Supplement to "Understanding the income gradient in college attendance in Mexico: The role of heterogeneity in expected returns"

(*Quantitative Economics*, Vol. 5, No. 3, November 2014, 583–630)

Katja Maria Kaufmann
Department of Economics and IGIER, Bocconi University

S.1. Background information on college enrollment and on costs and financing of college attendance in Mexico

In 2004, around 22% of adolescents of the relevant age group (18–24 years) were attending college in Mexico to receive an undergraduate degree (*licenciatura*) (ANUIES annual statistics 2004). This attendance rate is significantly lower than in many other Latin American countries (see Table S.1). Mexico is characterized by large inequalities in access to college education for different income groups. In comparison to other Latin American countries, such as Colombia, Argentina and Chile, only Brazil has a smaller fraction of poor students attending college (see Table S.1). Figure S.1 displays college attendance rates of 18–24-year-old high school graduates for different parental income quartiles.[1] High school graduates are already a selective group; for example, for urban Mexico, about 75% of the relevant age group attain a high school degree. The attendance rate of high school graduates in the lowest parental income quartile is around 22% compared to 67% for the highest parental income quartile. The Jovenes con Oportunidades sample (2005) used in this paper consists of high school graduates from Oportunidades families and is thus only representative of about the poorest third of the high school graduate population. The positive correlation between parental income and college attendance rate can also be found for this sample, but differences between poorest quartile (17%) and richest quartile (35%) are smaller, as every individual in the sample is relatively poor (see Figure S.2, Jovenes con Oportunidades 2005).

College attendance costs in Mexico pocket a large fraction of parental income for relatively poor families. Costs consist of enrollment and tuition fees, fees for (entrance) exams and other bureaucratic costs, costs for transport and/or room and board, health insurance (mandatory for some universities), and costs for schooling materials such as books. Administrative data on tuition and enrollment fees per year from the National Association of Universities and Institutes of Higher Education (ANUIES) reveals a large degree of heterogeneity: Yearly tuition and enrollment costs vary between 50 pesos (Universidad Autónoma de Guerrero, Guerrero) and 120,000 pesos (Tecnológico de Monterrey, Monterrey Institute of Technology and Higher Education (ITESM), Campus Puebla),

Katja Maria Kaufmann: katja.kaufmann@unibocconi.it

[1] Parental income is measured in the last year before the college attendance decision.

DOI: 10.3982/QE259

TABLE S.1. Comparison of enrollment rates, fraction of poorest 40% in percent of the student population, fraction of GDP spend on higher education, fraction of expenditures on higher education on fellowships, and student loans: Mexico, other Latin American countries, Organization for Economic Cooperation and Development (OECD), and United States.

Countries Ranked by Per Cap GDP	Enrollment in Higher Education in % of 18–24-Year-Olds	Fraction of Poorest 40% of 18–24-Year-Olds as % of Student Body	Expenditures on Higher Education in % of GDP	Spending on Fellowships and Loans in % of Expenditures on Higher Education	Beneficiaries of Student Loans in % of Students
Brazil	16%	4%	1.5%	11.2%	6%
Colombia	23%	14%	1.7%	–	9%
Peru	29%	–	–	–	–
Mexico	*20%*	*8%*	*1.1%*	*6.2%*	*2%*
Chile	39%	16%	2.2%	34.8%	–
Argentina	37%	16%	1.1%	–	–
OECD	56%	–	–	17.5%	–
USA	54%	20%	–	–	35%

Sources: World Bank (2005) for Enrollment and Fraction of Poorest 40%, OECD Indicators (2007) for Expenditures on Higher Education and on Spending on Fellowships and Loans. CIA World Factbook (2006) and IMF Country Ranking for Ranking of Per Capita GPD (PPP). For Beneficiaries of Student Loans: Ministry of Education, Brazil (2005); ICETEX, Colombia (2005); SOFES (2005), ICEES (2006), ICCET (2007), and Educafin (2007) in Mexico; U.S. Office of Post-Secondary Education website, 2006. Information not available indicated as "–".

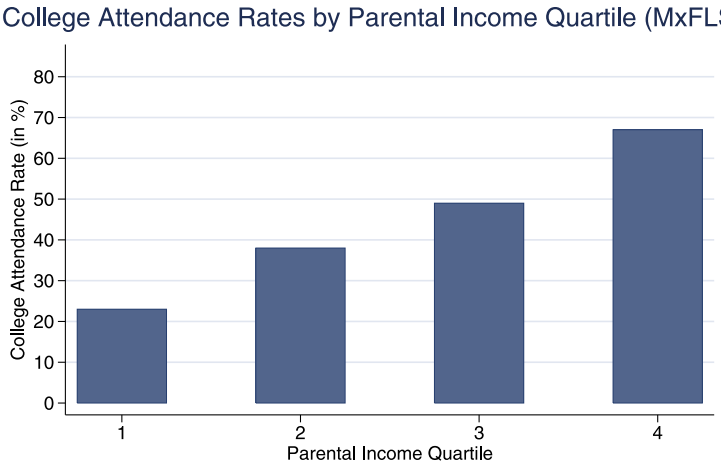

FIGURE S.1. College enrollment rates of 18–24-year-old high school completers by parental income quartile (Mexican Family Life Survey, 2003). *Source*: Author's calculation using the Mexican Family Life Survey, 2003.

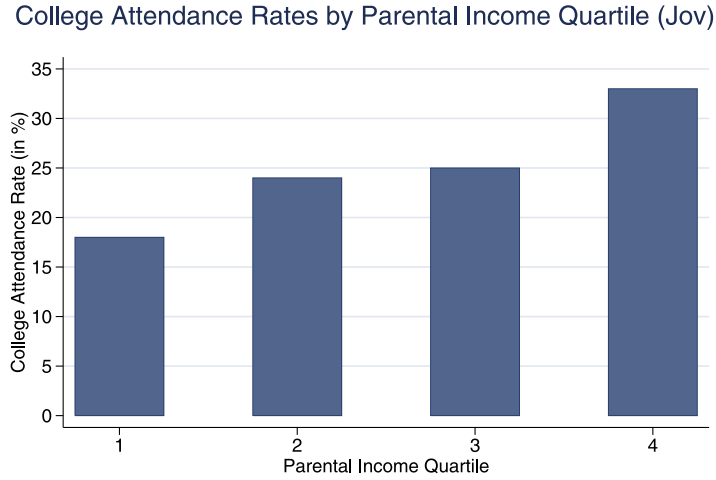

FIGURE S.2. College enrollment rates of 18–24-year-old high school completers by parental income quartile (Jovenes con Oportunidades Survey, 2005). *Source*: Author's calculation using the Jovenes con Oportunidades Survey, 2005.

which is equivalent to approximately $5000 and $12,000(U.S.). The tuition cost measure that I use in my analysis is the minimum yearly tuition/enrollment fee of universities in the closest locality with at least one university. Fifty percent of the high school graduates face (minimum) tuition costs of over 750 pesos, which is equivalent to about 15% of median yearly per capita parental income. The other important cost factor depends on whether the adolescent has to move to a different city and pay room and board or whether she can live with her family during college. I therefore construct a measure of distance to the closest university for each individual.

In Mexico, funding for higher education fellowships and student loan programs is very limited and only about 5% of the undergraduate student population receive fellowships, while 2% receive student loans, which is low even compared to other Latin American countries (see Table S.1). The national scholarship program Programa Nacional de Becas para la Educaciòn Superior (PRONABES) was created in 2001 with the goal of more equal access to higher education at the undergraduate level. In 2005, funding of PRONABES amounted to 850 million pesos (equal to $40 per student per year) and 5% of the undergraduate student population received a fellowship (*beca*) in 2005 compared to 2% in 2001/2002 (see Department of Public Education (SEP), 2005). Eligibility for a fellowship is subject to three conditions: first, a maximum level of family income, where priority is given to families with less than two times the minimum monthly salary, while in special cases people are still eligible with less than four times the minimum monthly salary. Second, students need a minimum GPA (80) and, third, they have to have been accepted at a public university or technical institute. After each year, the student has to prove that economic eligibility criteria are still met and that she is in good academic standing. In 2004/2005, the fellowship consisted of a monthly stipend of 750 pesos—slightly more than half the minimum wage per month—in the first year of studies, and increased to 1000 pesos in the fourth year of studies. Student loan programs are also of minor importance in Mexico. Only about 2% of the national student population benefit from a student loan, which is low even compared to poorer Latin American countries, such as Colombia (9%) and Brazil (6%). In Mexico, there are four different programs that offer student loans. The largest program, Sociedad de Fomento a la Educaciòn Superior (SOFES), offers loans to 1.5% of students and was implemented by a collaboration of private universities. It is need and merit based, but students with collateral are preferred. The other three are very small state programs, Instituto de Crédito Educativo del Estado de Sonora (ICEES) in Sonora state, Instituto de Crédito Educativo del Estado de Tamaulipas (ICEET) in Tamaulipas, and Educafin in Guanajuato, which are not part of my sample.

S.2. Brief introduction to the local instrumental variable methodology

To introduce the local instrumental variable (LIV) methodology (see Heckman and Vytlacil (2005) and Carneiro, Heckman, and Vytlacil (2010, 2011)), the framework of the generalized Roy model is a useful starting point (compare Section 2):[2]

$$\begin{aligned}
&\ln Y_0 = \alpha + U_0,\\
&\ln Y_1 = \alpha + \bar{\rho} + U_1,\\
&S^* = \mu(Z) - U_S,\\
&S = 1 \quad \Leftrightarrow \quad S^* \geq 0.
\end{aligned}$$

[2] $\ln Y_1$ and $\ln Y_0$ denote log earnings with and without college ($S = 1, 0$), α denotes average earnings without college, $\bar{\rho}$ denotes average returns to college, and U_1 and U_0 denote the error terms in the earnings equations. For notational simplicity, I omit conditioning on observable characteristics X. The latent variable S^* depends on observable characteristics Z, which contain at least one element that is not in X and the error term U_S. Individuals choose college if and only if the value of the latent variable S^* is larger than zero.

In the context of this framework, if U_S is independent of U_0, U_1, the average treatment effect can be calculated as the simple difference between the outcome of the "treated" ($\ln Y_1$) and the "untreated" ($\ln Y_0$). If, on the other hand, U_S is correlated with U_0, U_1, that is, people self-select into treatment based on U_S, which is correlated with the potential outcomes, then the simple difference will be a biased estimate of the average treatment effect. The problem is that one compares treated and untreated individuals who differ in their unobserved costs, U_S, and these unobserved costs are correlated with the potential outcomes.

The LIV methodology addresses this endogeneity problem as follows: Imagine U_S was observable and one could thus condition on U_S when computing the simple difference. In other words, one could use as counterfactual outcomes for people who were treated those individuals with the same U_S who were not treated. This approach would solve the usual endogeneity problem. This is exactly the key idea of the marginal treatment effect (MTE), which is defined as

$$\Delta^{\text{MTE}}(u_S) = E(\ln Y_1 - \ln Y_0 | U_S = u_S) = E(\rho | U_S = u_S). \tag{S.2}$$

The obvious question is how can one condition on U_S that is unobserved. Even though U_S is generally unobserved, it is known for individuals who are exactly indifferent between selecting into or out of treatment (on the margin), as can be seen from the selection equation: $S^* = 0 \Leftrightarrow \mu(Z) = U_S$. One can compute U_S for those individuals who are indifferent by estimating the selection equation and calculating the propensity score $P(Z) \equiv P(S = 1|Z = z)$, which is the probability of selecting into treatment conditional on observable characteristics Z. The marginal treatment effect can then be estimated for those individuals who are indifferent and characterized by $U_S = \mu(Z) = P(Z)$. For example, in my context, the MTE represents the average gross gain to college for individuals who are indifferent between attending college or not and who have unobservable costs of $U_S = u_S$.

In a second step, policy experiments can be performed using the estimated MTE in the following way (see Heckman and Vytlacil (2001)): The policy-relevant treatment effect (PRTE) is a weighted average of the marginal treatment effects (MTE), where the weights depend on who changes participation in response to the policy of interest. One important assumption underlying this analysis is that the selection equation continues to hold under hypothetical interventions. The PRTE can be written as

$$\text{PRTE} = \int_0^1 \text{MTE}(u)\omega(u)\,du, \quad \text{where } \omega(u) = \frac{F_P(u) - F_{P^*}(u)}{E(P^*) - E(P)}. \tag{S.2}$$

P is the baseline probability of $S = 1$ with cumulative distribution function F_P, while P^* is defined as the probability produced under an alternative policy regime with cumulative distribution function F_{P^*}. The intuition for the PRTE is as follows: Given a certain level of unobservable costs, u, those individuals with $P(Z) > u$ will attend college, which is equivalent to a fraction $1 - F_P(u)$. A reduction, for example, in direct costs, Z, will lead to a new larger probability of attending, $P(Z^*)$. Thus for a given u, there are now more people deciding to attend college, $1 - F_{P^*}(u)$, and the change can be expressed as $F_P(u) - F_{P^*}(u)$. The weight is normalized by the change in the proportion of people

induced into the program, $E(P^*) - E(P)$, to express the impact of the policy on a per person basis.[3]

S.3. Complementary material and robustness checks

S.3.1 *Complementary material*

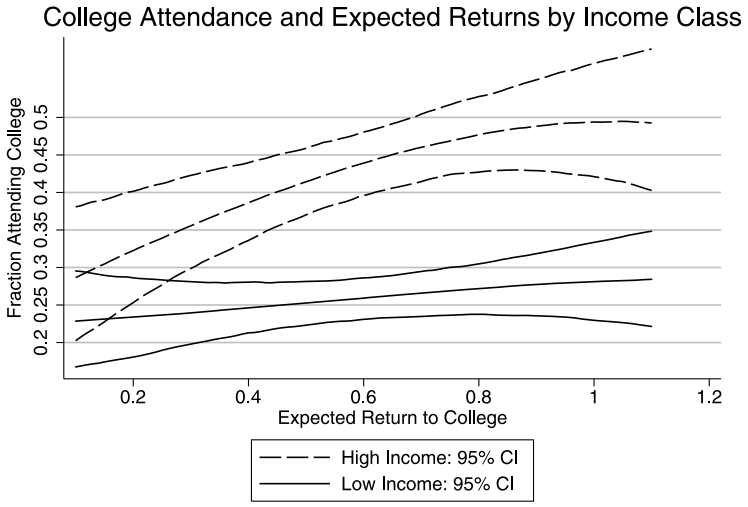

Figure S.3. The cumulative distribution function of costs with 95% confidence intervals.

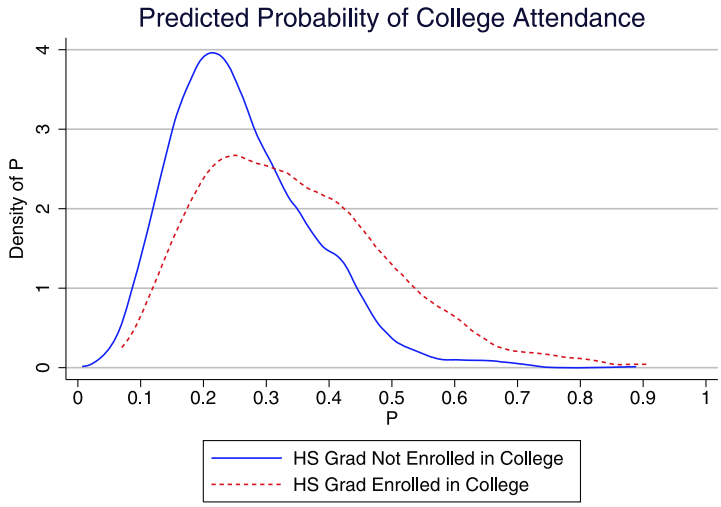

Figure S.4. The predicted probability of attending college.

[3]The intuition is even more straightforward in the following special case. Suppose that $S^* = Z'\gamma + V$. Consider a policy that shifts Z_k (the kth element of Z) to $Z_k + \varepsilon$. For example, Z_k might be the tuition faced by an individual and the policy change might be to provide an incremental tuition subsidy of ε dollars. The resulting PRTE_ε is the average return among individuals who are induced into university by the incremental subsidy, $\text{PRTE}_\varepsilon = E(\rho_i | Z'\gamma \leq V \leq Z'\gamma + \varepsilon\gamma_k)$.

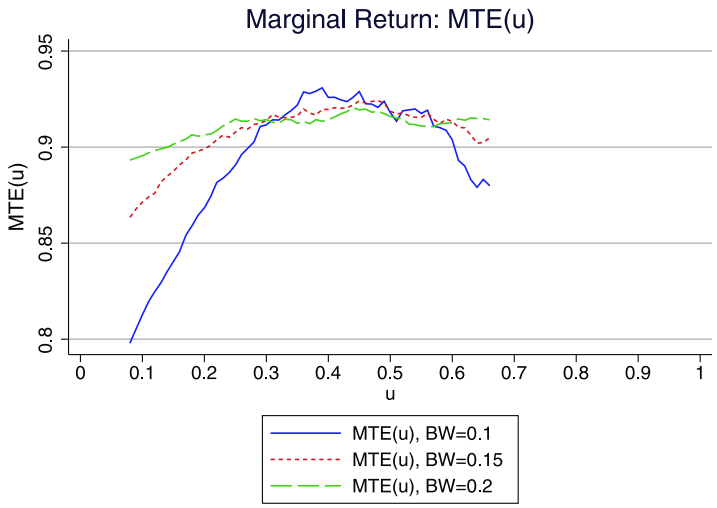

FIGURE S.5. The marginal return to college for different levels of unobserved costs.

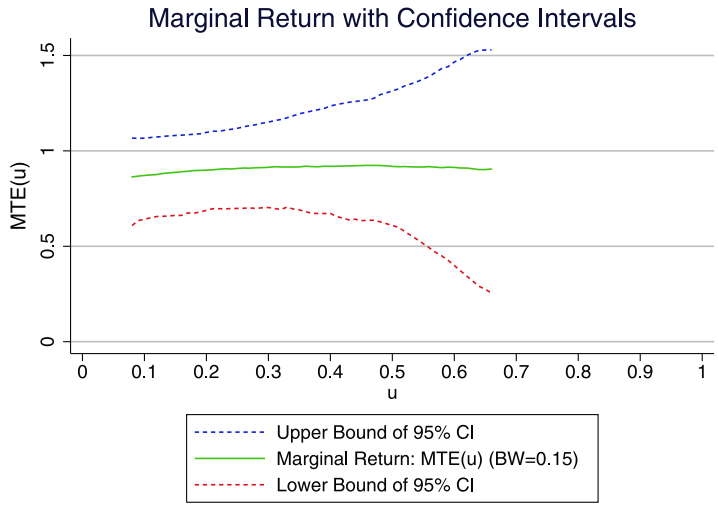

FIGURE S.6. The marginal return to college with 95% confidence interval bands.

TABLE S.2. Rationalization of choices.

	p-Value of KS-Test
Exp log earnings	
– Sr. high school	0.417
– College	0.677
Exp. return	
– College	0.188
Prob. of work	
– Sr. high school	0.236
– College	0.349
Observations	
(Sr. high school graduates/Grade 12)	1612/469

Notes: Table displays the p-values of Kolmogorov–Smirnov tests of equality of distributions. The null hypothesis is that the cross-sectional distribution of—for example—expected returns is the same for the sample of senior high school graduates (whose schooling decision we are analyzing) and the sample of a cohort that is one year younger and just starting grade 12 (who have thus not decided yet about whether to enroll in college or not).

TABLE S.3. Summary statistics of important variables of the two groups of respondents.

Respondent:	Adolescent	Mother	
	Mean (SD)	Mean (SD)	p-Value of Diff.
Expected return	0.6670 (0.3820)	0.6550 (0.3592)	0.347
Expected log high school earnings	7.5778 (0.5004)	7.6477 (0.4338)	0.000
Var. of log high school earnings	0.0054 (0.0079)	0.0046 (0.0062)	0.003
Var. of log college earnings	0.0039 (0.0061)	0.0034 (0.0054)	0.022
Prob. of work, high school	0.6657 (0.1817)	0.6505 (0.1780)	0.015
Prob. of work, college	0.8250 (0.1601)	0.8142 (0.1544)	0.046
College attendance rate	0.2308 (0.4215)	0.3636 (0.4812)	0.000
Female	0.5813 (0.4935)	0.4954 (0.5001)	0.000
GPA (scale 0 to 100)	82.19 (7.16)	82.27 (10.34)	0.783
Father's years of schooling	5.33 (2.96)	5.34 (3.03)	0.902
Mother's years of schooling	5.03 (2.77)	5.06 (2.76)	0.794
Per cap. par. income (pesos)	7519.54 (8010.08)	7925.42 (13,638.29)	0.371
Distance to univ. (km)	24.2312 (22.8159)	26.4647 (22.8688)	0.005
Tuition costs (pesos)	608.8104 (634.5729)	503.4896 (338.1346)	0.000

TABLE S.4. Correlation between earnings expectations and individual and family background characteristics.

Dependent Variable:	*Expected Earnings*	
	High School	College
Female	−0.116***	−0.069***
	(0.026)	(0.026)
GPA of jr. high school (0–100)	0.001	0.004**
	(0.002)	(0.002)
Mother's educ. jr. high school	−0.056	−0.046
	(0.036)	(0.035)
Mother's educ., sr. high school	−0.021	0.013
	(0.089)	(0.087)
Mother's educ., univ.	0.092	0.234
	(0.194)	(0.189)
Father's educ. jr. high school	−0.023	0.004
	(0.039)	(0.038)
Father's educ., sr. high school	0.060	0.114
	(0.071)	(0.069)
Father's educ., univ.	0.164	0.121
	(0.167)	(0.163)
Per cap. income 5–10k	0.015	0.015
	(0.029)	(0.028)
Per cap. income ≥ 10k	0.050	0.044
	(0.033)	(0.032)
Observations	3342	3342
Censored observations	1730	1730
Chi-square	211.983	157.746
Inverse Mills ratio	0.096	0.046
SE of inverse Mills	0.076	0.075

Notes: Table displays coefficients and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: not obese, father in household, father's and mother's education primary or less, lowest per capita parental income category, father's occupation unskilled worker, size of locality of residence less than 15k.

TABLE S.5. Correlation between expected returns and direct costs of schooling.

Dependent Variable:	*Expected Return*	
	Coeff. (SE)	Coeff. (SE)
Mother's educ., jr. high school	−0.009 (0.034)	0.011 (0.030)
Mother's educ., sr. high school	0.048 (0.076)	0.036 (0.073)
Mother's educ., univ.	0.168 (0.192)	0.115 (0.158)
Father's educ., jr. high school	0.001 (0.035)	0.027 (0.032)
Father's educ., sr. high school	0.066 (0.061)	0.054 (0.058)
Father's educ., univ.	−0.186 (0.144)	−0.054 (0.136)
Per cap. income 5–10k	0.022 (0.028)	−0.002 (0.023)
Per cap. income ≥ 10k	−0.007 (0.031)	−0.007 (0.027)
GPA, second tercile	0.004 (0.027)	0.026 (0.023)
GPA, top tercile	0.042 (0.028)	0.053** (0.024)
Distance to univ.	0.002 (0.002)	
Distance squared	−0.000 (0.000)	
Tuition costs	0.000 (0.000)	
Tuition squared	0.000 (0.000)	
Tuition > 750 pesos		0.046 (0.031)
Distance to univ. 20–40 km		0.013 (0.023)
Distance to univ. ≥ 40 km		0.043 (0.028)
Observations	2327	3342
Censored observations	1156	1730
Lambda	−0.086	−0.070
SE of Lambda	0.063	0.064

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, per capita income less than 5000 pesos.

S.3.2 *Robustness checks*

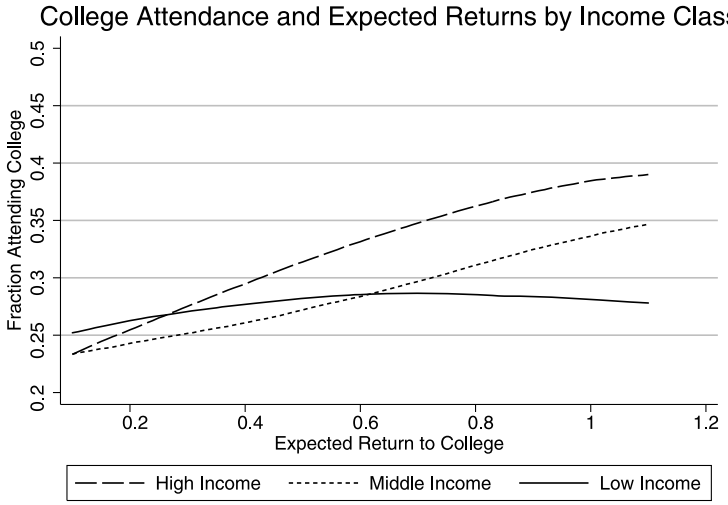

FIGURE S.7. The cumulative distribution function of costs for different income classes.

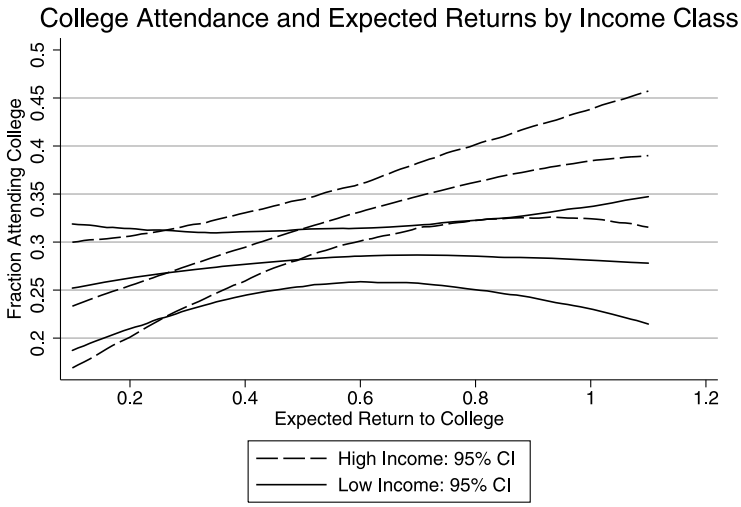

FIGURE S.8. The cumulative distribution function of costs with 95% confidence intervals.

TABLE S.6. Determinants of college attendance: total household income.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Expected return to college	0.092***	0.078**	0.076**
	(0.033)	(0.034)	(0.034)
Prob. of work, sr. high school	0.032	0.013	0.012
	(0.087)	(0.085)	(0.077)
Prob. of work, college	−0.008	−0.001	0.023
	(0.101)	(0.099)	(0.089)
Var. of log earn., sr. high school	−2.625	−3.016	−2.701
	(1.919)	(2.008)	(1.900)
Var. of log earn., college	−0.310	0.036	0.029
	(2.351)	(2.291)	(2.092)
Female (d)	−0.055*	−0.059*	−0.044
	(0.029)	(0.033)	(0.032)
GPA, second tercile (d)		0.055*	0.057*
		(0.031)	(0.030)
GPA, top tercile (d)		0.187***	0.170***
		(0.038)	(0.047)
Father's educ., jr. high school (d)		0.099**	0.078*
		(0.042)	(0.042)
Father's educ., sr. high school (d)		0.151*	0.109
		(0.078)	(0.074)
Father's educ., univ. (d)		0.547***	0.569***
		(0.120)	(0.142)
Mother's educ., jr. high school (d)		0.100**	0.076*
		(0.040)	(0.039)
Mother's educ., sr. high school (d)		0.203**	0.172*
		(0.099)	(0.101)
Mother's educ., univ. (d)		0.196	0.234
		(0.209)	(0.208)

(*Continues*)

TABLE S.6. *Continued.*

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Total fam. income, T2 (d)			0.025
			(0.028)
Total fam. income, T3 (d)			0.060*
			(0.032)
Distance to univ. 20–40 km (d)			−0.076***
			(0.028)
Distance to univ. ≥ 40 km (d)			−0.105***
			(0.030)
Tuition > 750 pesos (d)			−0.078**
			(0.038)
Observations	3342	3342	3342
Censored observations	1730	1730	1730
Log likelihood	−3041.971	−2990.349	−2975.200
Sample sel.: corr. between error	−0.487	−0.282	−0.061
Sample sel.: p-value	0.055	0.314	0.835

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, father's and mother's education primary or less, lowest family income tercile, distance to university less than 20 km and tuition less than 750 pesos.

TABLE S.7. Excess responsiveness of the poor to changes in direct costs (distance to college): per capita income and wealth.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Univ. 20–40 km ∗ par. income/wealth Q1	−0.123**	−0.124**	−0.145*
	(0.054)	(0.053)	(0.075)
Univ. 20–40 km ∗ par. income/wealth Q1 ∗ high exp. ret.			0.023
			(0.148)
Univ. 20–40 km ∗ par. income/wealth Q2	−0.009	−0.006	0.014
	(0.073)	(0.073)	(0.109)
Univ. 20–40 km ∗ par. income/wealth Q2 ∗ high exp. ret.			−0.042
			(0.136)
Univ. 20–40 km ∗ par. income/wealth Q3	−0.078	−0.081	−0.064
	(0.062)	(0.060)	(0.095)
Univ. 20–40 km ∗ par. income/wealth Q3 ∗ high exp. ret.			−0.018
			(0.141)
Univ. 20–40 km ∗ par. income/wealth Q4	0.074	0.071	0.116
	(0.073)	(0.072)	(0.109)
Univ. 20–40 km ∗ par. income/wealth Q4 ∗ high exp. ret.			−0.065
			(0.115)
Univ. > 40 km ∗ par. income/wealth Q1	−0.064	−0.064	−0.020
	(0.053)	(0.052)	(0.078)
Univ. > 40 km ∗ par. income/wealth Q1 ∗ high exp. ret.			−0.127
			(0.096)
Univ. > 40 km ∗ par. income/wealth Q2	−0.030	−0.030	−0.029
	(0.072)	(0.071)	(0.102)
Univ. > 40 km ∗ par. income/wealth Q2 ∗ high exp. ret.			−0.006
			(0.147)

(*Continues*)

TABLE S.7. *Continued.*

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Univ. $>$ 40 km $*$ par. income/wealth Q3	-0.178^{***} (0.058)	-0.177^{***} (0.057)	-0.214^{**} (0.085)
Univ. $>$ 40 km $*$ par. income/wealth Q3 $*$ high exp. ret.			0.106 (0.235)
Univ. $>$ 40 km $*$ par. income/wealth Q4	-0.088 (0.064)	-0.087 (0.063)	-0.177^{**} (0.076)
Univ. $>$ 40 km $*$ par. income/wealth Q4 $*$ high exp. ret.			0.266 (0.188)
Interaction of par. income/wealth quartiles and high ret.	Yes	Yes	Yes
Controls: expected return, exp. log earning Prob. of work and var. of log earning	No	Yes	Yes
Controls: GPA, par. income/wealth and educ., sex, state FE	Yes	Yes	Yes
Observations	3342	3342	3342
Uncensored observations	1612	1612	1612
Log likelihood	-2981.146	-2978.124	-2968.895
Sample sel.: corr. between error	-0.208	-0.177	-0.209
Sample sel.: p-value	0.488	0.565	0.504

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, lowest parental income/wealth quartile, interactions of distance to university less than 20 km with parental income/wealth and low expected return interacted with parental income/wealth quartiles.

TABLE S.8. Excess responsiveness of the poor to changes in direct costs (distance to college): total household income.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Univ. 20–40 km ∗ fam. income tercile 1 (d)	−0.107**	−0.108**	−0.085
	(0.042)	(0.042)	(0.057)
Univ. 20–40 km ∗ fam. income 1 ∗ high exp. ret. (d)			−0.058
			(0.081)
Univ. 20–40 km ∗ fam. income tercile 2 (d)	−0.019	−0.022	−0.034
	(0.051)	(0.050)	(0.075)
Univ. 20–40 km ∗ fam. income 2 ∗ high exp. ret. (d)			0.020
			(0.112)
Univ. 20–40 km ∗ fam. income tercile 3 (d)	0.102	0.095	0.115
	(0.066)	(0.065)	(0.093)
Univ. 20–40 km ∗ fam. income 3 ∗ high exp. ret. (d)			−0.038
			(0.106)
Univ. > 40 km ∗ fam. income tercile 1 (d)	−0.066*	−0.068*	−0.053
	(0.040)	(0.039)	(0.058)
Univ. > 40 km ∗ fam. income 1 ∗ high exp. ret. (d)			−0.039
			(0.082)
Univ. > 40 km ∗ fam. income tercile 2 (d)	−0.108**	−0.115**	−0.160**
	(0.050)	(0.047)	(0.070)
Univ. > 40 km ∗ fam. income 2 ∗ high exp. ret. (d)			0.115
			(0.158)
Univ. > 40 km ∗ fam. income tercile 3 (d)	0.002	−0.001	−0.127
	(0.072)	(0.071)	(0.083)
Univ. > 40 km ∗ fam. income 3 ∗ high exp. ret. (d)			0.323*
			(0.185)
Fam. income 1 ∗ high exp. ret. (d)			−0.111**
			(0.048)
Fam. income 2 ∗ high exp. ret. (d)			0.028
			(0.055)
Fam. income 3 ∗ high exp. ret. (d)			0.007
			(0.053)
Controls for expected return, exp. log earning Prob. of work and var. of log earning	No	Yes	Yes
Controls: GPA, fam. income and educ., sex, state FE	Yes	Yes	Yes
Observations	3342	3342	3342
Censored observations	1730	1730	1730
Log likelihood	−2985.843	−2981.618	−2960.931
Sample sel.: corr. between error	−0.133	−0.096	−0.144
Sample sel.: p-value	0.648	0.748	0.623

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, lowest family income tercile, interactions of distance to university of less than 20 km with family income and low expected return interacted with family income.

TABLE S.9. Excess responsiveness of the poor to changes in direct costs (distance to college): total household income and wealth.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Univ. 20–40 km ∗ fam. income/wealth Q1 (d)	−0.098**	−0.097**	−0.093**
	(0.042)	(0.041)	(0.042)
Univ. 20–40 km ∗ fam. income/wealth Q1 ∗ high exp. ret. (d)			−0.078
			(0.069)
Univ. 20–40 km ∗ fam. income/wealth Q2 (d)	−0.071	−0.075*	−0.056
	(0.045)	(0.044)	(0.052)
Univ. 20–40 km ∗ fam. income/wealth Q2 ∗ high exp. ret. (d)			0.010
			(0.093)
Univ. 20–40 km ∗ fam. income/wealth Q3 (d)	−0.050	−0.049	−0.070
	(0.047)	(0.046)	(0.049)
Univ. 20–40 km ∗ fam. income/wealth Q3 ∗ high exp. ret. (d)			0.041
			(0.100)
Univ. 20–40 km ∗ fam. income/wealth Q4 (d)	−0.066	−0.064	−0.081*
	(0.043)	(0.043)	(0.045)
Univ. 20–40 km ∗ fam. income/wealth Q4 ∗ high exp. ret. (d)			0.171
			(0.109)
Univ. > 40 km ∗ fam. income/wealth Q1 (d)	−0.112***	−0.114***	−0.110***
	(0.042)	(0.040)	(0.042)
Univ. > 40 km ∗ fam. income/wealth Q1 ∗ high exp. ret. (d)			−0.073
			(0.072)
Univ. > 40 km ∗ fam. income/wealth Q2 (d)	−0.081*	−0.081*	−0.061
	(0.044)	(0.043)	(0.050)
Univ. > 40 km ∗ fam. income/wealth Q2 ∗ high exp. ret. (d)			0.005
			(0.095)

(*Continues*)

TABLE S.9. *Continued.*

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Univ. > 40 km ∗ fam. income/wealth Q3 (d)	−0.085*	−0.087*	−0.100*
	(0.049)	(0.048)	(0.051)
Univ. > 40 km ∗ fam. income/wealth Q3 ∗ high exp. ret. (d)			−0.047
			(0.094)
Univ. > 40 km ∗ fam. income/wealth Q4 (d)	−0.060	−0.058	−0.061
	(0.049)	(0.048)	(0.048)
Univ. > 40 km ∗ fam. income/wealth Q4 ∗ high exp. ret. (d)			0.155
			(0.121)
Interaction of fam. income/wealth quartiles and high ret.	Yes	Yes	Yes
Controls: expected return, exp. log earning			
Prob. of work and var. of log earning	No	Yes	Yes
Controls: GPA, fam. income/wealth and educ., sex, state FE	Yes	Yes	Yes
Observations	3342	3342	3342
Censored observations	1730	1730	1730
Log likelihood	−2982.507	−2979.743	−2974.615
Sample sel.: corr. between error	−0.130	−0.097	−0.030
Sample sel.: p-value	0.657	0.747	0.923

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, lowest family income/wealth quartile, interactions of distance to university less than 20 km with family income/wealth and low expected return interacted with family income/wealth quartiles.

TABLE S.10. Excess responsiveness of the poor to changes in direct costs (tuition costs): per capita income and wealth.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Tuition > 750 ∗ par. income/wealth Q1	−0.064	−0.067	−0.000
	(0.048)	(0.047)	(0.071)
Tuition > 750 ∗ par. income/wealth Q1 ∗ high exp. ret.			−0.148*
			(0.084)
Tuition > 750 ∗ par. income/wealth Q2	−0.037	−0.037	−0.006
	(0.065)	(0.064)	(0.095)
Tuition > 750 ∗ par. income/wealth Q2 ∗ high exp. ret.			−0.055
			(0.118)
Tuition > 750 ∗ par. income/wealth Q3	−0.051	−0.055	−0.087
	(0.062)	(0.061)	(0.094)
Tuition > 750 ∗ par. income/wealth Q3 ∗ high exp. ret.			0.038
			(0.137)
Tuition > 750 ∗ par. income/wealth Q4	0.069	0.066	0.117
	(0.070)	(0.070)	(0.104)
Tuition > 750 ∗ par. income/wealth Q4 ∗ high exp. ret.			−0.106
			(0.101)
Interaction of par. income/wealth quartiles and high ret.	Yes	Yes	Yes
Controls: expected return, exp. log earning			
Prob. of work and var. of log earning	No	Yes	Yes
Controls: GPA, par. income/wealth and educ., sex, state FE	Yes	Yes	Yes
Observations	3342	3342	3342
Uncensored observations	1612	1612	1612
Log likelihood	−2987.524	−2984.668	−2972.787
Sample sel.: corr. between error	−0.329	−0.309	−0.326
Sample sel.: p-value	0.236	0.275	0.247

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, lowest parental income/wealth quartile, interactions of tuition costs less than 750 pesos with parental income/wealth and low expected return interacted with parental income/wealth quartiles.

TABLE S.11. Excess responsiveness of the poor to changes in direct costs (tuition costs): total household income.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Tuition > 750 ∗ fam. income T1 (d)	−0.070	−0.078	−0.038
	(0.049)	(0.049)	(0.067)
Tuition > 750 ∗ fam. income T1 ∗ high exp. ret. (d)			−0.084
			(0.076)
Tuition > 750 ∗ fam. income T2 (d)	−0.043	−0.045	−0.024
	(0.050)	(0.050)	(0.071)
Tuition > 750 ∗ fam. income T2 ∗ high exp. ret. (d)			−0.048
			(0.086)
Tuition > 750 ∗ fam. income T3 (d)	−0.044	−0.050	−0.087
	(0.052)	(0.052)	(0.069)
Tuition > 750 ∗ fam. income T3 ∗ high exp. ret. (d)			0.058
			(0.100)
Fam. income 1 ∗ high exp. ret. (d)			−0.090
			(0.061)
Fam. income 2 ∗ high exp. ret. (d)			0.060
			(0.069)
Fam. income 3 ∗ high exp. ret. (d)			0.003
			(0.062)
Controls for expected return, exp. log earning Prob. of work and var. of log earning	No	Yes	Yes
Controls: GPA, fam. income and educ., sex, state FE	Yes	Yes	Yes
Observations	3342	3342	3342
Censored observations	1730	1730	1730
Log likelihood	−2991.555	−2987.575	−2978.676
Sample sel.: corr. between error	−0.321	−0.318	−0.315
Sample sel.: p-value	0.295	0.310	0.264

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, family income lowest tercile, interactions of tuition costs less than 750 pesos with family income and low expected return interacted with family income.

TABLE S.12. Excess responsiveness of the poor to changes in direct costs (tuition costs): total household income and wealth.

Dependent Variable:	*College Attendance*		
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)	(3) Marg. Eff. (SE)
Tuition > 750 ∗ fam. income/wealth Q1 (d)	−0.060	−0.063	0.028
	(0.059)	(0.059)	(0.088)
Tuition > 750 ∗ fam. income/wealth Q1 ∗ high exp. ret. (d)			−0.141*
			(0.080)
Tuition > 750 ∗ fam. income/wealth Q2 (d)	−0.093*	−0.097*	−0.066
	(0.053)	(0.053)	(0.073)
Tuition > 750 ∗ fam. income/wealth Q2 ∗ high exp. ret. (d)			−0.062
			(0.093)
Tuition > 750 ∗ fam. income/wealth Q3 (d)	−0.017	−0.016	0.017
	(0.058)	(0.058)	(0.081)
Tuition > 750 ∗ fam. income/wealth Q3 ∗ high exp. ret. (d)			−0.067
			(0.093)
Tuition > 750 ∗ fam. income/wealth Q4 (d)	−0.031	−0.035	−0.095
	(0.054)	(0.054)	(0.070)
Tuition > 750 ∗ fam. income/wealth Q4 ∗ high exp. ret. (d)			0.123
			(0.108)
Fam. income/wealth Q1 ∗ high exp. ret. (d)			0.008
			(0.081)
Fam. income/wealth Q2 ∗ high exp. ret. (d)			−0.049
			(0.072)
Fam. income/wealth Q3 ∗ high exp. ret. (d)			0.069
			(0.078)
Fam. income/wealth Q4 ∗ high exp. ret. (d)			−0.032
			(0.060)
Controls for expected return, exp. log earning Prob. of work and var. of log earning	No	Yes	Yes
Controls: GPA, fam. income and educ., sex, state FE	Yes	Yes	Yes
Observations	3342	3342	3342
Censored observations	1730	1730	1730
Log likelihood	−2995.767	−2993.140	−2982.624
Sample sel.: corr. between error	−0.318	−0.313	−0.282
Sample sel.: p-value	0.250	0.264	0.311

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, parents' education primary or less, lowest family income/wealth quartile, interactions of tuition costs less than 750 pesos with family income/wealth and low expected return interacted with family income/wealth quartiles.

TABLE S.13. Time preference of different per capita income categories: total household income.

	Total Family Income Category				
	Tercile 1 (low)	Tercile 2	Tercile 3	Compare	
	(1) Mean (SD)	(2) Mean (SD)	(3) Mean (SD)	(1)–(2) Diff. (p-Value)	(1)–(3) Diff. (p-Value)
Intertemp Behavior: Health					
Smoke	0.03	0.02	0.03	0.01	0.00
	(0.18)	(0.16)	(0.18)	(0.450)	(0.946)
Drink alcohol					
Yes	0.12	0.11	0.15	0.01	−0.03
	(0.33)	(0.31)	(0.36)	(0.511)	(0.111)
≥ 2/week	0.04	0.04	0.05	−0.00	−0.01
	(0.19)	(0.19)	(0.21)	(0.837)	(0.416)
How Use 3000 *Pesos?*					
Immediate consumption	0.16	0.19	0.21	−0.03	−0.05
(alternative: save/invest)	(0.36)	(0.39)	(0.41)	(0.136)	(0.024)
Observations	585	523	504		

Notes: Columns (1)–(3) display means and standard deviations in brackets. Columns (4) and (5) display the difference of (1)–(2) and (1)–(3), respectively, and the p-value of the difference in brackets.

TABLE S.14. Counterfactual policy experiments: total household income.

Policy Change:	Individuals Changing College Attendance Decision		Individuals Attending College	
	Change in Overall Attendance Rate in pp (in %) (p-Value)	*Marginal* Expected Return (MTE)	*Average* Expected Return (TTE)	*Diff.* $MTE - TTE$ (p-Value)
Decrease distance by 20 *km*				
For all	1 pp (4%) (p-value 0.04)	0.89	0.71	0.18 (0.17)
For very poor	0.4 pp (2%) (p-value 0.12)	0.88	0.71	0.16 (0.29)
For very poor and very able	0.2 pp (1%) (p-value 0.09)	0.90	0.71	0.19 (0.18)
Decrease tuition by 10%				
For all	0.3 pp (1.5%) (p-value 0.49)	0.85	0.71	0.14 (0.27)
For very poor	0.3 pp (1.5%) (p-value 0.28)	0.79	0.71	0.08 (0.40)
For very poor and very able	0.3 pp (1.5%) (p-value 0.29)	0.81	0.71	0.10 (0.36)

TABLE S.15. Determinants of college attendance including ability–return interactions.

Dependent Variable:	*College Attendance*	
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)
Expected return to college	0.118**	0.116**
	(0.050)	(0.050)
Exp. return ∗ GPA 2	−0.059	−0.061
	(0.074)	(0.071)
Exp. return ∗ GPA 3	−0.087	−0.081
	(0.074)	(0.071)
Prob. of work, sr. high school	0.004	0.010
	(0.081)	(0.078)
Prob. of work, college	0.034	0.025
	(0.093)	(0.090)
Var. of log earning, sr. high school	−3.063	−2.794
	(1.973)	(1.916)
Var. of log earning, college	0.212	0.033
	(2.180)	(2.106)
Female (d)	−0.046	−0.044
	(0.032)	(0.032)
GPA, second tercile (d)	0.097	0.102
	(0.063)	(0.063)
GPA, top tercile (d)	0.241***	0.233***
	(0.074)	(0.075)
Father's educ., jr. high school (d)	0.074*	0.079*
	(0.042)	(0.042)
Father's educ., sr. high school (d)	0.096	0.105
	(0.075)	(0.074)
Father's educ., univ. (d)	0.570***	0.564***
	(0.132)	(0.144)
Mother's educ., jr. high school (d)	0.073*	0.075*
	(0.039)	(0.039)
Mother's educ., sr. high school (d)	0.176*	0.175*
	(0.101)	(0.101)
Mother's educ., univ. (d)	0.215	0.225
	(0.206)	(0.207)

(*Continues*)

TABLE S.15. *Continued.*

Dependent Variable:	*College Attendance*	
	(1) Marg. Eff. (SE)	(2) Marg. Eff. (SE)
Distance to univ. 20–40 km (d)	−0.076***	−0.076***
	(0.029)	(0.028)
Distance to univ. ≥ 40 km (d)	−0.106***	−0.105***
	(0.031)	(0.030)
Tuition > 750 pesos (d)	−0.083**	−0.080**
	(0.039)	(0.038)
Per cap. income 5–10k (d)	0.054*	
	(0.031)	
Per cap. income ≥ 10k (d)	0.120***	
	(0.037)	
Total fam. income T2 (d)		0.026
		(0.028)
Total fam. income T3 (d)		0.061*
		(0.033)
Observations	3342	3342
Censored observations	1730	1730
Log likelihood	−2972.170	−2974.427
Sample sel.: corr. between error	−0.140	−0.069
Sample sel.: p-value	0.634	0.816

Notes: Table displays marginal effects and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded categories: male, lowest GPA tercile, father's and mother's education primary or less, lowest household income tercile, distance to university less than 20 km and tuition less than 750 pesos.

TABLE S.16. Time preferences: comparison between per capita income $\leq$ 5k, $\geq$ 5k, and $\leq$ 10k.

Dependent Variable:	Smoke (Yes/No)	Alcohol (Yes/No)	Alcohol ($\geq$ 2/week)	Immediate Consumption
Per cap. income < 5k	−0.001	0.014	0.012	0.002
	(0.010)	(0.019)	(0.012)	(0.023)
Female	−0.050***	−0.061***	−0.027**	−0.007
	(0.009)	(0.017)	(0.011)	(0.021)
Age	0.013***	0.019**	0.009**	0.023**
	(0.004)	(0.008)	(0.005)	(0.009)
Chiapas	−0.020	−0.066***	−0.006	−0.170***
	(0.012)	(0.023)	(0.014)	(0.027)
Guanajuato	−0.021	−0.102	−0.017	0.166
	(0.065)	(0.119)	(0.075)	(0.144)
Guerrero	0.012	0.003	0.034*	−0.095***
	(0.016)	(0.029)	(0.018)	(0.035)
Michoacan	0.005	0.230***	0.058***	−0.013
	(0.017)	(0.032)	(0.020)	(0.038)
Veracruz	0.015	−0.040	0.013	−0.055
	(0.016)	(0.030)	(0.019)	(0.036)
Observations	1340	1340	1340	1340
R-squared	0.032	0.080	0.019	0.039

Notes: Table displays coefficients and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded category: male. All regressions contain state fixed effects.

TABLE S.17. Time preferences: comparison between per capita income ≤ 5k and ≤ 10k.

Dependent Variable:	Smoke (Yes/No)	Alcohol (Yes/No)	Alcohol (≥ 2/week)	Immediate Consumption
Per cap. income < 5k	0.003	−0.035	0.012	−0.015
	(0.012)	(0.023)	(0.014)	(0.027)
Female	−0.044***	−0.084***	−0.039***	−0.005
	(0.010)	(0.019)	(0.012)	(0.022)
Age	0.012***	0.010	−0.000	0.007
	(0.004)	(0.009)	(0.005)	(0.010)
Chiapas	−0.002	−0.037	0.003	−0.188***
	(0.013)	(0.025)	(0.015)	(0.029)
Guanajuato	−0.006	0.097	−0.011	0.315*
	(0.075)	(0.146)	(0.089)	(0.171)
Guerrero	0.020	0.073**	0.073***	−0.094**
	(0.016)	(0.031)	(0.019)	(0.037)
Michoacan	0.022	0.233***	0.052**	−0.033
	(0.018)	(0.035)	(0.022)	(0.041)
Veracruz	0.009	−0.026	0.004	−0.091**
	(0.017)	(0.032)	(0.020)	(0.038)
Observations	1224	1224	1224	1224
R-squared	0.027	0.075	0.028	0.044

Notes: Table displays coefficients and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Excluded category: male. All regressions contain state fixed effects.

REFERENCES

Carneiro, P., J. J. Heckman, and E. Vytlacil (2010), "Evaluating marginal policy changes and the average effect of treatment for individuals at the margin." *Econometrica*, 78 (1), 377–394. [4]

Carneiro, P., J. J. Heckman, and E. Vytlacil (2011), "Estimating marginal returns to education." *American Economic Review*, 101 (6), 2754–2781. [4]

Heckman, J. J. and E. Vytlacil (2001), "Policy-relevant treatment effects." *American Economic Review: Papers and Proceedings*, 91 (2), 107–111. [5]

Heckman, J. J. and E. Vytlacil (2005), "Structural equations, treatment effects, and econometric policy evaluation." *Econometrica*, 73 (3), 669–738. [4]

Submitted March, 2012. Final version accepted August, 2013.