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The Economics of Education: Vouchers and Peer Group Effects

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ABSTRACT

Lessons from the history of US school reforms and empirical analysis have painted a picture of schools as complex institutions producing a product that is influenced by the various choices made by parents and school bureaucracies who respond to institutional incentives. School vouchers change the incentives faced by these agents. This paper finds that when parents can choose schooling independent of housing, greater residential integration results, which brings with it much better equity properties than a more simple analysis would imply. While the fears by some that schools will become increasingly differentiated under voucher policies are well founded, this greater differentiation does not have to imply greater inequities in educational opportunities. In fact, under some plausible scenarios, the greater differentiation of schools leads to greater equity and greater efficiency in both public and private schooling.

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The proposal of introducing competition into the market for schools has a long history[1]. Beginning with Friedman's suggestion in the 1950's that such competition will reduce inefficiencies and increase the responsiveness of schools to the diverse and changing needs of parents and children, the idea of empowering parents to discipline schools has become a lightening rod for academic and public debates, with some predicting that private school vouchers are the panacea to cure all ills of centralised public education and others implying it will result in nothing less than the end of civilisation as we know it. As in all discourses characterised by such divisive rhetoric, the truth probably lies somewhere in between. Few real world policies have only positive consequences, and most give rise to winners and losers. But with the limited

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1 These remarks have been prepared for the New Zealand Association of Economists conference held in Wellington, NZ from September 2-4, 1998. The discussion is based on ongoing research summarised in Thomas Nechyba, "Public School Finance in a General Equilibrium Tiebout World: Equalisation, Equity and Private School Vouchers," NBER working paper, 1996; Thomas Nechyba, "School Financed Induced Migration Patterns: The Case of Private School Vouchers," *Journal of Public Economic Theory*, forthcoming; Thomas Nechyba, "Mobility, Targeting and Private School Vouchers," Stanford University working paper, 1998; and Thomas Nechyba and Michael Heise, "School Finance Reform: Introducing the Choice Factor," Stanford University working paper, 1998. References to other parts of the literature implicitly cited in these remarks can be found in these papers which are available upon request. The analysis is built on a model previously developed in Thomas Nechyba, "A Computable General Equilibrium Model of Intergovernmental Aid," *Journal of Public Economics* 62, 363-97, 1996; Thomas Nechyba, "Existence of Equilibrium and Stratification in Local and Hierarchical Public Goods Economies with Property Taxes and Voting," *Economic Theory* 10, 277-304, 1997; Thomas Nechyba, "Local Property and State Income Taxes: The Role of Interjurisdictional Competition and Collusion," *Journal of Political Economy* 105, 351-84, 1997; and some of the empirical motivation for the model is derived from Thomas Nechyba and Robert Strauss, "Community Choice and Local Public Services: A Discrete Choice Approach," *Regional Science and Urban Economics* 28, 51-74, 1998.

experience we currently have with real world voucher programs, there is wide room for continuing disagreements that have few roots in empirical facts.

In particular, while it is true that Friedman and the Chicago School have successfully persuaded countries like Chile to implement comprehensive voucher programs, the idea has become a serious policy issue in the United States only recently. At this time, several small publicly and privately funded voucher initiatives are in place in a few US cities, but it is difficult to draw large conclusions from such experiments because of their limited and targeted nature. Furthermore, it is problematic to draw large policy inferences for countries like the United States and New Zealand from experiences in countries like Chile, given the very different cultural, social and historical settings. A thorough understanding of the issues relevant to the voucher debate in different settings must therefore rest on a thorough understanding of the history and institutions into which vouchers are to be introduced and must draw on the lessons we have learned about education within the context of these institutions. This calls for a systematic approach that clarifies the channels through which such proposals impact parents, children and schools and that links these channels to empirically relevant data.

During the next 45 minutes, I will attempt to propose such a more reasoned analysis by combining what we have learned from past education policies with what researchers tell us about how schools function and how institutions change. I must apologise at the beginning, however, for the many references to

specific US experiences that I will make during this talk, but it is within this context that much of the research on schools as well as most of my own experience and knowledge lie. It is my suspicion that the lessons learned from this analysis extend beyond US borders, and I am here in part to learn more about the connection between problems in education faced by the US and those challenging other countries like New Zealand.

I will therefore begin by giving you a brief outline of the history of education policy in the United States that has led several states in the US to the brink of jumping into a full scale private school voucher experiment. Next, I will relate these historical lessons to the academic literature on schools and suggest that parents and school bureaucracies operate within institutional settings that provide them with incentives which have direct links to school quality. Finally, I will try to use this information to shed light on the potential of vouchers to address efficiency and equity problems in public education, and I will present you with some estimates from some of my own work. My goal, however, is not to persuade you of any precise estimates I may have derived, but rather to help clarify our thinking about the precise channels through which vouchers are likely to make a difference.

Let me begin, then, with a brief overview of the reasons underlying the current public call for private school vouchers in the United States. As many of you know, primary and secondary education has historically been a local government responsibility in the US, with public schools being funded and

controlled by nearly 15,000 different school districts. At a time when transportation and commuting costs were high, these school districts were usually quite heterogeneous as complementarities between doctors, carpenters, farmers and so forth forced different types of households to live within close proximity to one another. As commuting costs declined during this century, however, the organisation of public schools at such a local level began to introduce a force into household location choices that helped cause households of different types to segregate into different school districts. In particular, high income families began to have an increasing incentive to live in separate, mostly suburban, school districts in order to share a larger property tax base used to fund their schools and in order to take advantage of positive peer effects that, as I will argue shortly, are tied to socioeconomic characteristics. In order to protect this tax base and these peer effects from low income families wishing to share in good public schools, immigration into high income school districts by low income families was often successfully prevented through exclusionary zoning rules that prohibited the building of low income housing. Fiscal capacity for funding public education therefore began to vary across school districts, as did the fiscal need arising from peer effects.

Quite apart from the class based residential segregation this introduced in much of the country, the peculiar racist policies in Southern state legislatures led to separate public school systems for white and black children in 15 of the 50 states. With insufficient political will in state and federal legislatures to overturn these racially motivated policies, civil rights advocates began to turn to the court

system to challenge education policy. In one of its prouder moments, the US supreme court, in a unanimous decision, declared racially separate public schools in the South to be unconstitutional in 1954 and launched an era of racial desegregation in public education. While few today challenge the wisdom of this landmark court ruling, it did add even more relevance to the class based residential segregation force already in place. Far from equalising educational opportunities across students, therefore, racial desegregation of schools led to the exit of both whites as well as an emerging black middle class from traditionally minority dominated central cities, and differentiation of suburban school districts along income and school quality lines continued to increase.

In addition, the Supreme Court's decision to strike down racially separate public schools in the South created an opening for frustrated school reformers to turn to courts in other dimensions of school policy. In particular, given the wide disparities in funding of primary and secondary schools across different school districts, parents from poor districts began to challenge the constitutionality of a locally financed education system that yielded such wide disparities. While the US supreme court refused to become involved in these suits and argued that this was a state matter, state courts, beginning with a landmark decision in California in 1971 but now extending to a majority of states, have become increasingly involved in forcing greater centralisation of public school funding. Over the past three decades, this has caused the initial uniformity of local financing and control of schools across the US to give way to as many different state policies as there are states.

California, for instance, has abandoned local financing and with it local control of schools and has switched to a centralised state system with almost equal per pupil spending across all schools, while states like New Hampshire still rely very much on local funding and control, and other states have devised various state aid formulae intended to decrease but not eliminate school spending differences. This has given us many different natural experiments, and several lessons from an analysis of these experiments have emerged.

First, centralisation of school finance to the state level has invariably led to centralisation of control of local school policy at the state level. In California, for example, parents complain of an inability to successfully provide input to their pubic schools because local ideas are generally blocked by sweeping state rules on how schools are to be organised. Second, as state education policy has become more centralised, the power to control public education seems to have shifted to a growing education bureaucracy often dominated by increasingly powerful teacher unions, and the empirical evidence seems to indicate a negative correlation between school outcomes and unionisation of teachers. Third, centralisation has led to declining overall quality of public schools as measured by various output indicators, with the California public school system slipping from its generally recognised superiority in the 1960's to now ranking close to the bottom of the 50 states. Finally, contrary to the stated purpose of reformers, equalisation of education spending has not led to any substantial equalisation of educational opportunities. Both parental perceptions

and objective test scores suggest that school quality varies among districts as much now as it did prior to the equalisation reforms. All this reinforces evidence from the economics of education literature that suggests that financial resources are far from the only important input into the production of good schools, and that institutional factors, school bureaucracies and parents play an important role. It has been an unfortunate byproduct of court direction of school policy in the US that much of our focus has been taken away from these factors and that educational opportunity has incorrectly become synonymous with educational spending.

Throughout this period, historical trends of increasing spatial income segregation have continued, and pockets of dreadful public schools that resemble jails more than places of learning have emerged in increasingly isolated and minority dominated central cities. It is here above all that frustration has reached such levels that policymakers are seriously turning to more radical alternatives. Given the apparent inability of the political process first under decentralisation and then under centralisation to offer educational opportunities to disadvantaged children whose parents are locked into poor neighbourhoods, the idea of offering these parents a way out by enabling them to send their children to private schools has gained in appeal.

But what would be the overall impact of such a radical change into the existing system of public schools? To begin answering this question, we must first

better understand what inputs other than spending are important for public schools quality.

Let me turn, then, to what the academic literature tells us about this issue. While debates about which inputs are important in yielding good school outcomes are ongoing, much of the economics literature that attempts to uncover relationships between school outcomes like test results and school inputs like teacher characteristics and per pupil spending finds relatively little evidence for an important role of school spending. Rather, parental and child characteristics within classrooms seem to dominate any measurable inputs that are purchased by school boards, and some schools have been shown to be better than others even when controlling for all the obvious measurable differences between schools. Holding other factors fixed, excessive unionisation and centralisation of bureaucracies have been empirically linked to relative declines in student achievements, while parental involvement through parent teacher associations have been empirically linked to student gains. While researchers are far from untangling all the various forces important within complex public school institutions, the general picture that is emerging does suggest that courts in the United States have focused on the wrong measure when targeting all state resources toward equalisation of spending across schools. The dismal results we have seen in states like California are then far from surprising when viewed in light of this empirical evidence, and states like California seem to have missed 30 years of opportunities to improve educational outcomes by paying little attention to this evidence.

With this picture of schools as more complex institutions in mind, we can then turn to considering the specific roles played the two important actors in the production of schools: parents and school bureaucracies. Parents are important in that they choose where to live, where to send their children to school, how much to monitor their schools and how much to become personally involved with them, and school bureaucracies are important in that their efficiency in using resources and their flexibility to changing needs of children seem crucially dependent on the institutions within which they operate. We want to understand vouchers better by understanding how changes in incentives for these actors affects school inputs and institutions and then by relating this understanding to what we know about school inputs and school quality. More specifically, we can ask how can vouchers change incentives and institutions for these actors to accomplish what decades of centralisation and equalisation have failed to bring about?

Holding fixed the nature of the institutions in which they operate, let us consider parents first. Their choices impact the quality of local public schools through at least two distinct channels. First, they *directly* impact schools by personally becoming involved in them, exchanging information with teachers and monitoring their performance. Second, they *indirectly* determine school quality by selecting into schools, either by choosing schools explicitly or by choosing which school district to reside in, and thus they contribute to the characteristics of the parent and student populations in the school of their choice. Children that

are more prepared at home, whose parents monitor their progress and who do not add to disciplinary problems within schools contribute to a better school environment in which the school's resources can be used more effectively. The combination of the direct impact of parents and the indirect impact of their selection into schools has given rise to the commonly discussed *peer effect* a child brings to a school. While we have strong evidence that such effects exist and are important, they seem to differ across schools and across classrooms in ways we have yet to understand fully. It is important to recognise, however, that peer effects operate through both parents and children even if the two can often not easily be disentangles in empirical work. A change in incentives may lead to a change in parental choices in each of these areas thus influencing school quality.

While we have learned much about inputs that are important for schools given the particular institutional structure, and while we have recognised the importance of peer effects through parents and children, we know less about the role of school bureaucracies. The historical and anecdotal evidence I have discussed before suggests that centralisation of control leads to greater and more entrenched school bureaucracies dominated by teacher unions, and empirical evidence suggests that unionisation is negatively correlated with school performance. Furthermore, evidence of competition within the existing school system in the US suggests that higher competition from either Catholic schools or from a greater concentration of public schools tends to raise the performance of public schools. This evidence, however, is still sketchy and

controversial, and it is premature to read too much into it. But the general sense that is emerging suggests a negative role for unions when isolated from competition through a centralised school bureaucracy. Furthermore, evidence on the importance of parental monitoring of schools re-enforces this conclusion in that parents are less likely to monitor schools that are controlled by large and intransigent bureaucracies.

With these factors and the historical picture in mind, we can then begin our analysis of private school vouchers by asking how such vouchers change the incentives of parents and school bureaucracies and how these changes combine to impact both public and private schools. I propose to accomplish this by starting with a very simple model and slowly adding complexity. This allows us to keep track of important effects and to trace the various channels through which vouchers impact schools. Let me state formally that what I mean by a private school voucher here is a piece of paper denominated in dollars that entitles parents to a refund from the state government for any private school tuition expenses they incur up to the value of the voucher. Eligible parents may include all parents or just parents who live in particularly poor school districts or parents of particularly modest means. Vouchers can therefore be general in the way Friedman suggested, or targeted to residents or districts who are considered particularly needy.

Suppose first that we considered a single public school district with a single public school and no current private schools in isolation. For private school

vouchers to have an impact in this setting, at least one private school would have to emerge. In order to compete effectively, this private school would have to create an environment that is viewed by some parents as better than that found in the public school, especially if its tuition is higher than the face value of the voucher that is introduced. Such a better environment can be generated in three ways: First, if the public school currently operates inefficiently in that it allows a school bureaucracy to successfully seek rents that do not impact children positively, the private school can differentiate itself by using the same resources more effectively and thus raising the marginal productivity of a dollar. Second, to the extent that additional spending may be effective, the private school can outspend public schools and thereby raise quality. And third, the private school has the advantage of being able to use both tuition rates and admission standards to attract only those students who bring with them positive peer effects. Given that parental and child characteristics that produce positive peer effects are empirically correlated with household income, setting tuition rates above voucher levels would exclude low income parents. Furthermore, setting explicit admission standards can exclude lower ability children with worse peer effects more directly. Therefore, there is a tendency for private schools to select on peer qualities which public schools have to take as given and thus to skim the cream off the public school. Empirical evidence suggests that currently operating private schools in the US as well as private schools in countries like Chile are at least somewhat using this strategy. Of course, if voucher levels are sufficiently high, additional private schools who target lower income households with lower tuition levels may also emerge, but these schools

too have an incentive to set high admission standards to keep out children with low peer effects. Public schools, on the other hand, to the extent that they are currently operating inefficiently and to the extent that their bureaucracies benefit from greater overall spending, have an incentive to retain students, and thus the tax dollars that accompany those students, by improving their marginal productivity of a dollar through less rent seeking.

In this simplistic setting, two forces therefore emerge. Private schools will seek to attract the best parents and students away from public schools in order to compete effectively, while public schools will try to compete effectively by becoming more efficient. This classic tradeoff has captured the attention of much of the academic literature as well as the public debate on vouchers. If one thinks that the major problem with public schools is their current inefficiency, then it may be possible to argue that the cream skimming effect will be outweighed by the increased efficiency of public schools to yield better public schools under vouchers. If, on the other hand, one thinks that public schools are either already efficient or are unlikely to be able to overcome bureaucratic barriers to improving efficiency, the cream skimming effect will dominate and cause public schools to deteriorate. This deterioration then causes additional private schools to form and further exit from the public school which may ultimately lead to all but the worst students to switch to some private school. Such a possible collapse of public education lies at the core of the fears about vouchers often raised by its opponents.

The debate on vouchers as framed by this simple model encompasses much of what is in the mind of advocates on both sides of this issue. The model gives us obviously important insights into two important tradeoffs. However, I would like to argue here that it is hardly the complete story. The role of parents is reduced to choosing between a public and a private school when I have suggested before that parents also choose among public schools by their choice of residence and, once choosing a school, they decide on some level of involvement with that school. Both these factors are ignored in our simple model thus far. Furthermore, public schools are modelled solely as inefficient rent seekers without any details offered as to where all the inefficiencies of the public sector may lie and precisely how they may be affected by policy changes. I would therefore like to consider what additional forces might be introduced into this simple view of parents and schools in light of what we have learned from the historical and academic literatures.

Let me begin this process by considering the addition of household location choices. Whether under a centralised or a decentralised system of financing, all schools are, in the end, local, and local public school do not operate in isolation but rather as part of a larger system in which parents select into public school districts based in large part on differences in perceived school quality. Thus, as I have argued above, the public school system is already characterised by schools that are far from homogeneous, with more motivated parents of higher means selecting into better school districts protected from outside pressures through elevated property values. An important additional factor that is

therefore introduced once we expand our simple model to include multiple school districts is that, in the absence of private schools, a parent's choice of where to live is intimately linked with that parent's choice of where to send his or her child to school. The introduction of a private school voucher severs that link and allows parents to make separate housing and schooling choices. Given the overwhelming evidence that current residential location choices at least in the US are in large part determined by school district considerations, such a severing of the link between where one lives and where one goes to school should have major implications for how residential location choices are determined, and given that parental and child characteristics are an important input into the production of good schools, such changes in residential locations may impact school quality in important ways.

Suppose, then, that we expanded our simple one district model to include a second district, and suppose that prior to the introduction of vouchers, parents have selected into these districts based at least in some part on the schools in those districts. If everyone cares equally about schools, then higher income individuals will live in the better school district, and property values there will be higher. Now suppose that a voucher program is introduced, and suppose first that households cannot move across school districts. This leaves us with the simple model from before in which each public school simply competes with the threat of an emerging private school. Under the assumption of no household mobility, it is then unclear where a private school will emerge first: If public schools are sufficiently bad in the poor district, it may well be that private

schools targeted to higher income/higher ability children from that district form there without private schools forming in the better school district. Of course it is equally plausible that, if public schools in the poor district are not too bad, private schools first emerge in the wealthy district and attract high income/high ability children there. Now suppose, however, that households can move after the voucher policies are introduced. So long as acceptable houses and neighbourhoods within the poor district can be found or created, any household from the wealthy community who chooses to switch to a private school would move to the poorer community in order to pay less for housing which is more expensive in the rich community merely because of the presence of good public schools. Such house price differences are empirically huge, with houses in the good school district of Palo Alto where I live, for example, selling at a premium of two to four hundred thousand dollars just because of that community's better schools. Note that this difference of housing prices in Palo Alto emerges not because of school spending which is centrally controlled in California, but rather because of other factors that cause public schools in Palo Alto to be viewed as superior to other public schools. Were Palo Alto to also be allowed to choose its own funding levels in a more local system, these differences in house values would be even greater.

For the same reasons that public schools are a segregating force in US society, private school vouchers therefore introduce a desegregating force. Of course, neighbourhood and community choices by households are not exclusively determined by school considerations, which implies that the decoupling of

location and schooling choices through vouchers will not achieve a complete mixing of households in the way that may have existed during historical times when such mixing was economically necessary. Even modest migrations of middle income households into poorer communities, however, could set off a chain of events that might be economically quite significant. In particular, the greater attractiveness of poorer communities would cause property values there to rise and property values in wealthier communities to fall, and the migration of some middle income households could change the characteristics of neighbourhoods within poorer areas. In a model that I will discuss in some more detail during our panel discussion this afternoon and during a seminar tomorrow, I have attempted to incorporate neighbourhood externalities and amenities as well as differences in housing stocks across communities, and I have calibrated these to various data sets for the US. Voucher simulations in this model, under the assumption that public schools are already efficient without vouchers, consistently indicate that the change in migrations from an introduction of private school vouchers could reduce interdistrict differences in incomes and property values by one half, indicating that about one half of the current income segregation across communities is due to the prevalence of local public schools. Furthermore, this model is likely to under rather than overstate such effects because it assumes that neighbourhoods amenities and externalities remain unchanged as these migrations occur and that only property values of existing neighbourhoods would change to equilibrate the supply and demand of housing.

When combined with parental location decisions, the decisions of some parents to send their children to newly emerging private schools that skim the cream off public schools thus cause a decrease in residential income segregation. While this may indeed be a positive development in a system whose equity problems arise precisely because of the existence of residential segregation, it remains an open question to what extent this will actually improve educational opportunities for children. Several consequences from these migrations arise: First, private schools are likely to arise in poor communities, both because current high ability households there are likely to choose such schools and because households from other communities are likely to migrate there to pay lower housing prices and send their children to private schools. This prediction is at least somewhat confirmed by the experience in California in the 1970's when public school spending was equalised across districts. During a short period of 5 years, the number of private schools in California doubled, and a vast majority of these schools arose in low income, low school quality districts. Second, in the absence of efficiency gains in the public sector, public schools in general are still likely to suffer as they did in our original one community setting because of the cream skimming by emerging private schools. However, the declines in public school quality would occur in all communities, not just in those that experience an increase in the number of private schools, and my simulations suggest that declines in wealthy communities will be larger than those in poor communities. Third, those communities in which private schools arise derive a fiscal benefit due to increases in property values and decreases in the number of students attending public schools. These fiscal benefits are

even more important under local funding of public schools because the presence of a large number of households attending private schools acts much like a matching grant for these communities, as such households continue to pay local public school taxes without utilising their services. General private school voucher programs are therefore likely to not only offer increased educational choices to parents of high ability children in poor communities but also fiscal benefits to those parents and students in poor communities who remain in the public school system.

Table 1 demonstrates these effects quite starkly. This table presents estimates from simulations using my model in which parental location and schooling choices are undertaken simultaneously and which is calibrated to data from the state of New York. The top portion of the table reports estimates of variances in household incomes within and across communities for different voucher levels ranging from $1000 to $6000, and the lower portion does the same for property values. Note that within community variances increase while across community variances decline dramatically. Vouchers cause households to residentially integrate.

Next, Table 2 reports variances in school related variables ranging from per pupil spending and average abilities to average peer levels and overall school quality measures. These variances are presented both for students attending public schools and for all students who initially attended public schools but may have switched to private schools under the voucher program, and it presents

them both for the case of a version of the model that assumes mobility of households and one that does not. Note what a difference the extension of the model to include mobility of households makes: while variance measures increase dramatically in the lower part of the table where households are assumed to be immobile, they narrow considerably in the top part. In societies like the US in which close to 20 percent of urban households move in any given year, the inclusion of mobility in our thinking about education policy is therefore not only appropriate but may also be quite crucial. Furthermore, results do not change dramatically when the model is calibrated to the more centralised school system of California rather than the system in New York which still operates under some local funding.

In our short hour here this morning, I do not have the time to present to you in detail the precise way in which these estimates were arrived at, but I have made every attempt in this numerical analysis to both incorporate as much realism into the model as is possible with the available data and to avoid incorporating features that would bias the results in favour of vouchers. The analysis includes high, middle and low income school districts, where each district contains different neighbourhoods whose characteristics are calibrated to house price data. Households in the model are assumed to differ in incomes and ability levels, and are assumed to choose between neighbourhoods, school districts and public and private schools. School quality is determined through a combination of average spending as well as average parental and student characteristics within schools in a way that is consistent with the data, and

public schools are funded through property and income taxes that are determined in a political process as they are in most US states today. Private schools emerge only when demand for them arises, and public schools are already assumed to operate efficiently. The results I have presented in the previous tables, therefore, arise purely from changes in parental choices resulting from the addition of multiple communities to a simpler one community version.

The recognition of these kinds of migration effect also has strong policy implications for designing more targeted voucher initiatives. Until now, we have analysed general voucher programs accessible to all parents, but some proposals in the US involve targeting vouchers only to residents of low income communities while others involve targeting only to households with incomes below a certain threshold. If my estimates of migration effects are correct, then targeting vouchers to low income communities would entail effects quite similar to those I have described thus far because it is precisely in those communities that private schools would emerge even under a general voucher program and targeting to resident within low income communities does not prevent higher income households from other communities to migrate to poor school districts. If, on the other hand, vouchers are targeted to low income households, voucher use would be significantly less than under community targeting as middle and high income households can no longer migrate to poorer communities to take advantage of private education. Targeting to individuals rather than

communities therefore isolates public schools in middle and high income communities from competition that arises from migration.

While the results presented thus far point to important additional effects which arise when parental location choices are introduced into an efficiently operating public school system, the analysis ignores issues arising from current inefficiencies of public education. Rather than lumping all possible inefficiencies into one category as many models of public schools have done in the past, let me be more explicit here by distinguishing between three distinct ways in which such inefficiencies may arise. First, as was suggested by our initial one community model, public school bureaucracies may operate inefficiently in environments in which they are largely isolated from competition; that is, public schools may utilise current resources inefficiently. Second, given that residential and school choices are connected in a public school system, child abilities and talents may not be well matched to public schools, although the incorporation of migration allows some matching from residential location choices to emerge. And third, public schools may make inefficient use of parents and the information they bring to the schools. To the extent that these factors are important, we can expand the model presented so far to simulate how the introduction of vouchers may alter these inefficiencies.

First, we can add back to the model the competitive effect that was left out in the tables I have presented where it was assumed that public schools are, in fact, utilising resources efficiently. This is the most common argument put forth

in favour of vouchers. The addition of this effect into the simulations of course increases the policy appeal of vouchers, and, to the extent that competition is felt mainly in the district in which private schools arise, it benefits poor districts relatively more than middle income and wealthy districts. However, I have spent much of my time attempting to persuade you that migrations from middle and high income communities are likely to be quite strong, which implies that even public schools in districts that do not experience the formation of private schools might respond to competitive pressures if they care about losing certain types of desirable students. To what extent such competitive effects from vouchers are likely to arise, and to what extent they are likely to spread throughout the pubic school system as opposed to being concentrated in districts with poor public schools is an open question. As I have mentioned before, however, empirical evidence from existing school competition suggests that we ought to expect at least some effects of this kind. Furthermore, to the extent that teacher unions are responsible for existing inefficiencies in public schools, competition is likely to weaken their power, which may be one of the reasons that public school teacher unions currently compose the major political force against vouchers in the United States.

A second and more neglected source of inefficiency in public schools, however, arise from possibly inefficient matching of students with schools rather than an inefficient utilisation of resources within schools. This manifests itself in the models of public schools that are commonly employed, including those I have discussed thus far, through the way in which peer effects are incorporated.

Specifically, it is usually assumed that mixing children with different abilities benefits low ability children while hurting high ability children, an assumption that seems reasonable when the curriculum is designed in such a way as to attempt to teach all children the same material. Under such a school curriculum, one which closely approximates many current US public schools, parents who insure classrooms are functioning properly are benefiting everyone in that classroom, and high ability children are able to serve as mentors and role models for low ability children. A model of school quality that places emphasis on average peer qualities therefore seems both reasonable and consistent with empirical estimates under this setting.

However, imagine an environment in which schools specialise to target specific skills and abilities of their student populations, a system that is more like that currently in place in many European countries. Then it is no longer obvious that average ability levels within schools should matter in the way we have modelled thus far. If some schools attempt to train future economists while others train future carpenters, there is no reason to believe that the joint presence in one classroom of the future economist and the future carpenter will benefit either - in fact, I could relate personal anecdotes to suggest that the future economist is likely to be harmful to the future carpenter as he attempts to operate a chainsaw. If schools alter their curricula to meet student needs as schools become more homogeneous, it is therefore more appropriate to model both average abilities and variances in abilities as mattering in schools, where higher variances would lead to lower school quality. It is furthermore appropriate to

differentiate between different kinds of abilities and not to lump all talents that children are endowed with into one category.

When schools are permitted to target their curriculum to student needs and when the model of peer effects is adjusted to take this into account, my model continues to predict migration effects of the type discussed so far, but now the increased homogeneity of student populations in both public and private schools lends itself to a much different normative interpretation. In particular, private schools now become more attractive due to their ability to target curricula, and pubic schools, to the extent that they are able to also target their resources in the same way as they become smaller and more homogeneous, are able to compete more effectively as voucher levels increase. While public school quality declined when such curriculum targeting was not permitted, public school quality in poor communities is now the first to increase as it is the first to experience declining enrolments and greater homogeneity. As general ability levels fall in these schools, their variance also narrows, and a targeted curriculum can more than compensate for the absence of future physicists in the classroom. Note that this is not an argument involving public school bureaucracies inefficiently using resources. Rather, it is an argument about better matching of resources made possible by greater differentiation of both public and private schools. To what extent public schools will be able under vouchers to undertake such curriculum targeting is, of course, an empirical matter, and it is likely to depend on the institutions faced by the public school bureaucracy. In highly centralised systems like that in California, such targeting

by local public schools may be difficult to achieve, thus leaving us with declining public school quality in the presence of vouchers. In states with greater local autonomy, however, the possibility of targeting public school curricula as public school populations change is more likely. Curriculum design, therefore, involves better matching of school resources to student needs, and the possibility of heterogeneity in school curricula causes us to view peer effects quite differently than we would in the absence of such a possibility.

Finally, not only might public school inefficiencies arise from inefficient utilisation of resources and inefficient matching of children to schools, public school bureaucracies may also be either unable or unwilling to utilise parents efficiently. Current empirical work by one of my graduate students suggests that information and monitoring from parents is quite important and highly correlated with household income, and that the effectiveness of parental monitoring at improving schools increases as schools face more competitive environments. In addition, of course, parents who decide on how much to monitor consider their potential impact on schools prior to engaging in costly monitoring efforts. Economic theory tells us that monitoring by parents should increase as schools become smaller because the free rider problem is mitigated. Similarly, as parents within schools become more homogeneous, their ability to solve coordination problems involved in monitoring schools increases. To the extent that this is true, the smaller and more homogeneous schools under competition are likely to lead to more effective parental involvement in both public and private schools.

Table 3 attempts to summarise numerical estimates of adding these various considerations to my simpler model from before, and it does so for a version of the model calibrated to New York City which has a centralised structure of public school finance. The table reports school averages for students attending public schools as well as for all student who attend public school in the absence of vouchers. The simulated voucher level in this table is a modest $2,500.

The first two columns present outcomes when the model contains none of these additional features, one for the case of no voucher and the other for the case of the $2,500 voucher. The introduction of this voucher causes 14 percent of children to switch to private schools, two thirds of whom previously attended public schools in middle to high income districts but now move to low income districts to attend private schools. Parental income and child ability levels within public schools therefore decline, as does average public school quality. At the same time, those children who switch to private schools gain from improvements in their school quality, and average school quality across all students remains roughly unchanged.

The next set of columns adds the standard competitive effect of vouchers by assuming that the marginal product of resources within public schools improves when these schools are faced with private school competition. Two versions of this effect are modelled. In the first column, the positive competitive effect occurs only in districts in which private schools emerge. This causes a slight

decline in private school enrolments to 13 percent, and an increase in the average quality of public schools in the poor community. If, however, the competitive effect of private schools in poor districts spills over into middle and high income districts due to migration pressures that such districts experience, public schools everywhere become more competitive thus causing private school enrolments to decline to 10 percent and overall public school quality to improve further despite the decline in peer quality within those schools.

Columns 5 and 6, on the other hand, return to the assumption that public schools are using resources efficiently and incorporates the potential for schools to better match their curriculum with student needs as student populations become more homogeneous. Column 5 assumes that only private schools undertake such curriculum targeting, while Column 6 allows public schools to do the same. In the former case, private schools become more attractive and lead to greater attendance rates but poorer public school performance as more high quality peers exit, while in the latter case, public schools respond to this competition and therefore improve in quality. Finally, Column 7 allows for parental input and monitoring to become more effective as schools become smaller. This gives an additional advantage to private schools and also to the public schools in poor communities who experience declining enrolment.

The main message of this table is that the equity enhancing migration effects described earlier are immune to the addition of other types of effects, and that

these other effects only serve to increase the efficiency properties of vouchers. Table 4 then zeroes in more closely on the equity properties of the school system by focusing on variances of the same variables across students. For ease of interpretation, these variances are normalised to 1 in the absence of vouchers, with variances below 1 implying a narrowing of differences and variances above 1 implying a widening of these differences. Notice that because of migration effects, variances in public school quality decline as vouchers are introduced, as do variances across all students, both public and private. Furthermore, these declines are generally amplified as additional effects are modelled. The only variance measures that increase are those of household income and child ability within schools because all schools, both public and private, become more homogeneous under the voucher policies, but this clearly does not mean that school quality variances increase. Finally, the last two rows in the table again demonstrate the powerful residential integration produced by the decoupling of residential location and schooling choices, with variances in both district income and property values narrowing sharply.

What I am attempting to argue, then, is that discussions of vouchers require a deeper analysis than that usually offered by simple models pitting a single public school against a private school. Lessons from the history of school reforms and from scholarly empirical analysis have painted a picture of schools as far more complex institutions producing a product that is influenced by the various choices made by parents and school bureaucracies who respond to institutional incentives. School vouchers change the incentives faced by these

agents. Parents are able to choose schooling independent of housing, which implies greater residential integration that brings with it much better equity properties than a more simple analysis would imply. While the fears by some that schools will become increasingly differentiated under voucher policies are well founded, this greater differentiation between schools does not have to imply greater inequities in educational opportunities. In fact, under some plausible scenarios, the greater differentiation of schools leads to greater equity and greater efficiency in both public and private schooling. Such results, of course, are dependent on a variety of assumptions which I have attempted to make explicit during my discussion.

With decentralisation of public schools leading to the types of equity concerns prevalent in the US, and with centralisation shown to be both ineffective in addressing these inequities as well as contributing to greater inefficiency, vouchers may therefore be able to introduce equity and efficiency into the public system, whether it be centralised or decentralised. In the spirit of healthy academic scepticism, of course, I should conclude by pointing out that while I have made every attempt in my numerical analysis to use the available evidence to inform a simulation model, results are still derived from a model, not from real world experiments. I believe we can learn much about the relevant issues we should be thinking about from such an approach and we can get a first order sense of the magnitude of likely effects. Ultimately, however, there is no substitute for real world experiments and solid empirical work with data from such experiments to determine the magnitudes of these effects more precisely.

TABLE 1

Variances within and across Communities

	Variance in Income Values			
Vouch	Comm. 1	Comm 2	Comm 3	Across
$0	1.7048	3.0709	1.0025	2.5739
$1000	3.4500	2.2214	1.3639	2.1549
$2000	5.0900	2.1725	2.0025	1.4117
$3000	5.4600	3.3500	1.9100	0.9267
$4000	4.3400	4.7600	2.1600	0.7467
$5000	4.6822	5.3281	3.1625	0.1091
$6000	2.3539	3.6461	3.5025	1.3325

	Variance in Property Values			
Vouch	Comm. 1	Comm 2	Comm 3	Across
$0	0.0652	0.1469	0.2331	0.2175
$1000	0.0600	0.1309	0.2195	0.2016
$2000	0.0612	0.1270	0.2081	0.1946
$3000	0.1556	0.1262	0.1824	0.1001
$4000	0.1690	0.1210	0.1768	0.0695
$5000	0.2223	0.3148	0.1393	0.0466
$6000	0.1787	0.2809	0.3739	0.0930

Source: Thomas Nechyba, “Mobility, Targeting and Private School Vouchers,” Stanford University working paper, 1998

TABLE 2

	Full Mobility							
	Variance Across Public School Students				Variance Across All Students			
Vouch	Spending	Ability	Peers	Quality	Spending	Ability	Peers	Quality
$0	0.0256	0.7780	0.0306	0.0276	0.0256	0.7780	0.0306	0.0276
$1000	0.0257	0.5360	0.0277	0.0279	0.0250	1.3535	0.0370	0.0288
$2000	0.0255	0.3837	0.0227	0.0275	0.0236	2.1945	0.0422	0.0280
$3000	0.0206	0.0212	0.0138	0.0175	0.0185	5.5197	0.0664	0.0236
$4000	0.0135	0.1382	0.0141	0.0133	0.0136	7.2392	0.0750	0.0210
$5000	0.0127	0.7233	0.0179	0.0177	0.0314	10.4334	0.0835	0.0345
$6000	****	****	****	****	0.0344	11.0413	0.0933	0.0476

	No Mobility							
	Variance Across Public School Student				Variance Across All Students			
Vouch	Spending	Ability	Peers	Quality	Spending	Ability	Peers	Quality
$0	0.0256	0.7780	0.0306	0.0276	0.0256	0.7780	0.0306	0.0276
$1000	0.0259	0.8120	0.0308	0.0281	0.0259	0.8120	0.0308	0.0281
$2000	0.0259	0.8120	0.0308	0.0281	0.0259	0.8120	0.0308	0.0281
$3000	0.0339	1.6673	0.0434	0.0375	0.0324	2.2388	0.0439	0.0352
$4000	0.0501	2.7694	0.0668	0.0532	0.0419	4.7148	0.0651	0.0429
$5000	0.0417	5.8064	0.0953	0.0620	0.0495	7.1608	0.0731	0.0512
$6000	0.0208	2.2043	0.2076	0.0316	0.0497	8.3204	0.0620	0.0480

Source: Thomas Nechyba, “Mobility, Targeting and Private School Vouchers,” Stanford University working paper, 1998.

TABLE 3

School Averages Under Different Assumptions
($2,500 Full Voucher)

	Calibrated Base Model		Competition & Bureaucracy		Curriculum Targeting		Info/ Monitor
	No Voucher	Base Model	W/in Dist.	W/in & Across Dist.	Private Schools	All Schools	Parental Input
% Switch to Priv. Sch.	---	14.2	13.1	10.5	18.9	13.8	17.5
Pub. School Means							
Per Pupil ($)	8,103	8,021	8,051	8,098	8,011	8,067	8,002
Household Income ($)	34,321	29,723	29,892	30,871	28,948	29,735	29,647
Child Ability*	6.20	5.86	5.91	6.01	5.74	5.89	5.76
School Quality**	7.83	7.55	7.88	8.11	7.41	8.01	7.71
*Across all Students****							
Per Pupil ($)	8,103	7,822	7,891	7,932	7,901	7,872	7,864
Household Income ($)	34,321	34,321	34,321	34,321	34,321	34,321	34,321
Child Ability*	6.20	6.20	6.20	6.20	6.20	6.20	6.20
School Quality**	7.83	7.84	8.02	8.39	8.17	8.42	8.36

* The Child ability levels are arbitrarily calibrated to lie between 1 and 10.

** School quality arises endogenously from the combination of per pupil spending, per pupil household income, and average child ability in the school. For purposes of this calculation, all values are scaled to lie between 0 and 10. While there is thus no natural interpretation for the magnitude of a particular school quality level, we emphasise here the direction and magnitude of change in the variable as we move across the table.

*** Note that "all students" here refers to all students that are initially in the public school system before the introduction of vouchers. Therefore, the values in the first column are identical to those for public schools.

Source: Thomas Nechyba and Michael Heise, “School Finance Reform: Introducing the Choice Factor,” Stanford University working paper, 1998.

TABLE 4
Variances Under Different Assumptions*
($2,500 Full Voucher)

	Calibrated Base Model		Competition & Bureaucracy		Curriculum Targeting		Info/ Monitor
	No Voucher	Base Model	W/in Dist.	W/in & Across Dist.	Private Schools	All Schools	Parental Input
Across Public Schools							
Per Pupil ($)	1.0	0.97	0.97	0.98	0.96	0.97	0.96
Household Income ($)	1.0	0.91	0.93	0.95	0.89	0.92	0.93
Child Ability**	1.0	0.72	0.73	0.74	0.78	0.71	0.75
School Quality***	1.0	0.88	0.72	0.91	0.94	0.69	0.71
Across all Schools							
Per Pupil ($)	1.0	0.94	0.94	0.95	0.93	0.94	0.94
Household Income ($)	1.0	1.32	1.33	1.24	1.43	1.31	1.38
Child Ability**	1.0	1.18	1.17	1.15	1.24	1.19	1.21
School Quality***	1.0	0.99	0.82	0.91	1.05	0.87	0.88
Across School Districts							
Household Income	1.0	0.71	0.71	0.74	0.67	0.70	0.68
Property Values	1.0	0.61	0.59	0.64	0.56	0.61	0.59

* Note that, in order to ease interpretation, these variance values are scaled in various ways to all equal 1 for the base case of no vouchers. Our emphasis here is therefore not on absolute but rather on relative magnitudes across columns.

** The Child ability levels are arbitrarily calibrated to lie between 1 and 10.

*** School quality arises endogenously from the combination of per pupil spending, per pupil household income, and average child ability in the school. For purposes of this calculation, all values are scaled to lie between 0 and 10. While there is thus no natural interpretation for the magnitude of a particular school quality level, we emphasise here the direction and magnitude of change in the variable as we move across the table.

Source: Thomas Nechyba and Michael Heise, “School Finance Reform: Introducing the Choice Factor,” Stanford University working paper, 1998.