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*Programa Nacional de
Becas Estudiantiles
Impact Evaluation
Findings*

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INTRODUCTION AND BACKGROUND

In November 2003, President Kirchner of Argentina, along with the Minister of Education, Science and Technology, announced that the *Programa Nacional de Becas Estudiantiles* would make scholarships available to 350,000 economically vulnerable students during the 2003-2004 academic year. The *Becas* program targets youth ages 13-19 years, who are entering their 8th and 9th years of study in public schools (in the third cycle of the EGB, or *Educacion General Basica*) and are at risk of leaving school before completing their education. The primary objectives of the program are to support the retention, promotion and graduation of students in the EGB, thus increasing educational attainment and promoting human capital development among Argentine youth.

The *Programa Nacional de Becas Estudiantiles* aims to achieve these objectives through the provision of scholarships (in the form of bi-annual payments to the families of participating youth), conditional on the students' school attendance and annual grade progression. Each annual scholarship totals 400 *pesos*, paid in two equal installments of 200 pesos each (during May and September). Eligible students come from families with a monthly total income less than 500 pesos and who do not receive any similar benefit from another organization. Recruitment of the most recent cohort of *Becas* beneficiaries began in March 2004.

The *Programa Nacional de Becas Estudiantiles* began in the late 1990s and was identified as one of the priority social programs meriting support and protection following the 2001 economic emergency in Argentina. Statistics from Inter-American Development Bank (IDB) documents indicate that although nearly all children ages 6-13 years have access to primary school, only three-fourths of them complete nine years of basic education, and only half make it to the last year of high school.¹ Furthermore, there are large discrepancies in who completes high school by household income. As of 1999, only 27% of 19-20 year olds in the lowest quintile of household income completed high school, whereas the comparable number for those in the top income quintile was 83%.

The Argentine government and IDB were concerned that the economic crisis would increase student dropout rates, given the out-of-pocket costs of children's school attendance—i.e., school supplies, clothing, transportation, etc.—that further strain tight family budgets in difficult economic times. Thus, the *Programa Nacional de Becas Estudiantiles* was designated for protection in the most recent loan package to the national government of Argentina, with a goal of reaching approximately one quarter of indigent children ages 13-18 years. The cost of the 2003 *Becas* program (scholarships and operations) has been estimated at \$46 million USD.²

¹ Loan proposal: Program for Social Protection and Mitigation of the Impact of the Crisis on the Poor, AR-0295.

² Argentina Plan de Emergencia Social, April 10, 2003.

I. IMPACT EVALUATION: OBJECTIVES AND STRATEGY

- 1.1 One of the conditions of the IDB loan to the Argentine national government in support of the priority social programs was a commitment (on behalf of the Argentine government) to a plan for monitoring the effectiveness of these programs in targeting benefits, delivering services, and improving health and educational outcomes for the poor. Although ex-post impact evaluations of these programs were not mandatory, in the case of the *Programa Nacional de Becas Estudiantiles*, the availability of baseline data on program applicants and other administrative data, along with modest supplementary resources for additional data collection, has made an ex-post impact evaluation possible. The *Becas* program evaluation team includes IDB officials; principal investigators and staff of the *Universidad Nacional de Tres de Febrero* (UNTREF), *Centro de Investigaciones en Estadística Aplicada* (CINEA); and consultants to the IDB. The evaluation team began work on the *Becas* program evaluation in July 2003.
- 1.2 In accord with the primary program objectives, the evaluation team identified the following key student outcomes of interest in the impact evaluation: student attendance (retention) in school, absences, grade repetition, school completion rates, labor force participation and performance in school. Other outcomes of interest are the students' perceptions of the effects of receiving the scholarship on their behavior and their weekly hours of work inside and outside of the household.
- 1.3 Since a random assignment evaluation strategy was not feasible, the evaluation approach takes advantage of the fact that approximately one half of the students determined eligible to receive the *Programa Nacional de Becas Estudiantiles* in 1999 were excluded due to quota restrictions that limited the number of *Becas* beneficiaries by school. In statistical terms, the exclusion by quotas proxies random assignment and acts as an instrument for creating equivalent treatment and control groups. There is also natural variation in the treatment received, in particular, in the number of years students received the scholarship, to use in identifying program impacts.
- 1.4 Retrospectively, the evaluation team constructed a treatment group of *Becas* beneficiaries and a comparison group of students who were identified as eligible for the program but did not receive the scholarship in 1999 from the 1999 cohort of students entering the 8th grade. Members of the evaluation team then went into the schools and obtained the individual student records for the treatment and comparison group members, from 1999 through 2003, to use in constructing the student outcome measures. In addition, a follow-up survey was administered in the spring of 2004 to collect data comparable to that obtained in the baseline survey and to gather supplemental information about the *Becas* students' experience with and perceived effects of the *Programa Nacional de Becas Estudiantiles*.
- 1.5 The details of the sampling strategy, data collected and methodological approach to the analysis are described below.

II. SAMPLES AND DATA

2.1 The three main sources of data used in the evaluation are:

- Baseline survey—*Encuesta de Los Aspirantes de Becas*—completed by all students and their families at the time that they apply for the scholarship program.
- School administrative records on student attendance, retention, grade repetition, grade completion and average performance (course grades) obtained for students in the evaluation, 1999-2003.
- Follow-up survey administered in 2003 to the *Becas* beneficiaries and comparison group of non-beneficiaries in the evaluation.

2.2 The baseline data were used to construct the treatment and comparison groups. By 1999, there were approximately 300,000 applicants to the *Becas* program, 240,000 of whom were determined eligible for the scholarship. Of these 240,000, 120,000 students were excluded from participating due to the quotas. A random stratified sample of these cases (from among the 8th grade eligible students) was selected to form the treatment and comparison groups.

2.3 The sample selection criteria included:

- a. Geographical area/locality: 8 provinces were chosen to represent the diverse geographical areas of Argentina.
- b. A total of 24 schools were selected from within these eight provinces.
 - i. The total number of *Becas* beneficiaries and eligible students who were not *Becas* beneficiaries had to be large enough to permit random sample selection within the schools (a minimum of approximately 200 beneficiaries/200 eligible non-beneficiaries).
 - ii. Within the provinces, at least one district with a high ratio of program participation to demand for the benefit was chosen, and one district with a low participation/demand ratio (suggesting higher levels of need) was selected.
 - iii. Approximately equal numbers of “cabecera” and “non-cabecera” schools were selected.
 - iv. The schools selected were clustered within the provinces to make data collection cost-effective.
- c. Following sample selection according to the above criteria, the ratio of *Becas* beneficiaries (treatment group) to non-beneficiaries (comparison group) was approximately 2:1.

Table 1 shows the distribution of treatment and comparison group members by schools within provinces.

- 2.4 Following the definition/selection of treatment and comparison group members, the evaluation team went to the 24 schools to recover the administrative data (school records) for each of the 3490 students in the evaluation. The school records included the following information: student ID number in school registrar, school year, most recent home address, continuation in school, left for another school, left the school registrar (e.g., discontinued studies), courses in school, completion of course material, course grades, absences, sanctions, and repetitions. The availability of the entirety of this information varied from school to school. Student registration information was complete for two-thirds of all the students (ranging from 29.9% to 98.6% complete across the provinces).³
- 2.5 The follow-up survey, Encuesta para los Aspirantes 1999 y su Grupo Conviviente Evaluacion 2004, was administered early in 2004. A total of 2,586 students and their families completed the survey (see Table 2). The ratio of *Becas* beneficiaries (treatment group) to non-beneficiaries (comparison group) among the survey respondents was consistent with the full sample at approximately 2:1. The follow-up survey data include information similar to that collected in the baseline survey to allow for pre- to post-program comparisons of student behavior and family background (education, income, housing conditions, labor force participation, etc.), as well as additional information about the students' receipt of the *Becas* and their opinions about the effects of the program.
- 2.6 Data from the three major sources described above were linked to facilitate analyses for the impact evaluation. The assembly of these data was completed by the Universidad Nacional de Tres de Febrero (UNTREF), Centro de Investigaciones en Estadística Aplicada (CINEA) and is carefully and thoroughly documented in two major reports: Evaluación del Impacto del Programa Nacional de Becas Estudiantiles: 1º Informe de Avance (December 31, 2003) and Evaluación del Impacto del Programa Nacional de Becas Estudiantiles: 2º Informe de Avance (February 15, 2004).

Sample verification

- 2.7 Prior to undertaking an econometric analysis of program impacts, the samples of treatment and comparison group members were compared, and their status as *Becas* beneficiaries or non-beneficiaries was verified with administrative data and information from the follow-up survey.
- 2.8 The administrative data show that a total of 3416 annual scholarships were given to 2500 beneficiaries in the selected sample areas. Tracking these beneficiaries from year to year (see below), it is clear that few received the *Becas* scholarship in every year.

³ See the report by UNTREF-CINEA, December 31, 2003: Evaluación del Impacto del Programa Nacional de Becas Estudiantiles: 1º Informe de Avance.

Tracking <i>Becas</i> Beneficiaries, 1999-2002*			
Beneficiary 1999	Beneficiary 2000	Beneficiary 2001	Beneficiary 2002
New: 1925	Continuing: 580	Continuing (from 1999): 160	Continuing (from 1999): 33
	New: 340	Continuing (from 2000): 133	Continuing (from 2000): 10
		New: 208	Continuing (from 2001): 0
			New: 27
Total 1999: 1925	Total 2000: 920	Total 2001: 501	Total 2002: 70

*Data on the 2003 beneficiaries was collected in the follow-up survey.

- 2.9 Although treatment group contamination (i.e., comparison group members who received the *Becas* scholarship) is not evident in the administrative data, individual reports from the follow-up survey indicate that some in the comparison group may have received the scholarship. Specifically, 62 follow-up survey respondents (in the comparison group) reported receiving the *Becas* scholarship in 1999; 58 said they received the scholarship in 2000; 37 reported receiving it in 2001, and 44 comparison group members said they received the scholarship in 2002. In all, there were 157 separate cases in the comparison group who reported receiving the *Becas* scholarship in at least one year (for a total of 201 scholarships).
- 2.10 If these 157 cases are moved from the comparison group (as originally defined) to the treatment group, the total number of treatment group members increases from 2340 to 2497, which more closely approximates the total number of beneficiaries (2500) as estimated by the analyses above.
- 2.11 Comparisons of the baseline characteristics of treatment and comparison group members (both with and without the 157-case sample adjustment) are shown in Tables 3 and 4. The differences between treatment and comparison group members that are statistically significant at the $\alpha=0.01$ level (with 99% confidence) are shown in bold in these tables. It is apparent that the sample adjustment has little effect on these comparisons. It is also clear, however, that there are important differences in the baseline characteristics of the treatment and comparison group members; in other words, they are not statistically equivalent (as expected if the quotas had randomly assigned eligible students to receive the *Becas* scholarship or to not receive it.) In particular, there are statistically significant differences between the treatment and comparison group members in terms of their family income per capita, number of household members, number of dependents under age 18, living conditions, overcrowding, work inside the home, and a measure of risk/vulnerability.
- 2.12 A third comparison was made to determine if the treatment comparison group members for which follow-up survey data were available differed from those who did not respond to the survey. Follow-up survey responses were missing from 581 treatment group members and 323 comparison group members (see Table 5). In general, the differences between those with and without follow-up survey data are small, although some of these

differences are statistically significant. These results suggest that impact analyses using the follow-up survey data should control for the differences between these two groups.

- 2.13 Finally, it is also important to note that there are some discrepancies between students who are identified as *Becas* beneficiaries in a given year and these students/families' reports that they did not receive the cash benefit in that same year. Among the treatment group, 259 reported not receiving the scholarship in 1999; 285 said they did not receive the scholarship in 2000; 175 indicated that they did not receive the benefit in 2001, and 21 treatment group members said they did not receive the *Becas* in 2002. It is speculated that some of these reports of non-receipt simply reflect administrative delays in the administration of the *Becas* program and the delivery of the subsidies, (i.e., the subsidy is in fact received, but at a later time.) Nonetheless, these discrepancies have implications for the impact analysis. In the econometric analysis (discussed below), a variable is created that defines the number of years the *Becas* scholarship was received by students and their families based on the student/family reports.

III. ANALYSIS OF PROGRAM IMPACTS

- 3.1 The data analysis findings presented in this report focus on the key student outcomes described earlier: student attendance/retention, absences, grade repetition, completion of third-cycle EGB, student performance in school and labor force participation. The analysis began with some simple descriptive comparisons of the outcomes of treatment and comparison group members. The key outcome variables and other measures used in the analysis are briefly described below and in greater **detail in Appendix A.**

Measures of treatment status

- 3.2 Three alternative measures of treatment group status were used in the analysis:
- Treatment indicator=0 if a member of the comparison group of non-beneficiaries
=1 if identified as a *Becas* beneficiary in administrative data;
 - Scholarship receipt=0 if no scholarship was received in any year
=1 if received the *Becas* scholarship 1 year only
=2 if received the *Becas* scholarship 2 or more years
 - # Scholarship years=0 if no scholarship was received in any year
=1 if received the *Becas* scholarship 1 year only
=2 if received the *Becas* scholarship 2 years
=3 if received the *Becas* scholarship 3 years
=4 if received the *Becas* scholarship 4 years
=5 if received the *Becas* scholarship 5 years
- 3.3 The first treatment group indicator is based on the identification of treatment and comparison group members through the sample selection process, with the adjustment made for comparison group members who reported that they received the *Becas* scholarship in at least one year (i.e., 2497 treatment group members and 993 comparison

group members). The second and third measures of the number of years the *Becas* scholarship was received by the students and their families are based on administrative records and the follow-up survey questions (that ask if the *Becas* scholarship was received in each year, 1999-2003). These data do not include information for the 904 cases with missing data in the follow-up survey. The reported frequencies are (based on n=2586):

No receipt of the <i>Becas</i> scholarship	Count=863	33.37%
Received the <i>Becas</i> 1 year only	893	34.53
Received the <i>Becas</i> 2 years	485	18.75
Received the <i>Becas</i> 3 years	196	7.58
Received the <i>Becas</i> 4 years	92	3.56
Received the <i>Becas</i> 5 years	57	2.20

- 3.4 After accounting for the 581 cases in the treatment group with missing follow-up data, the reported receipt of the *Becas* scholarship by 1723 students is still slightly less than 1916 (the number of treatment group members with complete data). As indicated earlier, some of this discrepancy might be explained by known administrative delays in the processing and delivery of the scholarships. In light of these discrepancies, multiple measures of treatment group status are used in the statistical analysis of program impacts.

Outcome measures

- 3.5 Since the primary objective of the *Programa Nacional de Becas Estudiantiles* is to increase the number of poor students completing school (i.e., attending school a full five years from 8th grade to 12th grade), the key outcome measure used in the econometric analysis of program impacts is based on the students' school attendance records and reported attendance in the follow-up survey. From these data, a measure was constructed that indicates for each year (1999-2003) if the students attended school all of the year; if they began school and then left that year, or if they did not attend school at all in a given year. From this measure, the primary dependent variable in the analysis—the number of years attended a full school year—was created. A frequency table of this variable (for the 2586 cases with complete data) shows the following:

Did not attend a full year of school any year	Count=56	2.17%
Attended 1 full year of school	195	7.54
Attended 2 full years of school	244	9.44
Attended 3 full years of school	243	9.40
Attended 4 full years of school	334	12.92
Attended 5 full years of school	1514	58.85

- 3.6 A cross-tabulation and chi-square test of the number of years attended a full school year by the (0/1) treatment group indicator showed that members of the treatment group were significantly more likely ($p < .0001$) to attend 5 full years of school (see below). There is also a strong, statistically significant ($p < .0001$) and positive association between the

number of years the *Becas* scholarship was received and the number of years students attended a full school year.

Number of years attended full school year							
	0	1	2	3	4	5	Total
Comparison Group	25 3.73%	73 10.90%	70 10.45%	68 10.15%	80 11.94%	354 52.84%	670 25.91%
Treatment Group	31 1.62%	122 6.37%	174 9.08%	175 9.13%	254 13.26%	1160 60.54%	1916 74.09%
Total	56 2.17%	195 7.54%	244 9.44%	243 9.40%	334 12.92%	1514 58.55%	2586 100.0%

3.7 Of course, the above numbers are simple descriptive statistics that don't take into account the observed differences between the treatment and comparison groups. If the observed differences between those who received the *Becas* and those who did not are not correlated with the students' selection into the program and student outcomes, then a simple linear control function (regression) model should produce unbiased estimates. However, even with quotas operating to exclude eligible students (who form the comparison group), it is a strong assumption to make that any estimated differences in outcomes would not be due to the selection process. Thus, in addition to the estimation of ordinary least squares (OLS) regressions, propensity score matching methods are used to adjust for pre-treatment differences between the *Becas* beneficiaries and non-beneficiaries. A large and growing literature on the use of econometric matching methods explores and challenges Rosenbaum and Rubin's (1983) early result that matching on the propensity score (i.e., the estimated probability of program participation) removes all bias associated with pre-treatment differences between the treatment and comparison groups, as long as there are no unobservable variables that influence selection into the program and the estimated outcomes (Imbens, 1999, 2004; Mueser, Troske and Gorislawsky, 2003; Heckman and Navarro-Lorenzo, 2004).

Econometric analysis of program impacts

3.8 The baseline measures used in estimating the probability of treatment or *Becas* scholarship receipt (the propensity scores) include: student age at application, household income per capita, number of household members, number of dependents under age 18, index of household living conditions, index of overcrowding (persons per room), distance to school, hours of work per day outside the home, number of days worked per week outside the home, hours per day in work in the home, number of days worked per week in the home, index of socioeconomic vulnerability, and province indicators. These variables are described in greater detail in Appendix A. The same set of variables is used in the linear control function (OLS) models to control for observable differences between the treatment and comparison group members.

3.9 Five different sets of propensity scores are estimated to use in calculating five measures of program impacts on student school attendance/completion (i.e., in statistical terms, the average treatment effect on the treated):

1. Treatment group members (n=1916) matched with comparison group members (n=670) (using the first treatment group status measure described earlier)
 2. Treatment group members with only 1 year of *Becas* scholarship receipt (n=893) matched with comparison group members reporting no *Becas* scholarship receipt (n=863)
 3. Treatment group members with 2 years of *Becas* scholarship receipt (n=830) matched with comparison group members reporting no *Becas* scholarship receipt (n=863)
 4. Treatment group members with 3 or more years of *Becas* scholarship receipt (n=345) matched with comparison group members reporting no *Becas* scholarship receipt (n=863)
 5. Treatment group members with 2 or more years of *Becas* scholarship receipt (n=830) matched with treatment group members reporting only 1 year of *Becas* scholarship receipt (n=893)
- 3.10 The results of propensity score estimation predicting participation for any treatment (1 to 5 years of scholarship receipt) versus no treatment, and receipt of *Becas* scholarship for 2 or more years versus only 1 year of treatment (including only treatment group members), are shown in Appendix B, along with additional information about the matching method employed in these analyses. The results from predicting any scholarship receipt (the first model) show that older children were significantly less likely to be *Becas* scholarship recipients, which is consistent with the goal of the program to intervene early in the third cycle of the EGB (i.e., at the time of entry to high school) and with subsequent findings that the duration of scholarship receipt was relatively short for many. Also consistent with the explicit selection criteria, those who scored higher on the index of need (i.e., suggesting greater need or higher risk of not completing school) were significantly *more* likely to receive the *Becas* scholarship; in terms of log-odds ratios, for each additional point higher on the need score, a student was 35.5 percent more likely to receive a scholarship. Those students from families with per capita incomes below 45 pesos per month were also more likely to participate (significant at $\alpha=0.06$), although after controlling for the index of need and those with the lowest incomes, the relationship between income and participation reversed (i.e., students from families with lower per capita incomes were less likely to participate). It should also be noted that students in Buenos Aires (the omitted province in the propensity score model) were more likely to be scholarship recipients than students from other provinces in the samples, while those who lived farther away from school were significantly less likely to participate.
- 3.11 Table 6 summarizes the results of the econometric analyses estimating the impact of the program on student attendance. Comparing the matching and OLS estimates, there is only one substantive difference in the interpretation of the model findings across these two methods. In the first comparison of all treatment group members with comparison group members (non-beneficiaries), the matching analysis results show no statistically significant difference (no impact) of the program on the number of years students attended the full school year. The OLS regression results, on the other hand, suggest a

statistically significant, positive average effect of the *Becas* program (0.441 of a year). It is worth noting that the matching analysis in this comparison drops more than 10% of the treatment group because of the lack of a common support (no close match in the comparison group for these cases). The subsequent comparisons are based on a more precise match that takes into consideration the important variation in the number of years the *Becas* scholarship was received by treatment group members.

- 3.12 The other econometric results in Table 6 show the estimated effects of receiving 1 year of the scholarship vs. no scholarship, 2 or more years of the *Becas* scholarship vs. no scholarship, 3 or more years of the *Becas* scholarship vs. no scholarship, and 2 years or more years of the *Becas* scholarship vs. just 1 year of the scholarship. Due to the relatively small number of treatment group members receiving more than 3 years of the *Becas* scholarship, matching analyses were not separately estimated for those students who received the *Becas* for 4 or 5 years.
- 3.13 The results of these analyses all show statistically significant average impacts of the *Becas* scholarship program on the recipients. As one would expect, the average impact is largest for those students receiving the *Becas* for 3 or more years. They gain nearly $\frac{3}{4}$ of a year in full school year attendance compared to those who do not receive the *Becas*. Students who receive the *Becas* scholarship for 2 years gain about 0.40 of a year in full school year attendance compared to those who do not receive the *Becas*. The conservative average impact estimate of receiving just 1 year of the *Becas* scholarship (vs. no *Becas* scholarship) is about 0.2 year in full school year attendance.
- 3.14 The comparison of treatment group members who reported receiving 2 or more years of the *Becas* scholarship with those who received only 1 year of the scholarship confirms that the impact of an additional year of the *Becas* might be even greater among those who stay in the program. The matching and OLS estimates are the same for this average impact estimate, suggesting that students who continue in the *Becas* program for a second year or more gain nearly $\frac{1}{2}$ year more in full school attendance (beyond the impact of the first year).⁴
- 3.15 *Academic performance.* Two measures of student academic performance are available for each school year (from school records): students' average grades in their coursework and grade repetition.⁵ Propensity score matching methods were used to estimate the average and marginal impacts of the *Becas* program on these academic performance outcomes. The results of the analyses are shown in Table 7. A large number of cases (up to one-third) were excluded from the average impact estimation due to a lack of common support (i.e., poor matches).

⁴ In general, the comparability of the average impact estimates across these two methods of analysis (matching and OLS) suggests that the set of variables used in the propensity score estimation do well in accounting for selection into the program.

⁵ Within the cohort of students in this study (that began the *Becas* program in 1999), these academic performance data are available for fewer students each year, in part because some of these students leave school, but also in part due to information missing from the student records.

- 3.16 The findings in Table 7 suggest that participation in the *Becas* program contributed to significantly reduced grade repetitions and increased student grade averages in nearly every year, 1999-2002. The sizes of the estimated average impacts are fairly consistent from year to year, although no average impacts on students' grades are found for the years 2001 and 2002. This latter finding is not unexpected, given that about one half of all of the treatment group members received the scholarship in only one year (i.e., 1999 or 2000).
- 3.17 The results of the marginal impact estimation in Panel B show that the *Becas* program reduced grade repetitions and contributed to significant increases in the scholarship recipients' grade averages. The probability of repeating a grade was reduced by about 0.05-0.08 in the years 1999, 2000 and 2001 (with no significant marginal impacts found in 2002). The marginal impact of the *Becas* program on students' grade averages was also not trivial. Looking across the years, grades appeared to increase by about 0.14-0.17 of a point with receipt of the scholarship for more than one year (with a median grade average of approximately 7.28 for students over this period).
- 3.18 *Absences from school.* Pre-program data were available on the number of student absences from school in the year prior to their application to the *Becas* program. Student records also indicated the number of absences for four years of the *Becas* program, 2000-2003. Simple descriptive statistics of these measures for *Becas* beneficiaries and comparison group members show no statistically significant differences between these two groups in the average number of absences (see below). However, for both groups, there are large differences in the pre-program versus during program averages, suggesting that the data collected before the program may not be the same as those collected during the program. It is possible that the pre-program measure—self-reported in the baseline survey that assessed eligibility—understates the true number of absences. Perhaps more problematic, though, is the extent of missing information on absences in the students' school records, with subsequent sample sizes about one-fourth the size of the baseline sample.

Number of student absences Year and number of students	Mean	Median	Std. Dev.	Minimum	Maximum
Pre-program – <i>Becas</i> beneficiaries (n=1915)	1.76	0	4.80	0	89
Comparison group (n=670)	1.38	0	3.52	0	25
2000 – <i>Becas</i> beneficiaries (n=516)	12.06	10	12.18	0	202
Comparison group (n=94)	13.39	12	8.72	1	35
2001 – <i>Becas</i> beneficiaries (n=409)	13.35	12.5	8.74	0	70
Comparison group (n=63)	12.53	11	8.04	1	32
2002 – <i>Becas</i> beneficiaries (n=406)	14.15	13	9.03	0	49
Comparison group (n=57)	12.79	11	7.94	1	35
2003 – <i>Becas</i> beneficiaries (n=296)	16.30	13	12.42	0	52
Comparison group (n=34)	12.21	9	11.87	0	54

- 3.19 Propensity score matching analyses to compare student absences among the *Becas* beneficiaries and comparison group members for each of the years following the introduction of the *Becas* program were also conducted. Not surprisingly, large numbers

of students were not on the “common support,” i.e., excluded due to poor matches, and thus, the sample sizes for these estimations were even smaller, (e.g., only 308 beneficiaries matched to the 94 comparison group members in 2000). The matching analyses likewise showed no statistically significant differences in the number of absences among *Becas* beneficiaries versus the nonbeneficiaries during these years (2000-2003).

3.20 *Program effects on youth labor force participation.* The baseline survey of *Becas* program applicants inquired about youths’ work inside and outside the home, including the number of days they worked per week and the number of hours per day they worked. On the follow-up survey, there is only one measure of labor force participation that is comparable to the measures collected at baseline. The follow-up measure is a categorical measure of the number of hours worked per week *outside the home*, (i.e., 10 hours or less, 11-20 hours, 21-30 hours, 31-40 hours, or greater than 40 hours). A similar measure was constructed from the baseline data, and students’ work participation outside the home at baseline was compared to their work participation outside the home at follow-up. This simple comparison is shown in the table below.

Number of hours worked outside the home per week	Pre-program (baseline) <i>Frequency and percent</i> N=2572		Follow-up <i>Frequency and percent</i> N=2586	
	Treatment <i>(Becas)</i>	Comparison group	Treatment <i>(Becas)</i>	Comparison group
10 hours or less	1879 (98.6%)	663 (99.4%)	1386 (72.3%)	507 (75.7%)
11-20 hours	23 (1.2%)	3 (0.5%)	107 (5.6%)	30 (4.5%)
21-30 hours	0	0	77 (4.0%)	23 (3.4%)
31-40 hours	2 (0.1%)	1 (0.2%)	86 (4.5%)	25 (3.7%)
Greater than 40 hours	1 (0.05%)	0	260 (13.6%)	85 (12.7%)

3.21 A chi-square test was performed to assess if the differences observed between treatment and comparison group members at baseline in the number of hours worked outside the home were statistically significant; a chi-square test was also performed to test for differences between treatment and comparison group members at follow-up. Both of these tests showed no statistically significant differences between *Becas* program participants and comparison group members in labor force participation (p-values=0.352, 0.510, respectively)—no differences at either the pre-program or post-program points of measurement. However, what is apparent is that the distribution of responses at baseline is very different from that at follow-up in the number of hours worked. It is possible that the pre-program and follow-up measures of work outside the home are not the same (or at least that they were not interpreted in the same way by survey respondents). It is also plausible that the higher reported number of hours worked at follow-up reflect in part the fact that these students are now older and have greater labor force participation opportunities.

IV. SUMMARY OF EVALUATION FINDINGS

- 4.1 This nonexperimental evaluation of the *Programa Nacional de Becas Estudiantiles* in Argentina examined the program's impact on students' attendance (retention) in school, completion of the third cycle of EGB, their academic performance and work outside the home. In addition, students' perceptions of the effects of receiving the scholarship on their behavior were also reported.
- 4.2 Because there was considerable variation in the number of years students received the *Becas* scholarship, it was important to distinguish among those in the treatment group who received the scholarship just one year versus two years or three to five years in assessing the program's impact on school attendance and retention. Indeed, the results showed that the average impact of the program on school attendance is largest (and statistically significant) for students who received the *Becas* scholarship for 3 or more years. They attended school for nearly $\frac{3}{4}$ of a year longer than students who did not receive the *Becas* scholarship. The impacts of receiving the *Becas* scholarship for students who received it for 2 years and for just 1 year were also statistically significant. Students receiving the scholarship for 2 years gained about 0.4 of a year in schooling completed, and those receiving it for just 1 year gained about 0.2 of a year, (compared to those with no *Becas* scholarship).
- 4.3 It was also important to determine if students were performing better in school due to receipt of the *Becas* scholarship. The measures of academic performance used in the statistical analysis were the average grade across all subjects for a given academic year and grade repetition. Given the potential for selectivity in both student retention and in grades reported, matching methods were used to estimate the *Becas* program's impact on student performance. Students were matched within each academic year (*Becas* beneficiaries and non-beneficiaries), and the statistically-adjusted differences were computed. The results of these analyses showed statistically significant *Becas* program impacts on students' performance, as measured by their average course grades and grade repetition. Econometric analyses of other academic outcomes such as student absences were limited by missing data in administrative (school) records for the students. In addition, separate pre-program and post-program comparisons showed no statistically significant differences in the amount of work *Becas* beneficiaries and non-beneficiaries performed outside the home.
- 4.4 In summary, the Programa Nacional de Becas Estudiantiles has had the largest impact on exactly the dimensions of students' educational trajectories that one would expect given the conditions placed on receipt of the scholarship (i.e., school attendance and annual grade progression requirements): it has significantly increased student attendance, reduced grade repetition, and improved students' performance in school. Furthermore, if more of the students receiving the scholarship participated for multiple (consecutive) years, it is likely that the program's impact could be appreciably augmented. Therefore, the primary recommendation for the Inter-American Development Bank and Argentina's Ministry of Education, Science and Technology based on this evaluation is to increase the

number of students receiving the Becas scholarship for more than one year, with 3-5 years of consecutive Becas scholarship receipt for each participating child as a goal.

Table 1: Distribution of treatment and comparison group members by schools and provinces				
Province	School	Treatment group	Control group	Total
<i>Salta</i>	506	111	97	208
	594	109	88	197
	Total	220	185	405
<i>Cuiudad de Buenos Aires</i>	128	161	93	254
	134	98	65	163
	355	128	66	194
	361	161		161
	Total	548	224	772
<i>Entre Ríos</i>	961	51	20	71
<i>Mendoza</i>	356	93	33	126
	366	75	42	117
	908	84	169	253
	Total	252	244	496
<i>Santa Fe</i>	350	78	22	100
	392	57	9	66
	400	100	63	163
	1737	119	29	148
	2153	85	47	132
	Total	439	170	609
<i>Tucumáan</i>	308	106	73	179
	778	111	24	135
	779	181	39	220
	Total	398	136	534
<i>Corrientes</i>	320	73	39	112
	325	61	13	74
	1116	141	35	176
	Total	275	87	362
<i>Córdoba</i>	220	49	32	81
	1238	67	31	98
	1255	40	22	62
	Total	156	85	241

Table 2: Follow-up survey—Encuesta para los Aspirantes 1999—respondents		
Province/geographical area	Number of respondents	Cases without follow-up data
<i>Córdoba</i>	191	49
<i>Corrientes</i>	329	33
<i>Mendoza</i>	323	173
<i>Paraná</i>	61	10
<i>Cuiudad de Buenos Aires</i>	457	306
<i>Rosario</i>	280	81
<i>Salta</i>	288	117
<i>Santa Fe</i>	170	78
<i>Tucumáan</i>	493	41
Total and %	2592 (74.5%)	888 (25.5%)

Table 3: Comparison of treatment and comparison group members (no sample adjustment)					
Treatment group N=2340 Comparison group N=1150					
Variable	Mean-Treatment	Mean-Comparison	Std. Dev. (*Unequal var)	Std. Dev.-Comparison	P-Value
Age	14.13	14.11	1.06	1.06	0.524
Gender (% female)	52.7%	52.1%			0.719
Income per capita	6.34	5.51	1.83	1.80	<0.0001
Number of household members	5.49	4.82	1.96	1.67	<0.0001
Number of dependents (age 19 or under)	4.67	3.50	2.15*	1.60	<0.0001
Living conditions index	2.07	1.89	0.87*	0.65	<0.0001
Index of overcrowding	2.23	1.50	1.70*	1.02	<0.0001
Distance to school center	2.06	1.98	0.87	0.83	0.015
Index of weekly work	1.06	1.04	0.37*	0.32	0.069
Index of work outside the home	1.10	1.06	0.65*	0.51	0.043
Index of work inside the home	2.28	2.12	1.39	1.36	0.001
Daily hours in home tasks	1.81	1.70	0.75*	0.67	<0.0001
Index of precariousness	39.13	34.96	5.44*	3.02	<0.0001

Table 4: Comparison of treatment and comparison group members (with sample adjustment)†					
Treatment group N=2497 Comparison group N=993					
Variable	Mean-treatment	Mean-comparison	Std. Dev. (*Unequal var)	Std. Dev.-Comparison	P-value
Age	14.12	14.14	1.06	1.06	0.701
Gender (% female)	53.1%	51.2%			0.309
Income per capita	6.28	5.53	1.83	1.83	<0.0001
Number of household members	5.47	4.88	1.94*	1.68	<0.0001
Number of dependents (age 19 or under)	4.61	3.46	2.13*	1.60	<0.0001
Living conditions index	2.05	1.86	0.83*	0.64	<0.0001
Index of overcrowding	2.19	1.48	1.68*	0.97	<0.0001
Distance to school center	2.05	2.00	0.87	0.84	0.169
Index of weekly work	1.06	1.05	0.36*	0.33	0.263
Index of work outside the home	1.10	1.06	0.64*	0.52	0.126
Index of work inside the home	2.26	2.14	1.39	1.37	0.016
Daily hours in home tasks	1.79	1.71	0.74*	0.69	0.002
Index of precariousness	38.88	34.93	5.41*	3.00	<0.0001

†Cases in the original comparison group who reported in the follow-up survey that they received the *Becas* in at least one year (1999-2003) were reassigned to the treatment group (i.e., n=157 cases changed treatment status).

Table 5: Comparison of cases with and without missing follow-up survey data					
Total number of cases with missing follow-up data: 904					
Treatment group: 581 (24.8%)					
Comparison group: 323 (28.1%)					
Variable	Mean	Mean-Missing	Std. Dev. (*Unequal var.)	Std. Dev.-Missing	P-Value
Age	14.10	14.21	1.05	1.07	0.006
Gender (% female)	52.1%	53.8%			0.386
Income per capita	6.16	5.81	1.77*	2.08	<0.0001
Number of household members	5.38	4.97	1.86	1.96	<0.0001
Number of dependents (age 19 or under)	4.34	4.11	2.02*	2.17	0.006
Living conditions index	1.99	2.01	0.76*	0.95	0.483
Index of overcrowding	1.95	2.10	1.53	1.61	0.016
Distance to school center	2.02	2.08	0.85*	0.90	0.072
Index of weekly work	1.05	1.07	0.34*	0.40	0.198
Index of work outside the home	1.08	1.11	0.58*	0.67	0.204
Index of work inside the home	2.21	2.28	1.38	1.40	0.206
Daily hours in home tasks	1.80	1.82	0.72	0.74	0.999
Index of precariousness	37.61	38.18	5.07*	5.42	0.005
Becas beneficiary in 1999, 2000, 2001 or 2002	68.02%	64.27%			0.039

Table 6: Econometric matching and OLS regression analysis results: Impacts of Programa Nacional de Becas Estudiantiles on number of years attended full school year		
Treatment/comparison groups	Matching analysis impact estimates (standard errors in parentheses)	OLS regression impact estimates (standard errors in parentheses)
Treatment group members (n=1916) vs. comparison group members (n=670)	0.216 ^a (0.078) ^d	0.441* (0.064)
Treatment group members with only 1 year of Becas scholarship receipt (n=893) vs. comparison group members reporting no Becas scholarship receipt (n=863)	0.197 ^{b*} (0.094)	0.328* (0.071)
Treatment group members with 2 years of Becas scholarship receipt (n=485) vs. comparison group members reporting no Becas scholarship receipt (n=863)	0.409 ^{b*} (0.083)	0.504* (0.084)
Treatment group members with 3 or more years of Becas scholarship receipt (n=345) vs. comparison group members reporting no Becas scholarship receipt (n=863)	0.707 ^{c*} (0.133)	0.795* (0.098)
Treatment group members with 2 or more years of Becas scholarship receipt (n=830) vs. treatment group members reporting only 1 year of Becas scholarship receipt (n=893)	0.481 ^{b*} (0.075)	0.482* (0.059)

^a 183 treatment group members are not on the common support (n=1,733 in matching estimation).

^b 3 treatment group members are not on the common support

^c 7 treatment group members are not on the common support

^d All standard errors reported in the table are estimated through bootstrapping and are bias-corrected.

*Indicates statistically significant at $\alpha < 0.05$.

Table 7: Analyses of impacts of Programa Nacional de Becas Estudiantiles on student performance								
Outcome Estimation method	Panel A: Becas beneficiaries vs. nonbeneficiaries							
	n^a	1999	n	2000	N	2001	n	2002
Grade repetition: differences in probability (standard errors)								
Matching <i>n</i> and cases excluded	1331 ^b	-0.108*	1082	-0.139*	768	-0.154*	637	-0.122*
	387 ^c	(0.032)	301	(0.054)	237	(0.054)	194	(0.054)
Grade average: average differences (standard errors)								
Matching <i>n</i> and cases excluded	1459	0.156*	1194	0.187*	890	-0.061	700	-0.150
	412	(0.047)	323	(0.058)	278	(0.096)	209	(0.094)
Outcome Estimation method	Panel B: Beneficiaries \geq two years vs. beneficiaries one year							
	n^a	1999	n	2000	N	2001	n	2002
Grade repetition: differences in probability (standard errors)								
Matching <i>n</i> and cases excluded	1257 ^b	-0.053*	1047	-0.072*	788	-0.079*	662	-0.053
	2 ^c	(0.022)	2	(0.030)	2	(0.035)	2	(0.036)
Grade average: average differences (standard errors)								
Matching <i>n</i> and cases excluded	1340	0.161*	1141	0.144*	907	0.169*	711	0.145*
	1	(0.045)	2	(0.060)	2	(0.053)	2	(0.068)

*Statistically significant at $\alpha < 0.05$

^aNumber in subsample (treatment + comparison group members)

^bTotal number of cases in matching estimation (Stata ps2match)

^cNumber of cases excluded from matching due to failure of common support

APPENDIX A: VARIABLES AND THEIR MEASURES USED IN STATISTICAL ANALYSIS

Variable (name in dataset)	Data range	Variable definition/construction
<i>Outcome measures</i>		
Number of years attended full school year	0-5	From follow-up survey question asking (for each year, 1999-2003) if students attended school all of the year (or began and left that year or did not attend school at all)
Number of absences	0-89	From student records in school registrar (for each year, 1999-2003)
Grade repetition	0-1	Binary variable for each year, indicating if the student repeated that grade, from student records in school registrar
Completion of third-cycle EGB	0-1	Binary variable indicating if the student completed the third-cycle of the EGB
Subject material performance (grades) (MAT1N-MAT17N)	1-10	Students' performance in coursework, quantified from 10 (excellent) to 1 (poor), by subject (1-17), from student records in school registrar
Average subject material performance (promedio)	1-10	Students' average performance in coursework (across 17 subjects) from student records in school registrar
Labor force participation	1-5	Categorical measure of number of hours worked outside the home per week (from follow-up survey)
<i>Control variables</i>		
Age (edad)	13-17	Students' age in years (baseline data)
Family income per capita (ingreso)	0-9	Total monthly income divided by number in household, converted to 9 categories: 0-15 (=9), 15-30, 30-45, 45-60, 60-75, 75-90, 90-105, 105-120, greater than 120 pesos per month (=1) (baseline data)
Number in household (canti)	0-13	Number of persons living in the household (baseline data)
Number dependents (dependen)	0-8	Number of household members age 19 or younger or with a sickness or incapacity that makes them dependent (baseline data)
Living conditions index (indice)	0-6	Average of values of four intermediate indicators: construction material, floors, bathrooms and appearance or condition (baseline data)
Household members per room (hacina)	0-6	Number of household members divided number of rooms in the home
Distance to school (distan)	1-4	Distance in km to central school (less than 1 km, 1-5 km, 6-10 km, or more than 10 km)
Number of student absences (faltas)	0-89	Number of student absences from school administrative data in year before application
Number of times students left school (aba)	1-3	Number of times students left school from school administrative data in year before application
Number of grade repetitions (repi)	1-5	Number of times students repeated a grade from school administrative data in year before application
Age-grade difference (pasado)	1-5	Difference between students' age and the age in grade year from school administrative data
Daily hours of work outside the home (traba)	1-8	Hours per day worked outside the home (0-2, 3-4, 5-6, 7 or more)
Days worked outside of home (trabaesc)	1-5	Number of days per week worked outside of the home (less than 1, 1-2.5, 2.5-4, 4-5.5, more than 5.5)
Number of days worked inside the home (tarea)	1-4	Time worked in the home (occasionally, 2-3 days per week, 4-5 days per week, all days)
Hours per day worked inside the home (afecta)	1-5	Hours per day worked inside the home (0-2, 3-4, 5-6, 7 or more)
Index of precariousness (total)	23-58	Constructed using the 20 measures described in the table below and/or above (computed by UNTREF)

Variable name in baseline database		Type of variable	Nombre del Indicador
1	Ingreso	SOCIOECONOMICA	Ingreso grupo familiar
2	Dependen	SOCIOECONOMICA	Tasa de dependencia
3	Ocupacio	SOCIOECONOMICA	Ocupación jefe/a de hogar
4	Emb_jef	SOCIOECONOMICA	Embarazo de la jefa de hogar
5	Tpvivie	SOCIOECONOMICA	Vivienda tipo
6	Tn vivie	SOCIOECONOMICA	Vivienda tenencia
7	Indice	SOCIOECONOMICA	Vivienda condiciones
8	Hacina	SOCIOECONOMICA	Hacinamiento
9	Distan	ALUMNO	Distancia al centro escolar
10	Trabaesc1	ALUMNO	Trabajo fuera del hogar
11	Trabaesc2	ALUMNO	Trabajo dentro del hogar
12	Desesc	ALUMNO	Desempeño escolar
13	Enfe	ALUMNO	Enferme/discapacidad del aspirante
14	Clima	SOCIOECONOMICA	Clima educativo
15	Solo	EXCEPCIONAL	Aspirante vive solo
16	Institu	EXCEPCIONAL	Aspirante institucionalizado
17	Empleador	EXCEPCIONAL	Aspirante en vivienda del empleador
18	Jefefam	EXCEPCIONAL	Aspirante jefe de familia
19	Emba_alu	EXCEPCIONAL	Aspirante embarazada
20	Paternid	EXCEPCIONAL	Aspirante padre/madre

Note: Indicators (dummy variables) are also used in the statistical models to control for differences across provinces.

APPENDIX B: PROPENSITY SCORE MATCHING ESTIMATION PROCEDURES

Matching methods estimate the effect of treatment on the treated under the assumption that, conditional on measured characteristics, participation in the program being evaluated is independent of outcomes. Propensity score matching methods are particularly useful in evaluations in which the number of pre-treatment variables is large, and their distribution varies significantly with treatment status. In these cases, standard adjustment methods, such as the linear control function, are typically inadequate. The descriptive statistics presented in Tables 3 and 4 show that there are significant differences in the pre-treatment characteristics of treatment and comparison group members in the *Programa Nacional de Becas Estudiantiles* evaluation. At the same time, there is a rich set of measures available to control for these differences, suggesting that matching methods are likely to be appropriate for this study.

Propensity score matching begins with the estimation of the probability $P(X)$ that an individual with characteristics X (among treatment and comparison group members) is a program participant. This reduces the matching problem to a single dimension, i.e., rather than matching on all values of X , the distribution of the propensity score (or probability of participation) is compared for treatment and comparison group members in making the matches. $P(X)$ is estimated using a logit model (see the example model below).

There are a number of different specifications possible for the propensity score matching procedure: one-to-one matching (e.g., nearest neighbor, within caliper), k-nearest neighbors, radius, kernel, local linear regression and Mahalanobis matching. (See the referenced papers for

a description of these different methods). In this study, radius matching is used with a caliper of 0.05 to remove matches for which the difference in propensity scores exceeds this threshold. A common support is also imposed to preclude poor matches between treatment and comparison group members. Other specifications were tested, including local linear regression and nearest neighbor methods, but the results were not sensitive to (did not vary with) the method used.

The matching estimation was performed using the Stata `psmatch2` command. Information on downloading and using this routine can be found at: <http://fmwww.bc.edu/RePEc/usug2001/psmatch.pdf>

All standard errors for the impact estimates were computed using bootstrapping methods. Information on how to compute these standard errors in Stata (in conjunction with the `psmatch2` estimation) can also be found at the above web link.

DETERMINANTS OF PARTICIPATION IN THE <i>BECAS ESTUDANTILES</i> PROGRAM			
Predictors (*=statistically significant at $\alpha < 0.05$, standard errors in parentheses below coefficients)	Any scholarship receipt (n=2585)		Beneficiary 2 or more years (n=1341)
Intercept	-4.8570*	(1.1904)	-3.0873 (1.5653)
Age	-0.1630*	(0.0806)	-0.1328 (0.0967)
Sex (male=1)	0.1194	(0.1032)	-0.2084 (0.1219)
Family income per capita	-0.2357*	(0.0557)	0.0078 (0.0691)
Income per capita < 45 pesos/month	0.3200	(0.1725)	0.1158 (0.1996)
Index of need/risk	0.3036*	(0.0311)	0.0508 (0.0299)
Parent highest education level	0.0755	(0.0406)	0.1109* (0.0511)
Number in household	-0.0189	(0.0471)	-0.0218 (0.0526)
Number of dependents	-0.0337	(0.0546)	0.0173 (0.0552)
Living conditions index	-0.1114	(0.0901)	0.1757 (0.0870)
Family members per room	0.0380	(0.0587)	0.0315 (0.0530)
Distance to school	-0.1635*	(0.0691)	0.0101 (0.0765)
Daily hours of work outside the home	-0.0413	(0.1047)	-0.1846 (0.1114)
Number of days worked inside the home	-0.0293	(0.0496)	0.0901 (0.0548)
Hours per day worked inside the home	-0.0630	(0.0971)	-0.1369 (0.1019)
Grade average in 1999	n.a.		0.4750* (0.1048)
Number of student absences (in 1999 for model 2)	0.0158	(0.0145)	-0.0039 (0.0098)
Number of grade repetitions	-0.1024	(0.0653)	-0.0320 (0.0801)
Age-grade difference	-0.0555	(0.1074)	-0.2801* (0.1303)
Number of times student left school	-0.2374	(0.2275)	-0.3091 (0.3039)
Salta	-1.8755*	(0.2167)	-1.099* (0.2667)
Entre Ríos	-0.2304	(0.3678)	-0.3407 (0.3931)
Mendoza	-1.4448*	(0.2014)	-0.9637* (0.2908)
Santa Fe	0.0210	(0.2077)	-0.5223* (0.2230)
Tucumán	-0.4748*	(0.1789)	0.0747 (0.1971)
Corrientes	-0.1523	(0.2385)	0.0128 (0.2309)
Cordoba	-1.3436*	(0.2384)	-1.6601* (0.3171)
Percent concordant/discordant	78.9/20.9		69.2/30.5

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