to 100%.

Community-Wide Effects of School-Finance Policy.

*** Suppose, as do *choice* advocates, that the public-school sector maximizes surplus. Then, as *choice* advocates predict, increasing the voucher level induces the public-school sector to increase the amount that it expends for purposes valued by students.** As the voucher increases from zero to $4000, public-school expenditures valued by students increase from $2000 to $3000 in the poor community, from $3000 to $4000 in the average one, and from $4000 to $6000 in the wealthy community.

*** The equilibrium private-school tuition almost always falls as the voucher level increases.** If the public sector maximizes surplus, then as the voucher increases from zero to $4000, private-school tuition falls from $5000 to zero in the poor community, from $7000 to $2000 in the average one, and from $10,000 to $6000 in the wealthy community. If the public sector behaves competitively, tuition falls from $8000 to $1000 in the poor community and from $10,000 to $5000 in the average one. The one exception to the general monotone relationship occurs in the wealthy community, where tuition rises slightly, from $9000 to $10,000.

Observe that in some of the simulations, private-school tuition falls even faster than the voucher rises. In these cases, introduction of a voucher system induces the private-school sector to lower the amount it expends on purposes valued by students.

*** The fraction of youth enrolled in public school falls as the voucher level increases.** The effect is most pronounced in the poor community, where public-school enrollment falls from .68 to .13 or from .92 to .59, depending on the assumption made about public-school behavior. There is a less substantial but still sizable drop in the average community, from .73 to .53 or from .96 to .84.

The effect is negligible in the wealthy community, where public school enrollment falls from .75 to .74 or from 1.00 to .98.

The pattern of decreasing public-school enrollment usually holds within each income group. There are, however, some simulations in which increasing the voucher generates a slight increase in public-school enrollments among upper-middle- or high-income youth. This result is theoretically possible. Increasing V_1 can induce a fall in both $(E_1 - E_0)$ and $(H_1 - H_0)$, thus diminishing the quality advantage enjoyed by private schools.

*** As the voucher level increases, the fraction of highly motivated students typically falls in BOTH school sectors.** The reason for this seemingly paradoxical result is that the youth who move from public to private school have higher average motivation than those who remain in the public sector but lower average motivation than those students already enrolled in private school. Hence, both H_0 and H_1 tend to fall as V_1 rises. This effect is largest in the poor community, where the enrollment shift is most pronounced, and is negligible in the wealthy community, with its small enrollment shift.

*** As the voucher level increases, the average schooling cost per youth paid by government rises by about $1000 if the public-school sector maximizes surplus and changes negligibly if the public-school sector behaves competitively.**

Effects of School-Finance Policy on Low-Income Youth

*** As the voucher level increases, the average amount that schools expend for purposes valued by low-income youth increases if the public-school sector maximizes surplus. This amount remains constant, but at a higher level, if the public-school sector behaves competitively.**

Suppose that the public-school sector maximizes surplus. Then increasing the private school voucher from zero to $4000 implies that the average amount schools expend for purposes valued by low-income youth increases by between $1000 and $2000. This occurs in part because the public-

school sector increases its valued-expenditure level E_0 and in part because some low-income youth shift their enrollment to the private sector, which expends more for purposes valued by youth.

Now suppose that the public-school sector behaves competitively. Then increasing the private-school voucher has essentially no effect on the average amount schools expend for purposes valued by low-income youth. Under the competitive-behavior assumption, public schools always spend all their revenue on purposes valued by students and very few low-income youth transfer from public to private schools.

* **The average amount that schools expend on purposes valued by low-income youth varies with community type more than it does with voucher level.** If the public-school sector maximizes surplus, expenditure per low-income youth within a community increases by between $1000 and $2000 as the voucher rises from zero to $4000 but, holding the voucher level fixed, increases by between $2000 and $3000 as one moves from the poor to the wealthy community. If the public-school sector behaves competitively, the expenditure per low-income youth within a community does not change as the voucher rises but, holding the voucher level fixed, increases by almost $6000 as one moves from the poor to the wealthy community.

* **The effect of voucher level on income segregation in the schools varies across communities and with the assumption made about public-school behavior.**

Suppose that the public-school sector maximizes surplus. Then we find the following as the voucher level increases from zero to $4000: In the poor community, the predominance of low-income students in the public schools falls from .44 of enrollment to .32 and the representation of low-income youth in the private schools increases from zero to .30. In the average community, the low-income fraction of public-school enrollment increases from .27 to .37 while the representation of low-income youth in the private schools remains minuscule, changing from zero to .01 of enrollment. In the wealthy community, the income distributions of the public and private schools do not change at all;

the distribution of income in the public schools is always a bit skewed toward the low end, relative to the community's income distribution, and the private-school sector is always an enclave of the two highest income groups.

Now suppose that the public-school sector behaves competitively. Then we find the following: In the poor community, the low-income fraction of public-school enrollment increases from .33 to .44 and the low-income fraction of private-school enrollment increases from zero to .10. (The reason why both fractions increase is that, as the voucher level V_1 rises, more youth in the three middle-income groups transfer from public to private school than do low-income youth.) In the average community, the low-income fraction of public-school enrollment increases from .21 to .24, and the representation of low-income youth in the private schools remains zero. In the wealthy community, the income distributions of the public and private schools essentially do not change at all.

5. LESSONS FOR EDUCATION POLICY

I hope that the reader will draw several policy lessons from this critique of the systemic *choice* debate and analysis of alternative school-finance policies.

The immediate lesson is that qualitative analysis cannot determine the merits of alternative school-finance policies. Qualitatively plausible arguments can be made both for public-school finance and for voucher systems. Hence, informed assessment of these policies requires quantitative analysis.

I certainly do not consider the quantitative analysis presented in Section 4 to be definitive, but I do think it provides strong evidence that voucher finance is not the panacea claimed by some of its recent advocates. Two findings stand out:

* **The educational effects of systemic *choice* on low-income youth appear to be neither uniformly positive nor negative.** The direction of the effect on income segregation in the schools varies with the prosperity of the community and with the manner in which public schools behave. The effect on valued expenditures per low-income youth is positive if the public schools maximize surplus but zero if the public schools behave competitively. Vouchers have a negative student-interaction effect on those low-income youth who remain in public schools: as the voucher level rises, the fraction of high-motivation students in the public schools tends to fall, especially in poor communities.

* **Even in the most favorable case, a systemic *choice* system would not come close to equalizing educational opportunity across income groups.** Whatever the voucher level chosen, the high-income youth in a given community receive higher-quality schooling, on average, than do the low-income youth. Moreover, youth living in wealthy communities receive higher-quality schooling than do ones living in poor communities.

These findings alone suffice for me to conclude that our nation should not rush to implement voucher programs, as advocated by the Bush administration. My confidence in this conclusion is reinforced by the fact that, in at least two respects, the analysis of Section 4 is biased in favor of vouchers. That analysis neglects the informational issues, discussed in Section 3.1, that form one of the primary arguments for public schooling. And it places no social value on public-school expenditures not valued by students; implicitly, the analysis of Section 4 has followed *choice* advocates and treated those expenditures as bureaucratic waste.

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