



Discussion Paper BRIEFS

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Discussion Paper 127

A Cost-Effectiveness Analysis of Demand- and Supply-Side Education Interventions: The Case of *PROGRESA* in Mexico

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In spite of the general consensus that increasing access to education is a key component of successful development strategies, there is still much disagreement about how best to allocate scarce public resources within the education sector. The debate, which typically centers on the relative importance of improved education quality versus improved education access, is essentially concerned with the issue of the most cost-effective way of achieving a given total number of years of education.

Yet concern for equity (or equality of opportunity) is a strong motivating factor underlying government intervention in the education sector. Since economies of scale imply that it is generally more cost-effective to locate schools in relatively densely populated areas, poorer households, which tend to be disproportionately located in remote areas, may face substantially higher private costs and, as a result, tend to acquire lower education levels. This may be further exacerbated by the relative importance of credit market failures for poorer households.

In this paper we consider two alternatives to increasing access to education for poor households, namely (1) extensive expansion of the school system and (2) subsidizing investment in education by the poor. To this end, we evaluate the Programa Nacional de Educación, Salud y Alimentación (*PROGRESA*), a program of the Mexican government that subsidizes investment in education by conditioning cash transfers to poor families on their enrolling their children in school and making regular trips to health clinics. We analyze the cost-effectiveness of the secondary education component of *PROGRESA* by comparing the cost-effectiveness of the educational grants to the policy of constructing new schools.

About PROGRESA

PROGRESA targets its benefits directly to the population in extreme poverty in rural areas. The program is made up of three closely linked components (education, health, and nutrition) based on the belief that there are positive interactions between the three. Our analysis concentrates on the education component, under which the program provides monetary education grants for each child under 18 years of age enrolled in school between the third grade of primary and the third grade of secondary school. In order to compensate for the forgone income that children would otherwise contribute to their families if they were working, the grant amounts increase as children progress to higher grades. After three years, families may renew their status as beneficiaries, subject to a reevaluation of their

socioeconomic conditions. On the supply side, extra resources are made available to schools serving the beneficiary communities to compensate for the expected increase in demand generated by the program.

Identification of Program Impacts

Using household-level data from surveys conducted in 1997, 1998, and 1999, we construct double-difference regression estimates to compare differences between treatment and control groups before and after the program. By adding supply indicators of schooling, we can isolate the effect of any improvements in supply over our period of analysis. The supply-side variables we consider are distance to the closest secondary school and other variables that serve as proxies for educational quality, including type of secondary school available, educational level of the teacher, per-centage of children reported as failing at least one class in the previous year, and student-teacher ratios.

Impact of PROGRESA on Enrollments

From average enrollment in secondary school of 65 percent for boys and 53 percent for girls prior to the program, the results indicate an increase of about 6 and 12 percentage points, respectively, from 1997 to 1999, effectively halving the initial gender gap. By including supply variables in our regression analysis, we can interpret these impacts as largely reflecting the impact of the educational grants. With regard to the supply-side variables, the analysis has shown that the most consistent and important determinant of school enrollment at the secondary school level is distance, with larger negative effects on girls than boys. Our results on the impact of other school quality variables show mixed results, with few variables significant at more than the 10 percent level.

Cost-Effectiveness Analysis

Our cost-effectiveness analysis integrates the impact analysis with the cost side. We start by translating our impact estimates for demand-side subsidies and supply-side expansion (i.e., reduced distance). We then combine these effectiveness measures with costs to calculate the cost of achieving an extra year of schooling, which we compare across the demand- and supply-side components of the program.

In order to identify the impact of the program on years of schooling, we ask how many extra years of schooling a cohort of 1,000 children would receive. This is derived as the

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difference between the total years of schooling they would receive after the program (given the higher enrollment rates) compared to before the program. For a representative cohort of 1,000 boys and 1,000 girls, the demand-side impact estimates imply 254 and 532 extra years of schooling for boys and girls, respectively, a clear bias in favor of girls and sufficient to nearly equalize average conditional enrollment rates in secondary school.

Simultaneous with the program transfers is the expansion of the supply of education. Here we are specifically concerned with expansion in terms of more schools, which manifests itself through a decline in the distance to the nearest school. Analysis of the distance variable indicates that the average distance to school has decreased from about 2.2 kilometers in 1997 to 2 kilometers in 1999. When the consequent enrollment impacts are concentrated on the transition year, a cohort of 1,000 girls entering grade 7 will receive 27 extra years of education in junior secondary school as a result of the combined decrease in distance from 1997–1999. The corresponding impact for boys is 25 extra years of schooling.

For both schooling subsidies and school construction, and separately for boys and girls, we calculate both the cost per extra year of schooling. Since the education subsidy is paid to all who enroll, we calculate the total cost of generating the total impacts by multiplying the total enrollment by grade after the program for the cohort of 1,000 children by the appropriate subsidy rate. We then sum across the appropriate grades and divide by the extra years of schooling generated by the subsidies to get the cost per extra year of schooling. The cost per extra year of schooling is \$12,557 for boys and \$6,904 for girls. Note that the higher enrollment effect for girls easily offsets their higher grant levels.

Comparing the cost-effectiveness of education subsidies with that of extensive expansion, it is clear that education subsidies are a substantially more cost-effective method of increasing the number of children enrolled in school. The lowest cost-effectiveness ratio for extensive expansion is for a 40-year period of impact on girls' enrollment with zero

discounting at just below \$103,600 per extra year of schooling. The largest cost-effectiveness ratio in the case of secondary education subsidies was just over \$12,600 for boys. Therefore, when combined with the fact that the parameters we have used were, if anything, biased against the demand-side, our conclusion that the demand-side program is a cost-effective way of getting more children into secondary school would seem to be quite robust.

Concluding Remarks

We have been concerned with evaluating the relative cost-effectiveness of two policy instruments aimed at increasing enrollment rates in junior secondary school in poor communities in rural Mexico. We have presented results that show that, in this context, demand-side policies are a much more cost-effective instrument than the alternative of expansion on the supply side. The large differences in cost-effectiveness ratios between grants versus school construction suggest that this result is likely to be fairly robust.

We caution that these results should not be broadly interpreted to mean that demand-side interventions are the only attractive alternative in terms of increasing enrollment rates. Other more focused instruments may exist on the supply side that might be cost-effective in specific environments. The analysis done here does, however, provide a useful model of the type that should be a prerequisite to the allocation of scarce resources in the important area of education. It should also be clear that the contribution of education expansion to the development process will also depend very strongly on both the quality of education that these children receive once in school as well as the pursuit of a macroeconomic strategy that enables this extra supply of educated adults to be absorbed into the labor force without adversely affecting the returns to human capital.

Keywords: education, demand-side subsidies, supply-side expansion, cost-effectiveness

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