Education Choices in Mexico: Using a Structural Model and a Randomized Experiment to evaluate PROGRESA

Attanasio, Meghir, Santiago

April 2005

PROGRESA

- PROGRESA was one of the first and probably the most visible of a new generation of interventions whose main aim is to improve the process of human capital accumulation in the poorest communities by providing cash transfers conditional on specific types of behavior in three key areas targeted by the program: nutrition, health and education.

Goals

- Analyze the impact of monetary incentives on education choices in rural Mexico
- Discuss effective design of interventions aimed at increasing school enrolment of poor children

Why do we care?

- A better understanding of the effectiveness of policies that promote school attendance is important: deficits in the accumulation of human capital have been identified by several commentators as one of the main reasons for the relatively modest growth performance of Latin American economies in comparison, for instance, with some of the South East Asian countries.

How to Answer?

- We use an evaluation sample that includes a number of villages where the program was not implemented for evaluation purposes.

- We estimate a simple structural model of education choices using the data from the PROGRESA randomized experiment.

- We then use the model to simulate the effect of changes to some of the parameters of the program.

- General equilibrium effect

What are the results?

- Relatively large general equilibrium effects of the program on child wages: in the treatment localities child wages are about 6% higher than in control localities.

- The program has a positive effect on the enrollment of children, especially after primary school.

- An approximately revenue neutral change in the program that would increase the grant for secondary school children while eliminating for the primary school children would have a substantially larger effect on enrollment of the latter, while having minor effects on the former.

Key Assumption

- We do not restrict the effect of the grant to be the same as that of wages, although from an economic point of view they both represent an opportunity cost to schooling.

Measuring the impact of the program

age group	eligible 97	eligible 97 + 98	non eligible	
6-17	0.039	0.034	0.049	?
	(0.012)	(0.012)	(0.021)	
6-9	0.008	0.003	-0.014	
	(0.005)	(0.005)	(0.009)	
10-13	0.037	0.032	0.030	
	(0.012)	(0.011)	(0.022)	
14-17	0.089	0.084	0.099	
	(0.033)	(0.031)	(0.0432)	

Post-program differences in educational attendance between treatment and control communities

Standard errors in parentheses are clustered at the locality level.

Table 2: Experimental Results October 1998

Measuring the impact of the program

Pre-program differences in educational attendance between treatment and control communities			
age group	eligible 97	eligible 97 + 98	ineligible
6-17	0.006	0.006	0.033
	(0.011)	(0.011)	(0.021)
6-9	-0.004	-0.003	-0.003
	(0.003)	(0.003)	(0.009)
10-13	0.014	0.013	0.034
	(0.012)	(0.011)	(0.022)
14-17	0.014	0.015	0.048
	(0.030)	(0.028)	(0.035)

Standard errors in parentheses are clustered at the locality level.

Table 3: Baseline Results August 1997

Measuring the impact of the program

Difference-in-differences estimates of program impact on educational attendance			
age group	eligible 97	eligible 97 + 98	ineligible
6-17	0.033	0.028	0.016
	(0.009)	(0.008)	(0.019)
6-9	0.012	0.007	-0.010
	(0.006)	(0.006)	(0.011)
10-13	0.024	0.020	-0.003
	(0.011)	(0.011)	(0.023)
14-17	0.075	0.069	0.051
	(0.025)	(0.021)	(0.037)

Standard errors in parentheses are clustered at the locality level.

Table 4: Experimental Results October 1998- August 1997

The Model

- Each child (or his parents) decide whether to attend school or to work
- Children have the possibility of going to school up to age 17
- Children who go to school do not work and vice-versa
- If they decide to work they receive a village/education/age specific wage
- If they go to school, they incur a (utility) cost
- With a certain probability, they progress a grade
- At 18, everybody ends formal schooling and reaps the value of schooling investments in the form of a terminal value function that depends on the highest grade passed

Why a dynamic model?

The Model

- The utility gain of going to school

$$u_{it}^s = \mu_i + a'z_{it} + bed_{it} + 1(p_{it} = 1)\beta^p x_{it}^p + 1(s_{it} = 1)\beta^s x_{it}^s + \varepsilon_{it}$$

- z_{it} relates to a number of taste shifter variables, including parental background, age and state dummies.

- x^p and x^s represent factors affecting the costs of attending primary school and secondary school.

- the term μ_i represents unobservables which we assume have a constant impact over time.

- The term ε_{it} represents a logistic error term which is assumed independently and identically distributed over time and individuals

- The utility of not attending school is denoted by:

$$u_{it}^w = \delta w_{it}$$

The Model

- Allowing for the program:

$$u_{it}^s = \mu_i + \delta\gamma\,(grant_{it}) + \zeta\,(poor_{it}) + \eta\,(Progresa_i) + a'z_{it}$$
$$+ b\,(ed_{it}) + 1(p_{it} = 1)\beta^p x_{it}^p + 1(s_{it} = 1)\beta^s x_{it}^s + \varepsilon_{it}$$

- the coefficient γ measures the impact of the grant as a proportion of the impact of the wage.

- If $\gamma = 1$, the effect of the grant on utility and therefore on schooling choices, would be the same as that of the wage

The Model

- The return to education and the terminal value function:

$$V(ed_{i,18}) = \frac{\alpha_1}{1 + exp(-\alpha_2 * ed_{i,18})}$$

The Model

- Thus the value of attending school for someone who has completed successfully ed_i years in school and is of age t already and has characteristics z_{it} is:

$$V_{it}^s(ed_{it}|z_{it}) = u_{it}^s + \beta\{p_t^s(ed_{it}+1)E\max\left[V_{it+1}^s(ed_{it}+1), V_{it+1}^w(ed_{it}+1)\right]$$

$$+(1-p_t^s(ed_{it}+1))E\max\left[V_{it+1}^s(ed_{it}), V_{it+1}^w(ed_{it})\right]\}$$

- value of working is similarly written as:

$$V_{it}^w(ed_{it}|z_{it}) = u_{it}^w + \beta E\max\left\{V_{it+1}^s(ed_{it}), V_{it+1}^w(ed_{it})\right\}$$

- where the expectation is taken over the possible outcomes of the random shock ε_{it}.

Results

	A	B	C
wage	0.129	0.129	0.129
	0.042	*0.042*	*0.042*
PROGRESA Grant	2.966	2.174	2.974
	1.077	*0.899*	*1.085*
term	5.598	5.591	5.589
	0.152	*0.152*	*0.153*
term	-1.146	-1.157	-1.146
	0.032	*0.033*	*0.032*
Poor	0.248	0.166	-0.128
	0.144	*0.146*	*0.195*
In PROGRESA village		-0.287	-0.629
		0.127	*0.244*
Father's Education - Default is less than primary			
Primary	-0.261	-0.260	-0.263
	0.113	*0.112*	*0.113*
Secondary	-0.582	-0.572	-0.582
	0.146	*0.145*	*0.146*
Preparatoria	-1.233	-1.207	-1.215
	0.323	*0.316*	*0.320*
Mother's Education - Default is less than primary			
Primary	-0.175	-0.180	-0.172
	0.117	*0.115*	*0.116*
Secondary	-0.430	-0.428	-0.432
	0.142	*0.141*	*0.142*
Preparatoria	-1.520	-1.487	-1.486
	0.439	*0.433*	*0.438*
indigenous	-0.546	-0.537	-0.536
	0.133	*0.131*	*0.132*
Km from secondary school	0.087	0.087	0.088
	0.010	*0.010*	*0.010*
cost of attending Secondary school	0.005	0.005	0.005
	0.001	*0.001*	*0.001*
age	3.041	3.000	3.024
	0.227	*0.226*	*0.227*
Prior Years of education	-1.819	-1.799	-1.805
	0.198	*0.197*	*0.197*
log-Likelihood	-26801.110	-26798.595	-26797.383

Notes as in Table 5. Discount rate $\beta = 0.85$ State dummies included
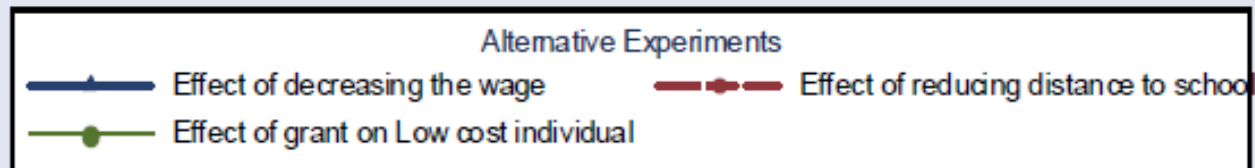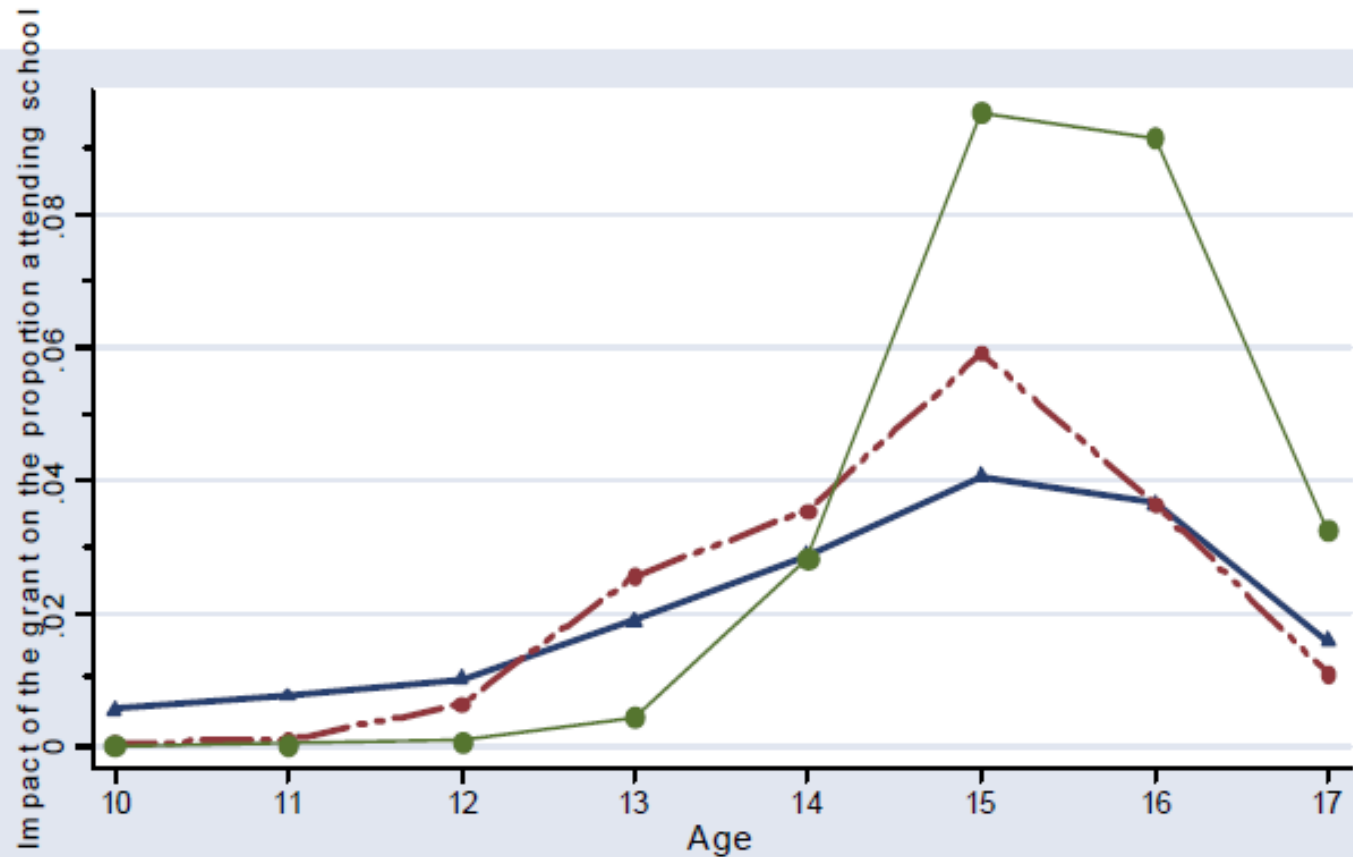
Table 7: Parameter etimates for the Education choice model

Simulations
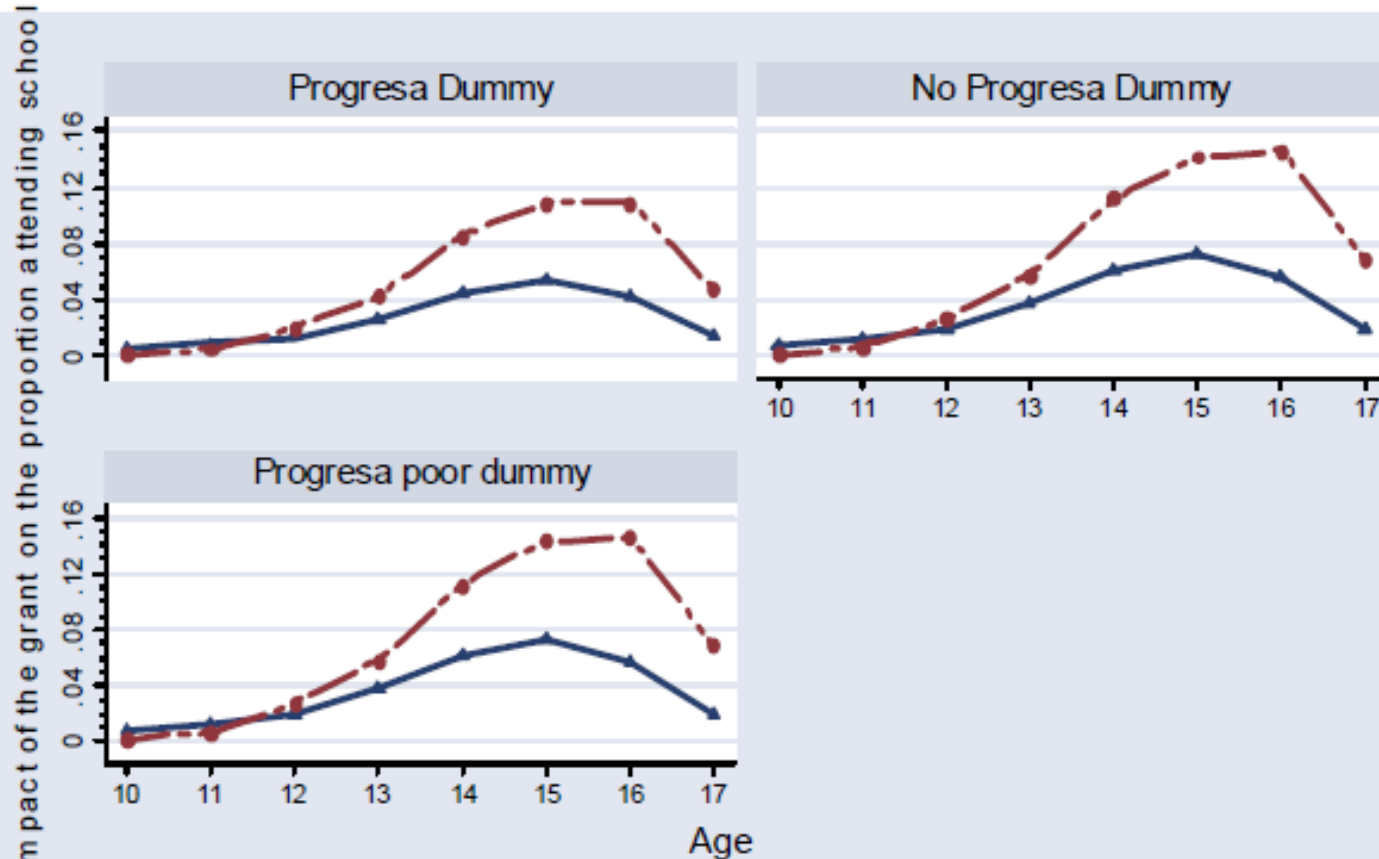
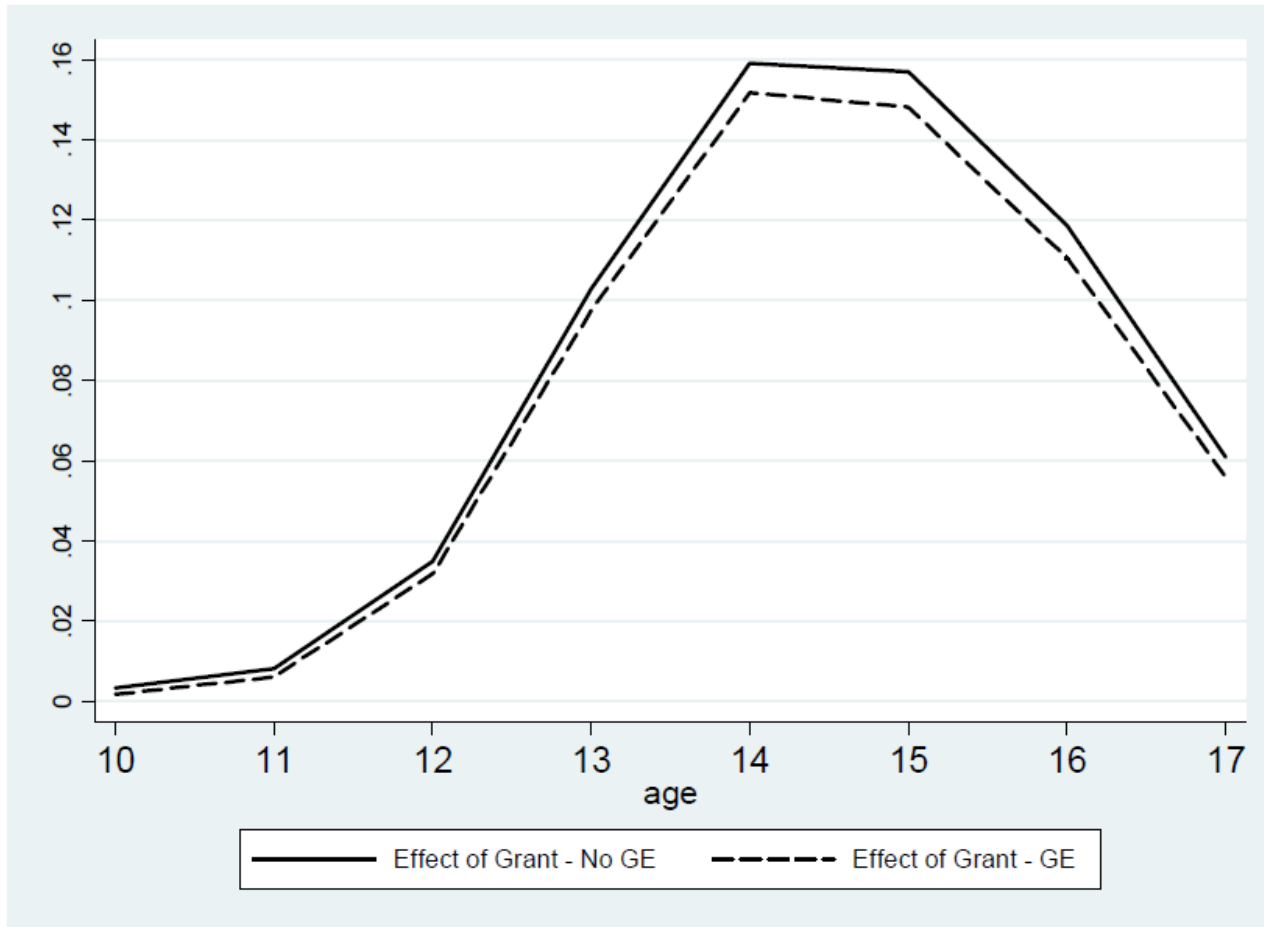Graphs by Progresa Dummy

Simulations

Simulations

Figure 2: The impact of an alternative grant structure.

Thank you