Comments

Luca Flabbi: Gallego and Hernando use estimated parameters from an earlier paper to implement relevant policy experiments about the design of the primary school system in Chile.[1] Their conclusions are informative: they show that the impact of the policies is quite heterogeneous across the population and that a recently approved law in Chile may increase welfare.

The authors devote their entire paper to performing detailed policy experiments: this area of research has a direct and immediate link to public policy considerations, and many countries—not only Chile—are experimenting with changes to their primary school system. Although the paper is devoted exclusively to Chile, this is an extremely interesting case study because many choices are available to students: public and private schools, to and without vouchers, with and without copayments. The authors could have devoted a little bit more effort to extending the lesson from Chile to the debate in other countries.

A second merit of the paper is that the policy experiments are extensively developed, assessing a wide range of general issues together with the specific policies actually implemented in Chile. It is a merit to have aimed at such complexity, but at the same time this is also a weak point of the paper. As I discuss in more detail below, it is not clear whether the estimated parameters can be used to credibly assess the impact of policies that represent a massive departure from the environment in which the estimates were obtained.

The estimated model is essentially a random utility model over primary school choice. The value added of the estimated specification with respect to the standard approach in this literature is the inclusion of an unobserved alternative-specific effect estimated by Berry, Levinsohn, and Pakes.[2] This is probably why the authors use the term *semi-structural*, as opposed to *reduced*

1. See Gallego and Hernando (2008).
2. Berry, Levinsohn, and Pakes (1995, 2004).

form, to contrast their estimates with other estimates in the literature. The authors insist a little too much on this labeling: it does not seem to add much in terms of clarifying what they are doing, while it may confuse a reader browsing through the paper. The only issue that seems relevant here is how credible the impact of the policy experiment is given the estimated parameters.

On this ground, I limit myself to a simple criterion. As in any policy experiment based on an estimated (structural or behavioral) model, only some equilibrium effects are taken into account: in this case, these are the (static) impact of the included observable characteristics on school choice, the estimated school effects, and some interactions between school attributes and student characteristics. The observables included in the specification are quite rich: at the student level, they include both ability tests and good family background measures, while at the school level, they include detailed variables such as a proxy for the use of disciplinary measures in the school. On the other hand, the authors do not take into account a number of notable and potentially relevant equilibrium effects such as peer effects (any policy that affects the school composition changes the peer effects generated in that school); school costs and possible school reactions to the simulated changes (a change in school composition may affect costs and may generate an increase or decrease in tuition); and some dynamic considerations (for example, the authors take the students' choice in fourth grade in isolation, when in fact it reflects each family's expectations about the total amount of schooling the student is likely to acquire and the associated returns).

Using this metric, the most convincing experiment in the paper seems to be the last one, in which larger vouchers are allocated to vulnerable students. This policy has the additional benefit of being calibrated to a recently approved Chilean law. The experiment is convincing because it really constitutes a local change with respect to the environment in which the parameters were estimated. In the original environment, vouchers were already present. Here, the authors simply increase the amount allocated to a subgroup, and the increase is not dramatic (from US$40.00 to US$63.00). Although, as mentioned, the authors ignore many potentially relevant equilibrium effects, it may be fair to claim that their impact is unlikely to change the main result. And the main result is extremely interesting: the law has a positive impact because it compensates the "losers" in a school choice system by giving them an appropriate additional payment in the form of a larger voucher.

I would like to contrast this policy experiment with the set of experiments that I think is the least convincing: the experiments related to the value of school choice. All these policies represent a massive change with respect to the original environment, in that students do not pay a fee and they are not free to choose their school. The different experiments are then characterized by the allocation mechanism, but this mechanism removes the only relevant decision taken by the individuals in the authors' earlier estimated model.[3] Moreover, the actual distribution of students over schools is by no means a local change with respect to the original environment. The ignored equilibrium effects could have a huge impact. In other words, if the reader (or the referee) has to prove that the equilibrium effects have the potential to significantly change the main result in the experiment on larger vouchers, the authors need to argue convincingly that the ignored equilibrium results cannot easily flip the results in the case of the value of school choice. The authors seem to be aware of the problem and provide a slim discussion, but they should have put more effort in this direction. Alternatively, the policies presented could have been more focused and limited.

The last set of policies concerns copayment: schools are not allowed to charge copayments on top of the vouchers. The first scenario assumes this has no impact on school revenue, which really seems too unrealistic to make the experiment informative. In the second scenario, school quality is allowed to decrease as a result of the reduced funds. This assumption is much more realistic, and it illustrates the value of considering school effects in detail. The main issue here is the mechanism for allocating students to schools. The estimated predicted probabilities are based on actual choices made by individuals, while in the Gale-Shapley algorithm used to implement the experiment, the authors are forced to use them as predicted probabilities of applying to a given school. The results are interesting, if not particularly credible: middle-class students tends to benefit the most because the policy has no impact on poor students (they do not pay a top-up anyway) while forcing rich students to pay more by traveling farther. The results are interesting because they are not obvious, and they show the importance of taking individual heterogeneity into account when assessing these policies. This remains the strongest point of the paper.

Melissa Tartari: A recent body of literature is concerned with understanding how parents decide in which school to enroll their child.[1] Interest stems

3. Gallego and Hernando (2008).

1. For example, Hastings, Kane, and Staiger (2007); Bayer, Ferreira, and McMillan (2007). Because school choice is tightly related to parents' residential location in the United States and other countries, a number of works focus on both location and school choice (for example, Bayer, Ferreira, and McMillan 2007).

from the empirical observation that schools differ dramatically in their characteristics and that these characteristics are strongly correlated with both parents' characteristics and child outcomes. Child outcomes, in turn, are strong correlates of well-being in adulthood. Uncovering the sources of such correlation is key to understanding the impact on child outcomes of existing interventions (such as residential restrictions in the form of attendance zones), as well as the potential of hypothetical interventions for improving the performance of those children at the bottom of the outcome distribution (for example, voucher programs and the design and targeting of school financing schemes). Recovering parental preferences toward schools is an essential component of this endeavor. A second, equally important, component is learning about the process through which parental decisions and school decisions translate into child performance.

The article by Gallego and Hernando focuses on the first of these components. The authors regard the task of recovering parental preferences as instrumental to quantifying the value to parents of being able to choose freely from the pool of available schools. Chile's twenty-year experience with an unconstrained and voucher-based school system provides an ideal opportunity to accomplish this task. The basic idea is that to quantify the value of choice, it should be sufficient to infer preferences from a situation in which choice is unconstrained and then use these preferences to determine welfare when school choice is eliminated altogether. Moreover, to the extent that what is revealed by observed school choices enables the authors to unbundle the above correlation, it may be possible to quantify the implications for welfare and child outcomes of restricting school choice (as opposed to eliminating it) or designing voucher systems that are better suited to undoing the impact on outcomes of differences in families' initial conditions (including preferences) and constraints. This is important in light of existing concerns, as pointed out by the authors, that "school choice may decrease school quality for poor students by moving good peers to other schools and produce competition in irrelevant school attributes if parents do not care about education outcomes."

In these comments, I present four main arguments: (1) the parameters in the indirect utility function estimated by the authors are complex functions of preference and technology parameters, and any inference with respect to these parameters does not reveal whether and how much parents value school attributes; (2) one cannot assess the welfare implications of eliminating or restricting school choice without recovering the link between inputs and child outcomes and the nature of peer effects; (3) the authors use equilibrium outcomes as instruments, and these instruments are invalid in the context of their own model; and (4) sorting implies an additional source of endogeneity that is ignored in the estimation. To illustrate these arguments, I proceed as follows. First, I set up a model of school choice behavior by parents The model implies the indirect utility specification of Gallego and Hernando. I use the model to discuss what the authors' approach recovers in terms of the underlying structure and thus what may be learned from their estimates (argument 1). Next, I consider the model's implications for the type of welfare analysis the authors carry out. I do so by recognizing (as do Gallego and Hernando) the equilibrium determination of some of the variables driving individual decisions (argument 2). I conclude by using the model to question the validity of the instruments employed by the authors to overcome the endogeneity of these determinants of behavior (arguments 3 and 4).

A Conceptual Framework

The indirect utility specification estimated by the authors can be rationalized by means of a "primitive" (that is, direct utility) choice problem. The model presented below recognizes that child outcomes are jointly produced by parents and schools.[2] It also allows for externalities in child outcomes production (such as peer or spillover effects) and in parental consumption (including conformity, information transmission, and joint consumption).

Consider an economy populated by J schools (each indexed by j) and many families. A family i is composed of a child and his or her parents. Parents are endowed with resources in the form of income (Y_i), education (E_i), and their child's ability or preschool knowledge (A_i).[3] Specifically, a child's ability is the output of a production process in which the inputs are parental resources (Y_i and E_i). Parents value family consumption (c_i) and their child's knowledge (K_i). They may also derive utility from the family characteristics of their child's schoolmates, such as family income.

A child's knowledge is a function of knowledge that can be measured by test scores (K_i^{TS}) and residual (or non-test-score) knowledge that is not measured by test scores (K_i^{NTS}).[4] Both types of knowledge are the output of a production process whose inputs are the school inputs invested in the child (I_{ij}),[5] a child's

2. For example, Todd and Wolpin (2003).

3. Endowments are, by definition, predetermined with respect to the choice being modeled.

4. Knowledge that is not measured by test scores might include noncognitive skills, religious values, manners, and so forth.

5. School investment may take the form of the school's facilities, teaching quality, teaching equipment, and so on.

ability (and thus, indirectly, parental inputs), and the within-school average ability of the child's schoolmates (for example, because of peer effects operating through externalities in learning, A_j). Schools invest equally in their students and charge a uniform fee or top-up (that is, $I_{ij} = I_j$ and $P_{ij} = P_j$).

Families take as given the equilibrium outcomes of the underlying aggregate economy, namely, the vector of top-ups charged by schools (P_j, for all j), and the characteristics of the peers (and of their parents) attending each school (E_j, Y_j, and T_j, for all j). Given these aggregate quantities, parents choose their consumption (c_i) and the school in which to enroll their child (d_{ij}) with the objective of maximizing their utility. The decision problem can be written as

$$\max \theta_0 K_{ij} d_{ij} + \theta_1 c_{ij} d_{ij} + \theta_2 Y_j d_{ij}, \tag{6}$$

subject to

$$K_{ij} = K_{ij}^{TS} + K_{ij}^{NTS}, \tag{7}$$

$$K_{ij}^{TS} = \gamma_{0j} + \gamma_1 A_j + \gamma_2 A_j + \gamma_3 I_j, \text{ for all } j, \tag{8}$$

$$K_{ij}^{NTS} = \beta_{0j} + \beta_1 A_i + \beta_2 A_j + \beta_3 I_j, \text{ for all } j, \tag{9}$$

$$A_i = \alpha_0 + \alpha_1 E_i + \alpha_2 Y_i, \tag{10}$$

and

$$c_{ij} = Y_i - P_j d_{ij}, \text{ for all } j, \tag{11}$$

where d_{ij} equals one if child i attends school j and zero otherwise. In equation 6, I have assumed that (a) the utility function is linear in its arguments and homogeneous across families; (b) the technologies for the production of preschool ability and knowledge are linear in inputs; and (c) a child's knowledge is the sum of his or her test-score and non-test-score knowledge. I also assume, as mentioned above, that test scores are a perfect measure of test-score knowledge. That is,

$$T_{ij} = K_{ij}^{TS}. \tag{12}$$

Measurement equation 12 and rational expectations (in aggregating equation 8 within schools) can be used to obtain the following expression for u_{ij}:

$$u_{ij} = \delta_0 + \delta_1 T_{ij} + \delta_2 E_i + \delta_3 Y_i + \delta_4 E_j + \delta_5 Y_j + \delta_6 T_j + \delta_7 P_j + \xi_j. \tag{13}$$

In particular, the coefficient of Y_j is given by

$$\delta_5 = \theta_0\alpha_2\left(\gamma_2 + \beta_2\right) - \frac{\left(\gamma_3 + \beta_3\right)\left(\gamma_1 + \gamma_2\right)}{\gamma_3} + \theta_2. \tag{14}$$

The indirect utility specification in expression 13 is essentially identical to Gallego and Hernando's specification.[6] Next, I use equation 14 to discuss what can be learned about parents' preferences from knowledge of the parameters in equation 13. I choose to focus on equation 14 because Y_j is, purportedly, an irrelevant attribute in the context of the model. That is, given preschool ability, income of own and other parents is irrelevant for a child's knowledge.

Argument 1: On What Is Recovered

Because the parameters appearing in equation 13 are complex functions of preference and technology parameters, inference with respect to δ does not reveal whether and how much parents value some school attributes. For instance, the coefficient of Y_j does not reveal parental preferences toward this school attribute. Indeed, δ_5 may be strictly positive both when $\theta_0 = 0$ (that is, when parents do not value their child's knowledge) and $\theta_2 > 0$ (that is, when parents value the characteristics of the parents of their child's classmates) and when the opposite is true, that is, when $\theta_0 > 0$ and $\theta_2 = 0$. Moreover, δ_5 may be strictly negative even if both θ_0 and θ_2 are strictly positive. To see this, observe that for δ_5 to be negative when $\theta_0, \theta_2 > 0$, it must be the case that

$$\frac{\gamma_2 + \beta_2}{\gamma_3 + \beta_3} < \frac{\gamma_1 + \beta_2}{\gamma_3}. \tag{15}$$

6. Gallego and Hernando's specification of equation 13 would result from the following modifications applied to the decision problem (equation 6): nonlinearities in the production of knowledge with respect to individual ability (producing terms capturing higher-order moments of the school distribution of pupils' characteristics, such as the variance of parental education); transportation costs in the budget constraints (producing a dependence on distance from school); observed heterogeneity in parental preferences (producing interactions of school and parental characteristics); and a full set of unobservable family-school tastes (introducing ε_{ij}). Gallego and Hernando's specification does not accommodate heterogeneity in children's innate ability (α_{oi} instead of α_o). Scale and level normalizations would need to be applied, and some parameters are not recoverable (for example, δ_2).

Inequality 15 is satisfied whenever

$$\frac{\beta_2}{\beta_3} < \frac{\gamma_2}{\gamma_3}, \tag{16}$$

that is, whenever the marginal rate of transformation between average peers' ability and school inputs is smaller in the production of non-test-score knowledge than in the production of test-score-relevant knowledge. The intuition for this result is as follows. Given T_j, which appears in equation 13, higher peers' income means higher A_j and thus lower school inputs. When inequality 16 holds, the reduction in school inputs is not compensated by the increase in peers' ability. The implied reduction in K_i^{NTS} lowers total knowledge and hence utility. Thus, peers' income may have a negative coefficient even if parents value knowledge and, hence, indirectly peers' income, as well as peers' income per se.[7]

Since the recovered parameters cannot be interpreted as reflecting preferences, they do not enable the researcher to discern between competing explanations (such as the empirical relevance of peers' characteristics as a determinant of behavior). Nevertheless, this deficiency may be of no practical consequence. The authors' goal is to conduct welfare analysis by contrasting the existing Chilean free school system with variously restricted versions of the school system. In many circumstances, policy analysis may be carried out with knowledge only of reduced-form parameters (in this model the δ). Such a result does not obtain, however, under the circumstances of Gallego and Hernando's paper. I elaborate on this claim next.

Argument 2: On the Counterfactual Simulations

Gallego and Hernando ask the following questions. How does the distribution of welfare change when the choice set is (variously) restricted? Which families would be better off and which would be worse off? These are relevant policy questions. They are so both for school systems in which the introduction of restrictions is contemplated (as in the case of Chile) and for school systems in which the relaxation of restrictions is envisioned or carried out experimentally or in otherwise limited form (as in the United States). Specifically, the

7. The nonrecoverability of preferences is seen to obtain in a context in which parents' inputs are predetermined (contrary to what the authors write).

authors consider ten different scenarios. It is useful to summarize these scenarios to see the underlying logic, commonalities, and differences.

Scenarios 1 and 2 are as follows: in scenario 1, students are assigned uniformly to the schools in their municipality of residence, and the overall copayment disbursement is charged to each family in proportion to their income (irrespective of the school attended); scenario 2 is the same as scenario 1, except that assignment preserves the relative size of schools within a municipality. Scenarios 1 and 2 are contrasted with the baseline case of the actual Chilean system of free choice and vouchers plus copayments. Scenarios 3 and 4 are as follows: in scenario 3, students are assigned uniformly to the schools in the municipality of their residence and attendance is completely free (no copayments or taxes); scenario 4 is the same as scenario 3, except that assignment preserves the relative size of schools within a municipality. Scenarios 3 and 4 are contrasted with a modified version of the baseline, in which the actual Chilean system of free school choice is preserved, but schools are now completely free.[8]

In scenario 5, families are free to choose their child's school, but only within their municipality of residence. In scenario 6, students are once again allocated to schools in their municipality (no choice), but the supply of private schools is reduced. In scenarios 7 and 8, school choice is unconstrained, but schools cannot charge copayments: school revenue is kept constant in scenario 7, but not in scenario 8. Finally, in scenarios 9 and 10, school choice is unconstrained, but vouchers are differentiated based on a family's income: school revenue is kept constant in scenario 9, but not in scenario 10. Scenarios 5 through 10 are contrasted with the baseline.

A feature common to all these counterfactual exercises is the outcome whose change is simulated. Most of the literature on school choice focuses on the impact of changes in schools' and parents' choice or constraint sets on children's outcomes, typically test scores. Instead, Gallego and Hernando mainly focus on parental welfare.[9] Now, when the parents' objective function does not depend exclusively on their children's knowledge (as explicitly acknowledged and implicitly accounted for by Gallego and Hernando), different policy prescriptions may result from a focus on parental welfare as opposed to child outcomes. Thus, the concern that societal and parental objectives may not coincide (as captured by the quote in the introduction of

8. This is unanticipated by parents and schools alike.
9. Gallego and Hernando also describe the impact on school segregation.

this comment) would suggest that making children outcomes the object of the analysis may be policy relevant. This, in turn, begs the question of whether the framework that Gallego and Hernando develop enables such a change in focus. The answer is negative. In fact, I will next argue that one does not have to "rank" parental welfare and child outcomes in terms of what "should" be the focus of policy analysis: determining the impact on child outcomes is instrumental to determining the impact on parental welfare.

Consider what is required to simulate choice-set restrictions within Gallego and Hernando's framework. Specifically, consider scenario 1 (or 2), in which school choice is eliminated. Let j denote the school chosen by the child's parents when their choice is not restricted and j' the school the child is assigned to under the counterfactual scenario. A look at equation 13 reveals that the following information is needed to evaluate the change in welfare: $(P_{j'}, T_{j'}, E_{j'}, Y_{j'}, \xi_{j'})$. Gallego and Hernando's approach delivers an estimate of $\xi_{j'}$. Also, because the researcher has full control over the allocation of students to schools, $(E_{j'}, Y_{j'})$ can be readily constructed by aggregating these characteristics of families within a school. However, $T_{j'}$ is not known, and the estimates of the parameters in equation 13 do not suffice for its derivation. The reason is simple: without knowledge of the mapping between inputs and test scores, it is not possible to predict the impact on test scores of the contemplated intervened allocation of students to schools. While demand-side parameters may be estimated without the need to recover supply-side (or cost) and technology parameters, the superficially straightforward exercise of exogenously imposing an allocation of children to schools cannot be assessed in terms of child outcomes and hence welfare.

Gallego and Hernando deal with their inability to predict $T_{j'}$ by using the average of the test scores observed in the baseline for those children that in the counterfactual are allocated to school j', say $\tilde{T}_{j'}$. Using equation 8, the sources of the difference between these two quantities can be made explicit:[10]

$$(17) \qquad T_{j'} - \tilde{T}_{j'} = \gamma_{0j'} - E\left(\gamma_{0j} \middle| d_{ij}^{*} = 1\right) + \left(\gamma_1 + \gamma_2\right)A - E\left(A_i \middle| d_{ij}^{*} = 1\right) + \gamma_3 I_{j'}\left(A\right) - E\left(I_j \middle| d_{ij}^{*} = 1\right),$$

where $T_{j'}$ is the average test score in j' when families do not select schools, but rather are allocated randomly to schools; A is the average child ability in

10. For simplicity, I disregard the geographic constraint embedded in the counterfactual scenarios.

the population; and $I_{j'}(A)$ denotes the investment made by school j' when it gets allocated a random sample of the children in the economy. Expression 17 shows that ex ante heterogeneity in school characteristics (the first term) and sorting of students into schools (the second term) lead to $T_{j'} \neq \tilde{T}_{j'}$, even if school investment (the third term) is assumed to be unchanged.

Finally, consider $P_{j'}$. By taxing individuals for the overall amount of copayments that schools charged in the baseline scenario, the authors effectively sidestep solving for the copayment that schools would charge if assigned students according to the counterfactual scenario.[11] This artifice keeps each school's resources unchanged. It does not imply, however, that a school's investment in children would also remain the same, unless the pool of students attending a school does not affect school input choices (see the third term in equation 17).

The above discussion reveals that there is a fundamental difference between the following three sets of endogenous equilibrium outcomes: (E_j, Y_j) on the one hand, T_j on the other hand, and finally P_j. Limiting the analysis to the short run does not solve this fundamental problem.[12] If there are externalities, average test scores within a school will change as a result of the reallocation even if prices and the school inputs subject to choice do not change or are exogenously set.

The choice of counterfactuals considered by Gallego and Hernando clearly discloses their concern with the above issue. In particular, the scenarios in which prices are fixed (or set to zero or replaced with taxes) and students are allocated exogenously (namely, scenarios 1, 2, 3, 4, and 6) are clearly designed to maximize the researcher's "control" over $(P_{j'}, T_{j'}, E_{j'}, Y_{j'}, \xi_{j'})$—that is, the determinants of welfare (and thus behavior)—by bypassing the equilibrium solution. However, while exogenously imposing the allocation of students to schools and setting prices is a clever (though maybe not very informative) device to overcome the equilibrium determination of $(P_{j'}, E_{j'}, Y_{j'})$, the presence of $T_{j'}$ requires explicit consideration of the technology for

11. In this discussion, I leave aside (as do Gallego and Hernando) the (nontrivial) issues of how incentives to invest in students might be provided to schools when students are assigned exogenously, that is, irrespective of the schools' behavior and characteristics. I similarly do not address the issue of how prices would be determined in equilibrium under exogenous allocation of students to schools. A careful consideration of these issues would require an analysis of equilibrium existence and uniqueness.

12. Here I define the short run as a period of sufficiently short length that schools do not react by changing either their investment in children or the copayment charged and families do not relocate or change their preschool investment.

the production of child knowledge, as well as the school input demand functions. By the same reasoning, scenarios 5, 7, 8, 9, and 10 appear even more problematic.[13]

The above discussion assumes that the authors' approach delivers consistent estimates of δ and recovers ξ_j. Next, I question this assumption.

Arguments 3 and 4: On the Validity of the Instruments

Gallego and Hernando's estimation approach is meant to accommodate (or account for) the following possibility: schools are heterogeneous in their characteristics, and some of these characteristics are determined as the outcome of the equilibrium interaction of families and schools.[14] Accordingly, they implement an instrumental variables (IV) approach to handle equilibrium-generated correlation between (T_j, P_j) and ξ_j. Their search for instruments falls on the characteristics—excluding ($T_{j'}$, $P_{j'}$)—of the six schools closest to school j that are (and are not) in the same municipality as j.

In light of the above discussion, a clear limitation of this approach is that sorting of children into schools induces a similar correlation between (E_j, Y_j) and ξ_j. Why this correlation should be less bias-inducing than the correlation with (T_j, P_j) is not clear to me. A second and intimately related problem with the chosen IVs for prices and test scores is that some of these neighboring schools' characteristics—namely, the average income and education of the parents who chose to enroll a child in j'—are an equilibrium object. As such, while they are excluded from the indirect utility of school j and correlated (through the equilibrium) with (T_j, P_j), they are also correlated with ξ_j.

Concluding Remarks

Gallego and Hernando's article has very ambitious goals: inferring parental preferences for schools' attributes and quantifying the value of school choice. Recognizing that child outcomes are the joint product of parental and school investments and that (some) school attributes are endogenous to the sorting

13. Gallego and Hernando clearly recognize this issue when they employ estimates of school productivity from Gallego (2006) in predicting test scores in scenarios 7 through 10. However, the approach underlying those estimates fails to properly account for externalities in production.

14. See the companion paper in which the estimation is carried out (Gallego and Hernando 2008).

of children to schools renders the authors' task a formidable problem. In this comment I have substantiated this claim by showing the following. First, the parameters estimated are complex functions of preferences and technological relationships, and as such they do not reveal whether and how much parents value school attributes. Second, the failure to recover preferences separately from constraints impairs the authors' ability to quantify the value of school choice by contrasting the existing Chilean school system with restricted—in the choice dimension—versions of the system. The reason is that determining the impact on child outcomes is instrumental to determining the impact on parental welfare: if there are externalities in learning, for example, average child outcomes within a school will change as a result of the reallocation, even if prices and school inputs do not change or are exogenously set. Third, if schools are heterogeneous along unobservable dimensions, the equilibrium determination of the allocation of children to schools induces correlation between such unobservable characteristics and both prices (copayments) and child outcomes (test scores), as well as predetermined (but selected) within-school average parental characteristics. This invalidates the use as instruments of schools' characteristics that are defined by aggregation within a school of parental characteristics such as education and income.

References

Abdulkadiroğlu, Atila, Parag A. Pathak, and Alvin E. Roth. 2005. "The New York City High School Match." *American Economic Review* 95(2): 364–67.

Aedo, Cristián. 1998. "Diferencias entre escuelas y rendimiento estudiantil en Chile." In *La organizacion marca la diferencia: educacion y salud en America Latina,* edited by William D. Savedoff, chapter 2. Washington: Inter-American Development Bank, Research Network

Auguste, Sebastián, and Juan Pablo Valenzuela. 2003. "Do Students Benefit from School Competition? Evidence from Chile." University of Michigan.

Balmaceda, Felipe. 2006. "La expansión en Santiago y la hipótesis de la 'demanda excesiva' por infraestructura." In *Santiago: dónde estamos y hacia dónde vamos,* edited by Alexander Galetovic. Santiago: Centro de Estudio Públicos.

Bayer, Patrick, Fernando Ferreira, and Robert McMillan. 2004. "Tiebout Sorting, Social Multipliers, and the Demand for School Quality." Working Paper 10871. Cambridge, Mass.: National Bureau of Economic Research.

———. 2007. "A Unified Framework for Measuring Preferences for Schools and Neighborhoods." Working Paper 13236. Cambridge, Mass.: National Bureau of Economic Research.

Berry, Steven, James Levinsohn, and Ariel Pakes. 1995. "Automobile Prices in Market Equilibrium." *Econometrica* 63(4): 841–90.

———. 2004. "Differentiated Product Demand Systems from a Combination of Micro and Macro Data: The New Car Market." *Journal of Political Economy* 112(1): 68–105.

Card, David, Marin Dooley, and Abigail Payne. 2008. "School Competition and Efficiency with Publicly Funded Catholic Schools." Working Paper 14176. Cambridge, Mass.: National Bureau of Economic Research.

Chakrabarti, Rajashri. 2005. "Do Vouchers Lead to Sorting under Random Private School Selection? Evidence from the Milwaukee Voucher Program." Harvard University.

Contreras, Dante, Sebastián Bustos, and Paulina Sepúlveda. 2007. "When Schools Are the Ones That Choose: The Effect of Screening in Chile." Working Paper 242. University of Chile, Department of Economics.

Cutler, David M., Edward L. Glaeser, and Jacob L. Vigdor. 1999. "The Rise and Decline of the American Ghetto." *Journal of Political Economy* 107(3): 455–506.

Duncan, Otis D., and Beverly Duncan. 1955. "A Methodological Analysis of Segregation Indexes." *American Sociological Review* 20(2): 210–17.

Elacqua, Gregory, Mark Schneider, and Jack Buckley. 2006. "School Choice in Chile: Is It Class or the Classroom?" *Journal of Policy Analysis and Management* 25(3): 577–601.

Engel, Eduardo, Alexander Galetovic, and Claudio Raddatz. 1999. "Reforma tributaria y distribución del ingreso en Chile." Working Paper 40. University of Chile, Center for Applied Economics.

Gallego, Francisco A. 2006. "Voucher-School Competition, Incentives, and Outcomes: Evidence from Chile." Santiago: Pontificia Universidad Católica de Chile.

———. 2008. Comment on "School Choice, Stratification, and Information on School Performance: Lessons from Chile," by Patrick J. McEwan, Miguel Urquiola, and Emiliana Vegas. *Economía* 8(2): 32–37.

Gallego, Francisco A., and Andrés E. Hernando. 2008. "School Choice in Chile: Looking at the Demand Side." Santiago: Pontificia Universidad Católica de Chile.

Gallego, Francisco A., and Claudio Sapelli. 2007. "El esquema de financiamiento de la educación en Chile: una evaluación." *Revista de Pensamiento Educativo* 40(1): 263–84.

Gallego, Francisco A., and others. 2008. "Análisis del impacto del sistema nacional de evaluación de desempeño a nivel de la comunidad escolar." Santiago: Pontificia Universidad Católica de Chile.

Hastings, Justine S., Thomas J. Kane, and Douglas O. Staiger. 2007. "Parental Preferences and School Competition: Evidence from a Public School Choice Program." Working Paper 11805. Cambridge, Mass.: National Bureau of Economic Research.

Hoxby, Caroline M. 2000. "Does Competition among Public Schools Benefit Students and Taxpayers?" *American Economic Review* 90(5): 1209–238.

Hsieh, Chang-Tai, and Miguel Urquiola. 2006. "The Effects of Generalized School Choice on Achievement and Stratification: Evidence from Chile's Voucher Program." *Journal of Public Economics* 90(8–9): 1477–503.

Leslie, Phillip. 2004. "Price Discrimination in Broadway Theater." *RAND Journal of Economics* 35(3): 520–41.

McFadden, D. 1974. "Conditional Logit Analysis of Qualitative Choice Behavior." In *Frontiers in Econometrics,* edited by P. Zarembka, pp. 105–42. New York: Academic Press.

Rothstein, Jesse. 2005. "Does Competition among Public Schools Benefit Students and Taxpayers? A Comment on Hoxby (2000)." Working Paper 11215. Cambridge, Mass.: National Bureau of Economic Research.

———. 2006. "Good Principals or Good Peers? Parental Valuation of School Characteristics, Tiebout Equilibrium, and the Incentive Effects of Competition among Jurisdictions." *American Economic Review* 96(4): 1333–350.

Sapelli, Claudio. 2003. "The Chilean Voucher System: Some New Results and Research Challenges." *Cuadernos de Economía* 40(121): 530–38.

Sapelli, Claudio, and Arístides Torche. 2002. "Subsidios al alumno o a la escuela: efectos sobre la elección de colegios publicos." *Cuadernos de Economía* 39(117): 175–202.

Todd, Petra E., and Kenneth I. Wolpin. 2003. "On the Specification and Estimation of the Production Function for Cognitive Achievement." *Economic Journal* 113(485): F3–F33.

Urquiola, Miguel, and Eric A. Verhoogen. 2007. "Class Size and Sorting in Market Equilibrium: Theory and Evidence." Working Paper 13303. Cambridge, Mass.: National Bureau of Economic Research.

Valenzuela, Juan Pablo, Cristian Bellei, and Danae de los Rios. 2008. "Evolución de la segregación socioeconómica de los estudiantes chilenos y su relación con el financiamiento compartido." Santiago: Fondo de Investigación y Desarrollo en Educación.