

The Social Cost of Open Enrollment as a School Choice Policy

Cory Koedel
University of Missouri

Julian R. Betts
University of California, San Diego and NBER

Lorien A. Rice
Mills College

Andrew C. Zau*
University of California, San Diego

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We evaluate the integrating and segregating effects of school choice in a large, urban U.S. school district. Our findings suggest that open enrollment, a school-choice program without explicit integrative objectives which does not provide busing, segregates students along three socioeconomic dimensions – race/ethnicity, student achievement and parental-education status. Using information on expenditures to promote integration at the district, we back out estimates of the social cost of open enrollment realized in terms of student segregation. Our estimates vary widely depending on several assumptions, but a social-cost estimate of roughly 10 million dollars per year is on the high end of our range of estimates for this single district. Although this number represents a sizeable portion of the district's integrative-busing budget, it is a small fraction of the district's total budget (≈ 1.4 billion dollars). Further, we note that this cost may be offset by benefits not related to integration.

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While much of the recent attention devoted to school choice in the United States has focused on the achievement-based benefits to student movers (e.g., Cullen, Jacob and Levitt, 2006; Angrist et al., 2002; Levin 1998), the historical roots of school choice lie in integrative reforms dating back to the civil rights movement.¹ Today, the persistence of residential segregation across the country suggests that school choice continues to be important as an integrative tool.

There are many reasons to expect society to value the integration of school-aged children. For one, it may reduce market inefficiencies resulting from discriminatory behavior later in life, particularly in diverse societies such as the United States.² Integration will also improve equity because there are large differences in school quality across segregated neighborhoods. However, despite these potential benefits, there is some argument as to whether anyone actually values integration, with research showing that both blacks and whites have a taste for segregation (for example, see King and Mieszkowski, 1973). But the bulk of the empirical evidence indicates that segregation is driven predominantly by white preferences, not black preferences (see, for example, Yinger, 1978; Cutler et al., 1999; Ihlanfeldt and Scafidi, 2002). This suggests that disadvantaged groups may be segregated unwillingly, at least to some degree, indicating a modern role for integrative school-choice policy.

Many school districts operate school-choice programs with explicit integrating objectives, or at the least, with operating structures designed to elicit integrative student movement. And while many of these programs originated from court orders to desegregate, they are often voluntarily continued by districts, at their own expense, even after court supervision is

¹ For recent studies looking at integration reform around the desegregation era, see Guryan (2004) and Cascio et al. (2008).

² There is considerable evidence that discriminatory behavior continues to persist in the modern economy. See, for example Antonovics and Knight (2009) and Holzer and Ihlanfeldt (1998).

lifted. This is the case in the San Diego Unified School District (SDUSD), where two integrative school-choice programs, the Voluntary Ethnic Enrollment Program (VEEP) and the magnet program, continue to operate to this day despite the fact that court supervision ended in San Diego in the late 1990s.³

The VEEP program was originally designed with the goal of mixing students to make within-school student populations more representative of the district's overall racial diversity.⁴ It originated as part of the district's response to the 1977 *Carlin v. Board of Education* decision, where the California Supreme Court determined that 23 San Diego schools were racially segregated and ordered the district to integrate them. After California passed Proposition 209 in 1996, it became illegal to provide programs that gave racial preferences. The VEEP program continued, but took a broader view of integration, focusing on economic disadvantage. District-provided busing is available to students who participate in the VEEP program, and the busing pattern is designed to move students between less affluent and more affluent neighborhoods. Schools in less affluent areas are matched to schools in more affluent, predominantly white areas, in what are called allied patterns. Although any student of any race can apply to attend any school in the VEEP busing pattern, the pattern is such that student-movement through the VEEP program should have an integrating effect on the district.

The magnet program was also part of the district's response to the 1977 court decision, and it was also designed with integration as an explicit objective. At its inception, the magnet program typically sought to attract students from primarily white to primarily non-white areas by offering specialized curricula and additional resources. A few magnets were established in relatively affluent areas in the hope of attracting students from less affluent areas. Similarly to

³ Since that time the VEEP program has been renamed to the Voluntary Enrollment Exchange Program.

⁴ For more details on each program, see Zau and Betts (2005).

VEEP, transportation is provided by the district for magnet students. Again, while any student can apply to any magnet school, the design of the magnet program is such that it should also integrate the district.

In addition to these two integrative programs, SDUSD also participates in the statewide open-enrollment program (referred to as “Choice” in California), which began in the 1990s. The open-enrollment program places no restrictions on student movement, conditional on space availability, and like other open-enrollment programs nationwide, students are responsible for their own transportation.⁵ The expected effect of the open-enrollment program on district-wide integration is unclear *ex ante*. On the one hand, participants in this program may be more likely to come from families whose residential-location options are limited financially. Students from these families could use the open-enrollment program to attend more desirable schools. To the extent that this is the case, it should increase integration district-wide as disadvantaged students relocate to schools in more advantaged neighborhoods. However, participation in the open-enrollment program may be constrained by transportation costs and time costs for some families because the program does not provide busing. If these costs deter disadvantaged families from participating and only students from relatively advantaged families change schools using the open-enrollment program, it could segregate the district.

We consider the effects of these three school choice programs on integration by race, student achievement and parental education levels.⁶ Race is often the focal point of integration-

⁵ The lack of structure to these programs generally makes large-scale busing infeasible, and most open-enrollment programs do not provide busing. One notable exception is Seattle Public Schools, which offers a limited form of open-enrollment with busing.

⁶ Another dimension of integration relevant to San Diego is English-Learner status. However, our social cost estimates are more likely to be externally valid if we do not factor in the integration of English Learners, who make up a much larger share of the San Diego student population than is seen in most other school districts.

based school choice policy, but the latter two measures also inform the integration debate.⁷ For example, if the provision of equity in education is an objective of school choice policy, student mixing along non-race dimensions will provide important information about whether school choice programs are successful in this way.

One overarching theme in our analysis is that students use all three choice programs to attend schools that are more socioeconomically advantaged than their local schools. Therefore, participation by minority and disadvantaged students exerts integrating pressure on the district, and participation by advantaged students, who are also seeking to improve the socioeconomic status of their peers, exerts *segregating* pressure. Not surprisingly, the VEEP and magnet programs integrate SDUSD by race. They also integrate the district by student achievement and parental-education status. Alternatively, the open-enrollment program segregates students across all three dimensions of integration that we consider.⁸

The open-enrollment program is generally viewed as costless because it does not provide busing, which means that accounting costs are near zero. However, the segregating effects of open enrollment imply a social cost as evidenced by district expenditures to promote integration. The simultaneous presence of the two integrating programs, and the segregating open-enrollment program, provides a unique opportunity to estimate this social cost. To do this, we first construct ratios of the segregating effects of the open enrollment program to the integrating effects of the VEEP and magnet programs. These ratios measure how much of the integration generated by the VEEP and magnet programs is “undone” by open enrollment. We then multiply these ratios by district expenditures on busing for the integrative programs, deemed “integration”

⁷ For example, Reback (2008) shows that test-score performance has non-negligible effects on the demand for school choice across districts and Jacob and Lefgren (2007) show that low-income parents strongly value student achievement when making requests for individual teachers in elementary schools.

⁸ Bifulco, Ladd and Ross (2009) provide similar evidence from Durham, North Carolina, showing that advantaged students use open-enrollment programs to segregate themselves from disadvantaged students.

expenditures in the district budget, to attach a dollar cost to the segregating effects of open enrollment (busing is the dominant accounting cost associated with the VEEP and magnet programs).

Depending on the relative weights placed on the different aspects of integration, our social-cost estimates range from \$387,000 to \$10.45 million per year, or between 2.4 and 65.3 percent of the annual budget allocated to integration-based transportation at SDUSD (all estimates are in 1999-2000 dollars). The wide range of estimates is the result of uncertainty over the valuations assigned to the different dimensions of integration. However, even at the high end, our estimate is small compared to the district's overall budget, which was roughly 1.4 billion dollars during the 1999-2000 school year.

We acknowledge several limitations in interpreting our social-cost estimates. First, our estimates are contextual. In addition to depending on the urban environment in San Diego, we also cannot observe the integrating or segregating effects of any of the school-choice programs in isolation. Thus, our estimates will be most relevant for open-enrollment programs in urban districts that operate in conjunction with other, integrative programs.

A second limitation is that we cannot observe *why* the SDUSD school board, which is democratically elected, continues to voluntarily operate the VEEP and magnet programs. Taking the district budget at face value, where the transportation expenditures associated with the VEEP and magnet programs are specifically referred to as "integration" expenditures, the integrative effects of the programs seem important. However, the VEEP and magnet programs may also offer other benefits, such as providing opportunities to students regardless of any integrative gains. Our social-cost estimates are most straightforward to interpret if the programs are operated entirely because of their integrative benefits, in which case the expenditures on VEEP

and magnet can be interpreted as a measure of societal willingness-to-pay for integration. If the VEEP and magnet programs are funded in part because they offer other benefits, our social-cost estimates will be overstated. We consider this possibility briefly when we present our results.⁹

Finally, we are unable to observe students' entire choice sets. From our data we observe students' choice sets within the public system given their current residential locations – that is, we observe each student's assigned local school, and his or her public school choice options. However, we cannot observe the portions of students' choice sets that involve Tiebout choice or public-private choice. In our analysis, we measure the integrative effects of the school choice programs by comparing the existing levels of integration in the district to the levels of integration that would occur if all students were returned to their assigned local schools. Clearly, students' local-school assignments are an imperfect indication of where they would go in the absence of the school choice programs. Nonetheless, the local-school assignments should provide a reasonable approximation if students participate in Tiebout and public-private choice much less than in the district-provided choice programs, which is plausible given that it is considerably more expensive to participate in Tiebout and public-private choice.¹⁰

I. Data and Program Mechanics

The data are based on applications to the three school choice programs at SDUSD for fall 2001, submitted to the district during the 2000-2001 school year. Across the district, roughly one in five students participates in one of these three programs. Our dataset includes basic demographic information about each student, including information on race, gender, parental education and English-learner status; as well as test-score achievement (from the Stanford 9

⁹ Another possibility is that the VEEP and magnet programs are maintained partly because of political inertia – that is, despite court supervision being lifted, they simply persist. We note that the inertia would have to be quite strong if this explanation were correct given that court supervision was lifted in the late 1990s and the programs still persist.

¹⁰ Brunner and Imazeki (2008) and Ferreyra (2007) provide recent evidence suggesting that Tiebout choice may be important, but it is difficult to infer how much Tiebout choice might substitute for the choice programs in our study.

exam, when available) and student-level information on activity in the choice programs. Specifically, we know how each student acted on each available option in each school choice program. We also have detailed data from each school in the district which we use to assemble information on their student-body compositions. This facilitates comparisons between each student's local school and choice options. It also allows us to evaluate the integrative effects of school choice relative to the counterfactual where the school-choice programs did not result in any student movement, and all students instead attended their local public schools.

In each school-choice program, students' applications to relocate to option schools are accepted based on space availability. If a school receives more applications than it has spaces available in a given grade, administrators hold a lottery to allocate the school-choice slots. These lotteries are based on random-number assignments conditional on priority groups. Priority groups depend on whether the student has a sibling who already attends the option school, the time of year in which the application was made (before or after the deadline), and whether the student is transferring from another school within SDUSD or (rarely) from outside. The magnet program also gives preference to "continuity" applications (i.e., the student is making the transition from elementary to middle or from middle to high school, and was already attending a magnet school with a similar curricular theme). In addition to the above priority groups, the magnet program uses geographic clusters to determine program admittance. The district is divided into four clusters that differ by socioeconomic makeup. The clusters are ranked from one to four for each magnet such that top priority is given to the cluster that least resembles that magnet. For some magnet schools, applications are processed in strict order by cluster and then, within-cluster, by priority group. For others, fixed percentages of admittees must be accepted

from each cluster.¹¹ We omit continuity applications and applications made from outside of the district in our analysis. Student movement resulting from the former can be attributed to prior choice-program activities, and out-of-district applications are given such low priority that almost none are accepted.

Appendix A describes the initial universe of choice applications and our final dataset. We exclude applications from our final dataset for several reasons in addition to those discussed above. First, we omit applications for kindergarten because we do not have demographic data for these students. We also exclude applications to the sixth grade because the choice set is extremely complex for these students, with some attending K-6 elementary schools and most attending K-5 schools. Unlike students in any other grade, students entering the sixth grade are unique in that they can use school choice to alter their schooling structures. Additionally, we do not use some applications because they are missing basic demographic or application data. We ultimately use about half of the total number of applications for each program in our analysis. Of the omitted applications, roughly three in five are omitted because they are for kindergarten or the sixth grade, and two in five for other reasons. The proportions of dropped applications for kindergarten versus the sixth grade are roughly reversed in VEEP relative to the magnet and open-enrollment programs. However, beyond this difference, Appendix Table A.1 shows that the patterns of missing applications across the three programs are very similar.

Clearly, our data represent a non-random subsample of the universe of applications. However, because our analysis is entirely comparative, we only require that the integrative effects implied by the missing applications in each program are proportional to what we observe in the data. Formally, defining INT_x^{obs} and INT_x^{unobs} as the integrative effects implied by the

¹¹ Note, however, that within any given school all applicants are treated equally regardless of race or ethnicity. Priority depends on cluster-wide differences between the local and magnet schools.

observed and unobserved student movers in each program, where $x = \text{VEEP}$, magnet or open enrollment, we assume:

$$(1) \quad \frac{INT_{VEEP}^{obs}}{INT_{VEEP}^{unobs}} = \frac{INT_{magnet}^{obs}}{INT_{magnet}^{unobs}} = \frac{INT_{open-enrollment}^{obs}}{INT_{open-enrollment}^{unobs}}$$

In the appendix we show that given (1), our data subsample is sufficient for our comparative social-cost calculations.

II. The Demand for School Choice

Table 1 shows the mean percentage-point difference in the racial/ethnic makeup between the schools that are applied to and the local schools of applicants for all applications, by race. For instance, the first row in the second column of the table shows the average difference in the percentage of white students between the choice and local schools of black applicants to the VEEP program. The extent to which choice programs have the potential to integrate the district depends on the degree to which the diagonal entries of a given panel are negative and the off-diagonal entries are positive. The table clearly shows that all students use the choice programs to apply to schools where a higher percentage of students are white.

School-choice participants similarly use the choice programs to improve the socioeconomic status of their peers as measured by student achievement and parental education. For our student-achievement analysis, we identify students as either above- or below-median performers based on their combined math and reading scores from the Stanford 9 exam, and evaluate student mixing among these two groups. For the parental-education analysis there is a large population of students for whom we do not have parental-education information.¹² We designate parental education as “high” if at least one parent attended some college, “low” if no parent has attended any college and “unknown” if the data are unavailable. We measure

¹² One reason is that parental education is not input into the data system until students are tested, which does not occur until the second grade. However, this does not explain all of the missing data.

integration among all three groups but focus on the integration of students whose parents are designated as having “high” and “low” parental education levels. Integration by student achievement and parental education may be of particular importance given the 2007 Supreme Court rejection of race-based preferences in school assignment decisions in Seattle and Louisville. In this case, Justice Anthony M. Kennedy suggested that districts may want to place greater emphasis on promoting integration along socioeconomic rather than racial lines.

Across all three dimensions of integration, students use the choice programs to attend schools at which students are more socioeconomically advantaged.¹³ As mentioned above, this means that participation by disadvantaged students should increase integration across the district but participation by advantaged students will further segregate students.

Participation by minority and disadvantaged students is much higher in the VEEP and magnet programs than in the open-enrollment program. We highlight these participation differences by comparing the shares of students participating in the choice programs to the shares of students in the district for each relevant group in Table 2. Minority and disadvantaged students are consistently over-represented in VEEP, (roughly) fairly-represented in magnet, and under-represented in open enrollment. This under-representation is interesting because disadvantaged students should be more likely to participate in school choice based on the evidence presented here that students use choice programs to improve the socioeconomic standing of their peers. Put differently, advantaged students are more likely to come from families that participate in the “primary” school-choice market – the housing market.

¹³ Tables analogous to Table 1 broken down by student achievement and parental education are available from the authors upon request. We do not have test-score data for all students. We use just the fraction of our student sample for whom we have test scores in this portion of our analysis.

Conversely, disadvantaged students should depend more heavily on the “secondary market”, operating through the district provided school-choice programs.¹⁴

III. Effects of School Choice on Integration

We measure the integrative effects of the choice programs using exposure indices. As an example, consider the exposure of black to white students in the district. An exposure index reports, for the typical black student in the district, the proportion of students in his or her school who are white. The formula for such an index is:

$$(2) \quad \sum_j \left(\frac{x_j}{X} \right) * \left(\frac{y_j}{t_j} \right)$$

In (2), x_j is the number of black students at school j , X is the total number of black students in the district, y_j is the number of white students at school j and t_j is the total population at school j . Thus, the exposure index is a weighted average of the proportion of students who are white at each school with the schools’ shares of the overall black population serving as the weights.

We compare the actual district-wide exposure indices to counterfactual indices that we calculate by “undoing” all of the student movement associated with the 2000-2001 applicants to the school choice programs, and returning these students to their local public schools. We interpret the differences between actual student integration and our counterfactuals as the single-year effects of the school-choice programs, again noting that we cannot observe Tiebout or public-private choice.¹⁵

¹⁴ Supply constraints in the school choice programs also affect participation. See Koedel et al. (2009) for more information.

¹⁵ As discussed in Section I and Appendix A, our exposure-index calculations are based on a subsample of the total application pool. The omitted applications should not be problematic for comparisons across programs; however, they will result in an understatement of the net single-year effects of the school choice programs.

Figure 1 shows results from our exposure-index calculations along each dimension of integration. In each case we show the net change in exposure resulting from the combination of all programs and the change in exposure attributable to each program individually. Figure 1 focuses on exposure to the group that is the most sought after in each case – the most socioeconomically advantaged. Tables 3 and 4 provide the numerical details for all of our exposure-index calculations.

The first panel of Figure 1 shows that the VEEP and magnet programs increase the exposure of whites to non-whites, and vice-versa. (We can sum the exposure of whites across racial groups to infer changes in exposure of whites to non-whites.) The open-enrollment program increases the exposure of whites to Asians but segregates whites from blacks and Hispanics. Notably, Asian students at SDUSD are much less likely to be disadvantaged than other non-white groups. While the VEEP and magnet programs integrate disadvantaged minorities with advantaged groups, the open-enrollment program is counterproductive in this sense.

The second panel of Figure 1 shows district-wide changes in exposure based on student achievement. Again, the VEEP and magnet programs apply integrating pressure along this dimension and the open-enrollment program segregates above- and below-median performers. Dominated by the negative effect of the open-enrollment program, the overall effect of all three programs on integration by student achievement is *negative*.

The third panel of the figure shows integration by parental-education levels, with the integrating and segregating effects of the three programs mirroring those found in the race and student-achievement analyses. The parental-education exposure indices are somewhat clouded by the ambiguity surrounding the “unknown” parental education group. Figure 1 shows that

integration between parental-education groups consists mostly of integration between students designated as having high parental education and students whose parental-education status is unknown. Looking specifically at the change in exposure between students from high and low parental education families, the effects of the choice programs seem fairly mild and again, the open-enrollment program applies segregating pressure.

IV. The Social Cost of Open Enrollment

Figure 1, and the corresponding Tables 3 and 4, imply a social cost of open enrollment. Namely, the open-enrollment program segregates advantaged and disadvantaged students. Interpreting the voluntary and continued funding of the VEEP and magnet programs as an indication of society's willingness-to-pay for integration, we use district expenditures on these programs to estimate the social cost, in dollars, of the segregation generated by open enrollment in San Diego.

Our calculations require that we estimate the quantity of integration purchased by the district for the price observed in the budget. Our exposure-index calculations from the previous section are helpful here, but imperfect because they are based on a single-year snapshot of the effects of the three programs. That is, they measure integration *flows* whereas district expenditures on VEEP and magnet are used to purchase integration *stocks*. In order for our flow-based integrative measures to be useful, it must be the case that the integrative effects of the VEEP, magnet and open-enrollment programs, measured in flows, are proportional to their respective effects on integration stocks. It is these stocks of integration that the district is purchasing through its operation of the VEEP and magnet programs.

The key assumption that we require in our analysis is detailed in equation (3). Namely, the ratio of the segregating effect of the open-enrollment program to the integrating effects of the

VEEP and magnet programs, measured in *flows*, must be approximately equal to the ratio of the effects of these programs on integration *stocks*. That is:

$$(3) \quad \frac{INT_o^F}{INT_v^F + INT_m^F} \approx \frac{INT_o^S}{INT_v^S + INT_m^S}$$

The subscripts on each term in (3) indicate the choice program (VEEP, magnet or open-enrollment). The superscript “*F*” denotes a flow effect and the superscript “*S*” denotes a stock effect, where by flow we mean the one-year change in integration driven by our cohort of study and by stock we mean the net integration in a given year that has resulted from all of the student movement from this and previous cohorts in each program. For example, INT_o^F is the integrating effect of the open-enrollment program along some dimension, such as the change in black-white exposure, measured as a “flow”, calculated using the exposure-index change generated by movements from one year of applications. This flow will be negative when the program segregates students.

Intuitively, the approximate equality in (3) will hold if relative student movement across the school-choice programs in our cohort is similar to that of prior cohorts. This requires that two conditions be met. First, our observed cohort must be similar to other cohorts in demographics and school-choice preferences. Given the size of each cohort at SDUSD, where the student population exceeds 140,000, this seems reasonable. Second, student movement via the school-choice programs in our observed cohort must be supply-side constrained similarly to other cohorts. There are two issues to consider here. First, the relative magnitudes of flows across the three programs for the cohort for which we have data should reflect the respective program sizes in the district, which we address below (see Equation (4)). Second, the distribution of available choice slots within each program faced by our cohort of applicants

should roughly mirror the district-wide distribution of active slots within each program. This condition would be violated if, for example, previous cohorts assumed the most desirable school-choice slots prior to program entry for our observed cohort. In this case, our observed cohort would only be active in the choice programs along the fringes of what was left over by previous cohorts, and there would be a disconnect between the ratio of integration-flow effects and the corresponding ratio of integration-stock effects.

Although we do not have the data to empirically investigate this possibility, it seems unlikely for three reasons.¹⁶ First, because the schooling process is finite, even if some of the early entrants into the school-choice programs took the most desirable slots, these students would not retain these slots indefinitely – they would graduate, and/or move on from elementary to middle school, or from middle school to high school. Given a perpetual line of exiting school-choice participants, particularly desirable slots that were absorbed by previous cohorts should continually become available. Second, heterogeneity in preferences among students and parents over choice schools as documented by Betts et al. (2006) and Glazerman (1997) calls into question the existence of a set of “clearly preferred” school-choice slots. Third, because the three choice programs have existed for several decades, the system is roughly in equilibrium, meaning that there has not been a radical departure from typical enrollment patterns in recent years.

If we can plausibly rule out differential supply-side constraints in the within-program distributions of available slots, it is straightforward to adjust equation (3) to ensure that our relative flow magnitudes are representative of the relative stock magnitudes for each of the three choice programs. Zau and Betts (2005) report that roughly 6.4, 6.2 and 6.6 percent of the

¹⁶ In principle we could investigate the distribution of available slots in our cohort and compare it to the distribution of slots among all current participants. However, because we do not have reliable data on students’ local schools outside of our cohort of study we cannot determine what options were available to these students.

SDUSD population was actively participating in the VEEP, magnet and open-enrollment programs in the fall of 2001, respectively. We denote these participation stock percentages by P_V^S , P_M^S , and P_O^S . We convert these to the total numbers of participants, or stocks, in each of the three programs by multiplying each by $T/100$ where T is the total enrollment in the district. We adjust our flow-effect estimates for the VEEP, magnet and open-enrollment programs to equate them in relative magnitudes with observed stocks in (4):

$$(4) \quad \frac{INT_o^F \left(\frac{P_O^S (T / 100)}{N_O^F} \right)}{INT_v^F \left(\frac{P_V^S (T / 100)}{N_V^F} \right) + INT_m^F \left(\frac{P_M^S (T / 100)}{N_M^F} \right)} \approx \frac{INT_o^S}{INT_v^S + INT_m^S}$$

Here, N_x^F , where $x=O, V, M$, represents the numbers of observed movers in each of the three choice programs in our data for this single cohort. In words, the left-hand side of (4) scales up each integration-flow effect by the ratio of total participation in the given program to observed movers into the given program in our data (for VEEP, magnet and open-enrollment, the respective scaling factors in equation (4) are approximately 17.15, 11.69 and 14.55). The assumption implicit in this weighting formula is that students who joined the choice programs in prior years proportionally affected integration in the same way as those entering in the fall of 2001.

The social cost of open-enrollment measured along any dimension of integration can be estimated by multiplying the ratio on the left-hand side by the district's combined expenditures on the VEEP and magnet programs. If the ratio is negative, it suggests a social cost and if it is positive (which does not occur here), it suggests a benefit in the sense that the open-enrollment program is providing "free" integration to the district.

Our estimate of VEEP and magnet expenditures comes from SDUSD’s Information Report for Student Transportation Services for the 1999-2000 school year, presented to the board of education in June of 2001. The report indicates that the district spent \$16 million on transportation for the VEEP and magnet programs in 1999-2000.¹⁷ That is, the cost of maintaining the integration *stocks* supported by the VEEP and magnet programs is roughly \$16 million per year, measured in 1999-2000 dollars. We combine our estimates of equation (4) with this cost information to calculate the social cost of open enrollment.

Our initial calculations assume that the district is only interested in racial integration, and in particular, the integration of whites with black and Hispanic students. This assumption follows most directly from the original integrative objectives of the VEEP and magnet programs. We assume the district is equally interested in integrating whites with blacks and Hispanics, meaning that we assign equal weight to white-black and white-Hispanic integration in the district. An alternative would be to re-assign black and Hispanic students as “disadvantaged minorities” and calculate new exposure indices; however, in this case the integrative effects for the much larger Hispanic population at SDUSD would dominate the integrative effects for black students.

Equation (5) illustrates our cost calculation based only on racial-integration effects. The flow-effect estimates are obtained from the upper-left panel of Table 3:

$$(5) \quad C = \left[\frac{1}{2} * (\$16mil) * \left(\frac{0.00007 * (14.55)}{0.00081 * (17.15) + 0.00061 * (11.69)} \right) + \frac{1}{2} * (\$16mil) * \left(\frac{0.00001 * (14.55)}{0.00299 * (17.15) + 0.00060 * (11.69)} \right) \right]$$

$$= \left[\frac{1}{2} * (\$16mil) * (0.046) + \frac{1}{2} * (\$16mil) * (0.003) \right]$$

¹⁷ Expenditure data specific to the VEEP and magnet programs could only be obtained from operations for the 1999-2000 school year. As long as the approximate equality in (3) holds across years, any year of expenditure data will be sufficient to calculate social cost. It is helpful that this estimate is from a year very close to the year from which we obtain our integration-flow measures (applications for fall 2001).

= \$387,000

The first term in (5) represents the social cost of open enrollment in terms of segregating black and white students, approximately \$364,000, and the second term the social cost in terms of segregating Hispanic and white students, approximately \$23,000.¹⁸ This implies a total cost of roughly \$387,000 per year, or 2.4 percent of the transportation budget allocated to promote integration at SDUSD.

Our cost estimate skyrockets if we assume that the district also cares about integration based on other socioeconomic characteristics, primarily because the segregating effects of the open-enrollment program are much larger along the other dimensions. For simplicity, consider the case where the district equally values integration by race, student-achievement, and parental education.¹⁹ If we assign weights of one-sixth each for white-black and white-Hispanic integration (for a one-third total weight on racial integration) and one-third each to integration by student achievement and parental-education status, the costs of the open-enrollment program calculated analogously to equation (5) are \$129,000 for racial segregation, \$9.16 million for student-achievement segregation and \$1.16 million for parental-education segregation. That is, a total cost of approximately \$10.45 million dollars.

The appropriate social cost measure probably lies somewhere in between the estimates of \$387,000 and \$10.45 million. On the one hand, it is unlikely that the district cares only about racial integration as race is often used as a proxy measure for social disadvantage more generally. On the other, given that the VEEP and magnet programs were specifically designed in the spirit of racial integration, it is also unlikely that equal value should be placed on all three

¹⁸ For illustrative purposes we show equation (4) using the flow-effect estimates as reported in Table 3; however, the entries in Table 3 are rounded such that equation (4) does not exactly produce our cost estimate of \$387,000, which we obtain using the unrounded flow-effect estimates.

¹⁹ We evaluate integration only between students designated as having high and low parental-education in these calculations.

integrative measures. Note that even small weights on the non-race measures of integration quickly amplify the implied social cost of the open-enrollment program. However, even at the high end, our social-cost estimates represent only a small fraction of the district's total budget, which was roughly 1.4 billion dollars for the 1999-2000 school year.

Finally, recall from the introduction that there are two reasons our estimates may overstate the social costs of open enrollment. First, district expenditures on VEEP and magnet may over-estimate society's willingness-to-pay for integration. This would be the case if these programs were maintained for non-integrative reasons like providing opportunities for disadvantaged students, or if they persist simply because of political inertia. Although we do not have the data to make strong claims about the plausibility of these alternative scenarios, it would be straightforward to deflate our estimates to be consistent with a world in which these factors are partly responsible for SDUSD's continued support of the VEEP and magnet programs. For example, if only half of the "integration" expenditures in the budget are truly indicative of a willingness-to-pay for integration, our cost estimates could be cut in half.

The second issue that could lead us to overstate social costs is that we do not observe alternate forms of school choice like Tiebout Choice or choice on the public-private margin. Here it is less clear how to adjust our estimates. Ultimately, while we are probably slightly overstating the segregating effects of open enrollment because of our inability to observe these alternate forms of school choice, we expect our counterfactual assignments of individuals to their local public schools to be fairly accurate.²⁰

²⁰ Our use of an observed payment as a measure of willingness-to-pay could also lead us to *understate* social costs. As an analogy, consider a consumer's purchase of good X for \$Y. By observing the purchase, we know the consumer was willing to pay *at least* \$Y, but we generally expect the consumer's true valuation to exceed \$Y. It is possible that the integrative benefits generated by the VEEP and magnet programs are worth more to the district than the required expenditures.

V. Conclusion

Students (and their families) use school choice programs to improve the socioeconomic standing of their peers. We observe that applicants use the choice programs to attend schools that have a higher proportion of white students, above-median test score performers and more students with highly educated parents. Because all participants use school choice programs to attend schools with more socioeconomically advantaged peers, participation by disadvantaged students tends to increase integration while participation by advantaged students applies segregating pressure.

Of the three school-choice programs in place in San Diego, the open-enrollment program is the only one that segregates the school district. Direct expenditures by SDUSD aimed at increasing integration suggest a social cost of open enrollment, realized in terms of student segregation. We provide estimates of this cost that depend on the relative valuations of integration along the three dimensions that we consider. Our most conservative estimate, which focuses solely on the segregating effects as measured by race/ethnicity and ignores the segregating effects as measured by student achievement and parental education status, implies that the open-enrollment program in San Diego has a social cost of \$387,000. At the high end, our analysis suggests a social cost of approximately \$10.45 million. Even this figure is fairly small when compared to the overall district budget. We also note that our treatment of school choice as a mechanism to promote integration ignores other issues, and benefits, that would merit attention in any careful cost-benefit analysis.²¹

²¹ The evidence on the benefits of school choice is mixed. Betts et al. (2006) find no consistent evidence of achievement gains for school-choice lottery winners in San Diego, with the exception of positive math effects at magnet high schools. Cullen, Jacob and Levitt (2006) also find little evidence that choice participants benefit from school changes and find that in some ways these students perform worse. Alternatively, Angrist et al. (2002) find positive school-choice effects. Despite the ambiguity in the literature, the queues of families lining up to participate in school-choice programs across the country suggest that there are benefits even if they have not been consistently identified by the research community.

Finally, we conclude by reminding the reader that the estimates presented here are contextual. We cannot tell whether the open-enrollment program would segregate the district in the absence of the VEEP and magnet programs, because we do not observe student behavior in the absence of these other programs. However, it is certainly possible, and even likely, that if the VEEP and magnet programs were discontinued some participants in these programs would choose to participate in open-enrollment. Depending on which types of students would use open-enrollment, this could increase or decrease the program's segregating effects. Perhaps this analysis is best viewed within the context of a multi-pronged school-choice system that includes busing programs. It seems clear that under these circumstances, open-enrollment will undo some of the integration created by these busing programs and in this way its true costs will exceed its simple accounting costs.

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Figure 1. Changes in actual exposure generated by the choice programs.

Note: The Choice program refers to the open enrollment program.

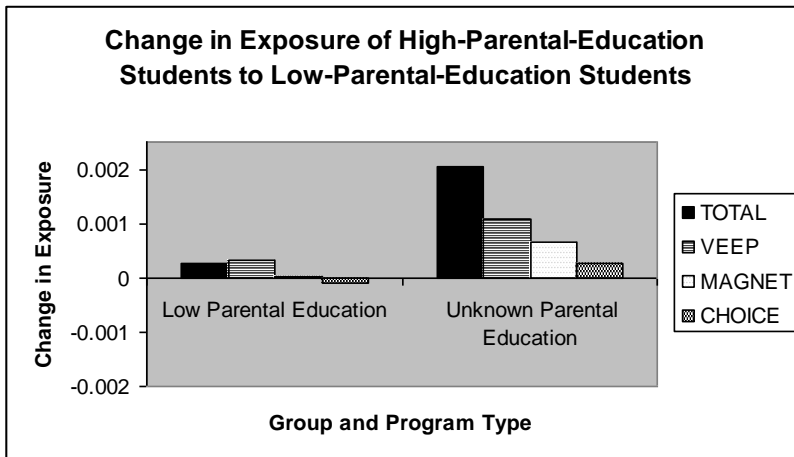
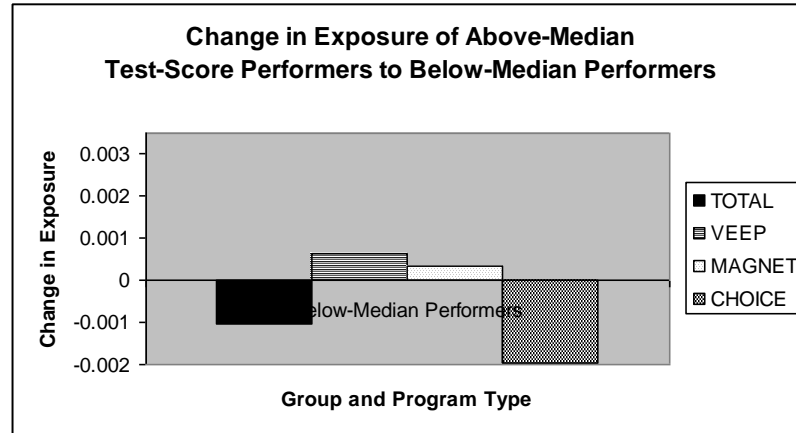
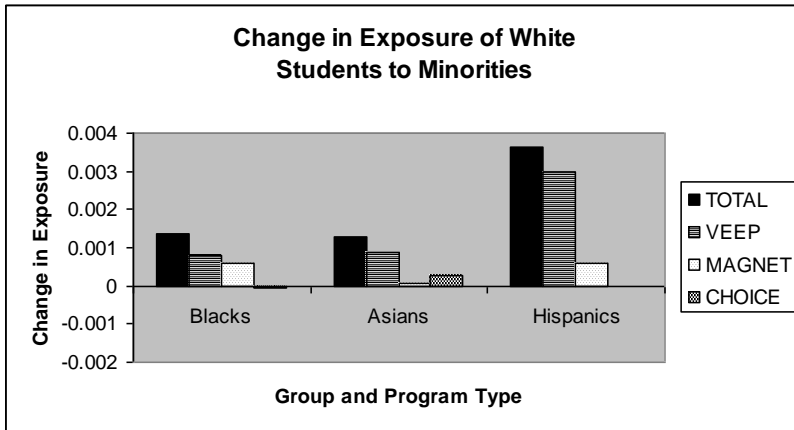


Table 1. Average Percentage Point Differences in the Racial/Ethnic Makeup at Option and Local Schools, as Implied by Application Data, by Applicant's Race and Program Type.

| | <u>Applicant's Own Race</u> | | | |
|---------------------------|-----------------------------|--------------|--------------|-----------------|
| | <u>White</u> | <u>Black</u> | <u>Asian</u> | <u>Hispanic</u> |
| <u>VEEP</u> | | | | |
| % White Diff | 38.3 | 41.6 | 39.6 | 38.8 |
| % Black Diff | -12.2 | -19.4 | -11.4 | -11.4 |
| % Asian/Pac Islander Diff | -5.9 | -5.5 | -12.3 | 0.4 |
| % Hispanic Diff | -21.1 | -16.9 | -16.8 | -28.1 |
| Number of Applications | 149 | 710 | 347 | 1696 |
| <u>Magnet</u> | | | | |
| % White Diff | 1.4 | 12.4 | 10.9 | 14.8 |
| % Black Diff | 5.6 | -3.6 | -1.6 | -2.0 |
| % Asian/Pac Islander Diff | -3.8 | -3.9 | -6.4 | -2.4 |
| % Hispanic Diff | -4.1 | -5.5 | -3.6 | -11.3 |
| Number of Applications | 897 | 1512 | 520 | 1634 |
| <u>Open-Enrollment</u> | | | | |
| % White Diff | 10.8 | 10.2 | 13.4 | 11.3 |
| % Black Diff | -3.0 | -5.4 | -2.9 | -3.0 |
| % Asian/Pac Islander Diff | -1.6 | -3.5 | -4.8 | -2.9 |
| % Hispanic Diff | -6.5 | -1.4 | -5.9 | -5.5 |
| Number of Applications | 1486 | 881 | 620 | 1355 |

Table 2. Application Shares Relative to District-wide Population Shares, by Program and Group

| | <u>Race</u> | | | | <u>Test-Score Achievement</u> | | <u>Parental Education</u> | | |
|---------------------------|--------------|--------------|--------------|-----------------|-------------------------------|---------------------|---------------------------|------------|----------------|
| | <u>White</u> | <u>Black</u> | <u>Asian</u> | <u>Hispanic</u> | <u>Above-Median</u> | <u>Below-Median</u> | <u>High</u> | <u>Low</u> | <u>Unknown</u> |
| Share of SDUSD Population | 0.27 | 0.16 | 0.18 | 0.38 | 0.50 | 0.50 | 0.27 | 0.19 | 0.54 |
| <u>VEEP</u> | | | | | | | | | |
| Share of Applications* | 0.05 | 0.24 | 0.12 | 0.58 | 0.35 | 0.65 | 0.18 | 0.25 | 0.57 |
| Total Applications | 149 | 710 | 347 | 1696 | 833 | 1575 | 532 | 717 | 1663 |
| <u>Magnet</u> | | | | | | | | | |
| Share of Applications* | 0.19 | 0.33 | 0.11 | 0.35 | 0.46 | 0.54 | 0.29 | 0.16 | 0.55 |
| Total Applications | 897 | 1512 | 520 | 1634 | 1690 | 1951 | 1324 | 731 | 2553 |
| <u>Open Enrollment</u> | | | | | | | | | |
| Share of Applications* | 0.34 | 0.20 | 0.14 | 0.31 | 0.57 | 0.43 | 0.32 | 0.14 | 0.55 |
| Total Applications | 1486 | 881 | 620 | 1355 | 1857 | 1421 | 1386 | 602 | 2400 |

*Note: we omit students who are not described by any of the racial/ethnic categories. Therefore, the “shares of applications” do not sum to 100 percent.

Table 3. District-Wide Exposure Indices by Race.

| Exposure Group | White Exposure | | | Black Exposure | | |
|--|------------------|------------------|---------------------|------------------|------------------|---------------------|
| | Whites to Blacks | Whites to Asians | Whites to Hispanics | Blacks to Whites | Blacks to Asians | Blacks to Hispanics |
| Actual exposure index for the district | 0.11364 | 0.16964 | 0.27614 | 0.19598 | 0.18199 | 0.37314 |
| Counterfactual exposure index if those who entered into option schools through any choice program had remained at their local school | 0.11228 | 0.16835 | 0.27252 | 0.19363 | 0.18342 | 0.37618 |
| Net effect on exposure index of all choice programs | 0.00136 | 0.00130 | 0.00362 | 0.00235 | -0.00143 | -0.00304 |
| Net effect on exposure index of all choice programs (Percent) | 1.21430 | 0.77092 | 1.32924 | 1.21430 | -0.77716 | -0.80773 |
| Net effect of VEEP Program | 0.00081 | 0.00089 | 0.00299 | 0.00140 | -0.00078 | -0.00203 |
| Net effect of VEEP Program (Percent) | 0.72415 | 0.52920 | 1.09661 | 0.72415 | -0.42263 | -0.53886 |
| Net effect of MAGNET Program | 0.00061 | 0.00009 | 0.00060 | 0.00105 | -0.00036 | -0.00053 |
| Net effect of MAGNET Program (Percent) | 0.54080 | 0.05139 | 0.21930 | 0.54080 | -0.19831 | -0.13967 |
| Net effect of OPEN ENROLLMENT | -0.00007 | 0.00028 | -0.00001 | -0.00013 | -0.00032 | -0.00055 |
| Net effect of OPEN ENROLLMENT (Percent) | -0.06555 | 0.16672 | -0.00481 | -0.06555 | -0.17260 | -0.14682 |

| Exposure Group | Asian Exposure | | | Hispanic Exposure | | |
|--|------------------|------------------|---------------------|---------------------|---------------------|---------------------|
| | Asians to Whites | Asians to Blacks | Asians to Hispanics | Hispanics to Whites | Hispanics to Blacks | Hispanics to Asians |
| Actual exposure index in the district | 0.24914 | 0.15498 | 0.27442 | 0.19432 | 0.15226 | 0.13149 |
| Counterfactual exposure index if those who entered into option schools through any choice program had remained at their local school | 0.24724 | 0.15619 | 0.27529 | 0.19177 | 0.15350 | 0.13191 |
| Net effect on exposure index of all choice programs | 0.00191 | -0.00121 | -0.00087 | 0.00255 | -0.00124 | -0.00041 |
| Net effect on exposure index of all choice programs (Percent) | 0.77092 | -0.77716 | -0.31437 | 1.32924 | -0.80773 | -0.31437 |
| Net effect of VEEP Program | 0.00131 | -0.00066 | -0.00030 | 0.00210 | -0.00083 | -0.00014 |
| Net effect of VEEP Program (Percent) | 0.52920 | -0.42263 | -0.10734 | 1.09661 | -0.53886 | -0.10734 |
| Net effect of MAGNET Program | 0.00013 | -0.00031 | -0.00035 | 0.00042 | -0.00021 | -0.00017 |
| Net effect of MAGNET Program (Percent) | 0.05139 | -0.19831 | -0.12678 | 0.21930 | -0.13967 | -0.12678 |
| Net effect of OPEN ENROLLMENT | 0.00041 | -0.00027 | -0.00028 | -0.00001 | -0.00023 | -0.00013 |
| Net effect of OPEN ENROLLMENT (Percent) | 0.16672 | -0.17260 | -0.10040 | -0.00481 | -0.14682 | -0.10040 |

Table 4. District-Wide Exposure Indices by Student Achievement and by Parental Education.

| Exposure | Above-Median Performers to Below-Median Performers | Parental Education: High to Low | Parental Education: High to Unknown |
|--|--|---------------------------------|-------------------------------------|
| Actual exposure index in the district | 0.41656 | 0.23631 | 0.21599 |
| Counterfactual exposure index if those who entered into option schools through any choice program had remained at their local school | 0.41758 | 0.23605 | 0.21394 |
| Net effect on exposure index of all choice programs | -0.00102 | 0.00026 | 0.00205 |
| Net effect on exposure index of all choice programs (Percent) | -0.24427 | 0.11054 | 0.95832 |
| | | | |
| Net effect of VEEP | 0.00062 | 0.00031 | 0.00109 |
| Net effect of VEEP (Percent) | 0.14848 | 0.13282 | 0.51136 |
| | | | |
| Net effect of MAGNET | 0.00035 | 0.00001 | 0.00064 |
| Net effect of MAGNET (Percent) | 0.083816 | 0.00477 | 0.30079 |
| | | | |
| Net effect of OPEN ENROLLMENT | -0.00195 | -0.00009 | 0.00026 |
| Net effect of OPEN ENROLLMENT (Percent) | -0.46673 | -0.03940 | 0.12316 |

Appendix A
Data Appendix

Many of the applications to the school choice programs are missing information that we require to make inference about the integrative effects of school choice and the underlying demand for school choice. We omit these applications from our analysis. Our largest data omissions come from applications to kindergarten and the sixth grade (see text for details). In addition to omitting these applications, we also omit applications where key information is not available, including basic demographics, local school assignments, or grade levels, among other things.

Our original dataset contains the universe of applications to the three choice programs submitted in the 2000-01 school year for participation in the fall of 2001-02 (excluding continuity applications). Table A.1 details the patterns of omitted applications that lead to our final dataset, which contains approximately 46.5 percent of the original universe of applications.

Table A.1. Data Omissions.

| | <u>VEEP</u> | | <u>Magnet</u> | | <u>Open-Enrollment</u> | |
|--|--------------|----------------|---------------|----------------|------------------------|----------------|
| | <u>Count</u> | <u>Percent</u> | <u>Count</u> | <u>Percent</u> | <u>Count</u> | <u>Percent</u> |
| Universe of Applications | 6453 | 100 | 9737 | 100 | 9401 | 100 |
| Application for Grade K | -636 | -9.9 | -1949 | -20.0 | -2093 | -22.3 |
| Application for Grade 6 | -1556 | -24.1 | -1039 | -10.7 | -1074 | -11.4 |
| Cannot determine current or next local school, and/or next grade | -687 | -10.7 | -931 | -9.5 | -1114 | -11.8 |
| Other application problems: missing information, omitted priority code, application error*, etc. | -662 | -10.3 | -1210 | -12.4 | -732 | -7.8 |
| Final Application Count | 2912 | 45.1 | 4608 | 47.3 | 4388 | 46.7 |

* For example, some VEEP applicants applied to schools that are not part of the busing pattern.

Although we omit a large number of applications from our analysis, the patterns of missing applications are consistent across the three choice programs (treating the omissions of grade-k and grade-6 applications as equivalent in cause). For the purpose of our relative comparison of the programs, it is this consistency across the three programs that is most important because it facilitates the assumption in equation (1) in the text. In words, equation (1) assumes that the ratio of the integrative flow effects of the included and omitted applications is constant across programs.

Algebraically, the assumption in equation (1) is sufficient for our calculations as long as the ratio of observed to unobserved moves is also constant across the three programs (Table A.1 suggests

that this is roughly the case).²² Returning to equation (4) from Section IV, we use our integration-flow estimates to calculate social costs based on the following ratio:

$$(A.1) \quad \frac{INT_o^F \left(\frac{P_o^S(T/100)}{N_o^F} \right)}{INT_v^F \left(\frac{P_v^S(T/100)}{N_v^F} \right) + INT_m^F \left(\frac{P_m^S(T/100)}{N_m^F} \right)}$$

Theoretically, we can incorporate the integrative effects of the unobserved applications into this equation, and do so in equation (A.2). The underlined integrative flow effects correspond to those from the unobserved applications, and we re-define the scaling factors (which will mechanically adjust with the inclusion of the unobserved applications) as θ_o , θ_v and θ_m , for open enrollment, VEEP and magnet, respectively.

$$(A.2) \quad \frac{(INT_o^F + \underline{INT}_o^F) * \theta_o}{(\underline{INT}_v^F + INT_v^F) * \theta_v + (\underline{INT}_m^F + INT_m^F) * \theta_m}$$

The assumption in equation (1) can be written to conform to the notation in (A.2) as:

$$(A.3) \quad \frac{INT_v^F}{\underline{INT}_v^F} = \frac{INT_m^F}{\underline{INT}_m^F} = \frac{INT_o^F}{\underline{INT}_o^F} = \gamma$$

Multiplying each term in (A.2) by γ yields:

$$(A.4) \quad \frac{(INT_o^F * \theta_o * \frac{INT_o^F}{\underline{INT}_o^F}) + (\underline{INT}_o^F * \theta_o * \frac{INT_o^F}{\underline{INT}_o^F})}{[(\underline{INT}_v^F * \theta_v * \frac{INT_v^F}{\underline{INT}_v^F}) + (\underline{INT}_v^F * \theta_v * \frac{INT_v^F}{\underline{INT}_v^F})] + [(\underline{INT}_m^F * \theta_m * \frac{INT_m^F}{\underline{INT}_m^F}) + (\underline{INT}_m^F * \theta_m * \frac{INT_m^F}{\underline{INT}_m^F})]}$$

Equation (A.4) can be simplified to the following expression, which is equivalent to the ratio that we use in our calculations:

$$(A.5) \quad \frac{INT_o^F * \theta_o * (\gamma + 1)}{\underline{INT}_v^F * \theta_v * (\gamma + 1) + \underline{INT}_m^F * \theta_m * (\gamma + 1)}$$

²² If γ is unknown and not equal to one, the assumption in (A.3) is not sufficient by itself for our calculations. It must also be the case that the ratio of observed to unobserved moves is constant across programs (this is required to ensure proper scaling). Fortunately, Table A.1 suggests that the ratios of observed to unobserved moves in each program are similar.