The Impact of Public and Private Job Training in Colombia

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by

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Abstract[1]

The authors present various matching estimators of the impact on earnings for individuals who attended public and private job training programs in Colombia. The authors estimate propensity scores by controlling for the wide variety of personal and socioeconomic background variables of those individuals. The effect of training, measured by the mean impact of the treatment on the treated, shows that: (i) for youths, no institution has a significant impact in the short or long run except private institutions for males; the scope of the data, however, limits the reliability of the result; (ii) for adult males, neither SENA nor the other public institutions have a significant impact in the short or long run; (iii) for SENA-trained adult females there are positive but not significant impacts in the short run and greater and close to significant effects in the long run. All other public institutions have a higher impact that is significant in the long-run; (iv) for adults trained at private institutions there are large and significant effects in both the short and long run, but for adult males in the short run the effects are smaller and only barely significant. In addition, neither short nor long courses provided by SENA seem to have a significant impact on earnings. In general, females benefit more from both short and long courses than males. Finally, a cost-benefit analysis shows that under the assumption of direct unitary costs equal to SENA, private institutions are more profitable than public institutions, which are in turn more profitable than SENA.

1. Introduction

Many authors have analyzed the performance of publicly-funded training programs in Colombia, and many have made policy recommendations in that regard. Thus far, however, there has been no precise appraisal of these programs' impact using techniques such as those surveyed by Heckman, LaLonde and Smith (1999). This is despite the large amount of government resources made available for that purpose.

This paper assesses public and private job training in Colombia. It examines the Servicio Nacional de Aprendizaje (SENA) independently of other public institutions, since it has the widest coverage among government programs. In the 1999-2000 period, SENA's proposed budget was close to $200 million, 5 percent of the total education budget and 0.2 percent of the country's GDP. Some 75 percent of the budget resources are devoted to training programs.

The next section outlines the programs to be evaluated and presents SENA's programs in detail. Section 3 describes the evaluation problem and defines the parameters of interest. This study's evaluation focuses on mean impacts. In particular, it seeks to assess the "effect of the treatment on the treated," perhaps the most popular parameter in the evaluation literature. In this section the authors define the parameter and the matching estimators to be used, in an effort to facilitate identification of the missing counterfactual.

Section 4 reviews the previous literature on job training and evaluation in Colombia, while Section 5 describes the data used for the evaluation. Section 6 sets out the variables to be used as determinants of program participation, and Section 7 presents the estimate of the propensity scores, a key step in calculating the matching estimators. One finding is that—along with standard socioeconomic background variables—the age at which individuals first worked for pay serves to predict program participation. It proved useful to distinguish those who had undergone training before last year from those who had not, across demographic groups. Section 8 illustrates the need to impose limits on the data in order to support the evaluation. Hence the estimates presented in this paper are conditional on the support described in this section for the different demographic groups and institutions.

Section 9 explains the estimates of the effect of treatment on the treated and the main differences between institutions. It finds that: (i) for youths, no institution has a significant impact in the short or long run except private institutions for males; the scope of the data, however, limits the reliability of the result; (ii) for adult males, neither SENA nor the other

public institutions have a significant impact in the short or long run; (iii) for SENA-trained adult females there are positive but not significant impacts in the short run and greater and close to significant effects in the long run. All other public institutions have a higher impact that is significant in the long-run; (iv) for adults trained at private institutions there are large and significant effects in both the short and long run, but for adult males in the short run the effects are smaller and only barely significant. Section 10 undertakes a cost-benefit analysis to assess the profitability of SENA and other courses. The final section summarizes the paper's main findings.

2. Programs to be Evaluated

Both public and private institutions provide training programs in Colombia, but the two kinds of institutions place different emphases on different types of programs. Private institutions offer more specialized courses, which public organizations do not, and unlike public agencies such as SENA they are unlikely to offer free basic skills courses. Public institutions have much greater national coverage than their private counterparts, which are concentrated in the main cities. The target groups also vary because of differences in the subjects taught, the educational level of the courses, their national coverage and so on.

Perhaps the most uniform series of training programs that can be assessed is that provided by SENA. SENA's programs make up a large share of the job training provided by Colombia's public sector, and hence they are relatively easy to examine. This paper assesses all the courses provided by the public sector, including SENA's, and all the private sector programs. SENA's programs differ from those provided by the rest of the public sector and the private courses in the ways mentioned above. Hence no effort is made here to compare the incomparable; the programs are assessed separately. Differences in their effects reflect differences in the composition of the courses on offer, their coverage, target groups and other factors. These differences could reveal which courses are more likely to have a greater effect. Thus they can be used for further assessments of the courses offered by each kind of institution, with a view to strengthening those that are more likely to upgrade the skills of the graduating trainees.

SENA is an agency of the Colombian government and was founded in 1957. It aims to promote efficiency in the labor market by providing a variety of services through programs for firms and workers. Those services include: (i) advising employers on labor market trends and

analysis, recruitment and so on; (ii) workshops on various matters to facilitate job-hunting; and (iii) identifying the training needs of job-seekers and providing them with that training. Some of the programs included in these services are:

- Training for youths with secondary education: training to help youths make the transition to the labor market by matching their profile and market needs.

- Labor adaptation for change: advice and training for workers to help them adapt to innovation and change. This is geared to public sector workers laid off during restructuring processes.

- Aid to displaced persons: programs to help people displaced by violence, including training, advice for employers and job promotion.

This paper analyzes the job training program, which offers short and long courses to train people for work. In 1997 some 82,000 students were enrolled in SENA's long courses and 918,000 in short courses for a total of 1 million students. Although the main purpose of the program is to prepare people for the labor force, many enroll partially to improve their job prospects through their investment in human capital and their access to the SENA network.

The program covers the whole country. SENA has 20 regional offices in the main cities, each offering courses in Centers of Vocational Training (CVT). There were a total of 111 such centers by 1997, providing training in four areas: agriculture, industry, commerce and services, and other sectors.

SENA offers counseling services to help individuals determine which courses best serve their interests. The entire population is eligible for job training courses, but SENA targets the poorest. For this reason, applicants are asked to provide information that enables assessment of their socioeconomic status.

3. The Evaluation Problem and the Matching Estimator

Following Heckman, Ichimura, Smith and Todd (1998) and Heckman, LaLonde and Smith (1999), and borrowing their notation, it is assumed that each person has two possible outcomes, Y_0 and Y_1, in the untreated and treated states respectively. Let $D = 1$ signify receipt of treatment and $D = 0$ its absence. Let φ be a vector of policy variables that operate on all persons. General

equilibrium effects are ignored so that the outcomes for any person do not depend on the overall level of participation in the program—that is,

$$E(Y_0 \mid D = 0, \varphi = \tilde{\varphi}) = E(Y_0 \mid D = 0, \varphi = 0) \qquad (1)$$

Thus the no-program state for non-participants is the same as the non-participation state, irrespective of the existence of the program. This assumption makes it possible to generalize from partial to general equilibrium.

Given the large population covered by the programs under analysis, their impact is likely to have general equilibrium effects. Consider the figures provided in Table 1. The table presents the number of individuals who received training in 1997 from either SENA, the rest of the public sector or any private institution; it also includes the number of individuals who have received training at any time in their lives. As the table shows, almost 3 million individuals underwent training in 1997, equivalent to around 18 percent of Colombia's economically active population.[2]

In view of these figures it is clear that equation (1) is unlikely to hold, as explained by the Heckman, Lochner and Taber (1998) study on the effect of college tuition changes on schooling and earnings. Evidence provided by Jimenez, Kugler and Horn (1989) suggests that some SENA courses complement formal education and others substitute for it. Careful examination of their results, moreover, reveals that individuals with less formal education (up to secondary level) take complementary courses, while more educated individuals (with some college education) take substitute courses. This suggests that SENA courses can be considered substitutes for higher education and complementary to secondary education. The general equilibrium effects of these programs should therefore be similar to those of a change in college tuition.

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[2] Only 500,000 people attended a SENA course in 1997. SENA, however, reports that 918,000 individuals attended its courses. The discrepancy arises because SENA does not take account of the fact that some individuals take more than one course a year. SENA counts every individual in every class as a different individual, irrespective of whether a person is taking more than one class. According to SENA's calculations, individuals who take short courses attend an average of 2.5 courses a year. Hence if the 82,000 individuals SENA reported as attending long courses in 1997 are subtracted from the 500,000, the total number of individuals counted by SENA as taking short courses gives a figure 2.2 times greater than that reported in the survey. This result is very close to SENA's estimates.

Table 1. Number of Individuals per Institution by Demographic Group

	SENA	Public	Private	Ever trained	No training	Public and private
Male Youth	71,081 (62)	89,675 (79)	123,859 (93)	317,193 (257)	2,964,036 (2,907)	213,534 (172)
Adult Male	192,191 (187)	309,306 (302)	815,756 (655)	2,538,253 (2,068)	4,505,283 (4,727)	1,125,062 (957)
Female Youth	50,558 (43)	86,313 (77)	190,917 (151)	346,953 (308)	3,018,902 (2,823)	277,230 (228)
Adult Female	187,245 (204)	364,166 (374)	1,019,125 (759)	2,820,916 (2,322)	5,362,354 (5,237)	1,383,291 (1,133)
Total	501,075 (496)	849,460 (832)	2,149,657 (1,658)	6,023,315 (4,955)	15,850,575 (15,694)	2,999,117 (2,490)

Source: Encuesta Nacional de Calidad de Vida, 1997

Number of observations in parentheses.

It can now be considered what would happen under the two mutually exclusive states: (i) one in which the participation of these programs is very modest, which will be used as the benchmark steady state; and (ii) one in which there is significant participation. Under steady state (ii), the wage ratios for college to high school and for training to high school would be smaller than in the benchmark steady state. This state would make the option of free training widely available, generating costs to the economy for all while benefiting only the trainees.

Under steady state (i), individuals in high school might stay there or be induced to attend either college or training programs under steady state (ii). Revealed preference, however, suggests that these individuals would not attend college under steady state (ii). Since they chose not to attend college in the benchmark state, under which the college premium was higher, it is unlikely they would do so under steady state (ii). Higher relative wages would also discourage them from attending training programs, but free (or very low-cost) tuition would encourage them to exercise this option. Individuals in college under the benchmark steady state face a similar circumstance. The lower college premium would induce them only to attend high school under steady state (ii). In addition to this effect, free (or very low-cost) tuition would induce them to attend training.

Overall, training programs under steady state (ii) are expected have less of an impact than those under the benchmark steady state. This is because of the reduction in the training to high school wage ratio brought about by massive supply.

3.1. The Parameter of Interest and the Required Counterfactual

At this point it is important to describe the general benchmark under which programs are usually assessed, so as to secure a better understanding of the contributions and limitations of previous evaluations of Colombian programs and the one in this study. The focus is on the evaluation of mean impacts. First, denote the outcomes corresponding to the untreated and treated states by Y_0 and Y_1, respectively, which can be expressed in linear regression form as a function of a set of conditioning variables X,

$$Y_i = X\beta_i + U_i, \quad i = 0,1. \tag{1}$$

The observed outcome Y is given by

$$Y = DY_1 + (1-D)Y_0 = X\beta_0 + D[X(\beta_1 - \beta_0) + U_1 - U_0] + U_0 \tag{2}$$

When $D=1$, Y_1 is observed, and when $D=0$ Y_0 is observed. In addition, $E(U_0|X)=0$ and $E(U_1|X)=0$.

One of the parameters of interest is the Average Treatment Effect (ATE). This measures the effect of randomly picking a person with characteristics X and moving that person from "0" to "1",

$$ATE = E(Y_1 - Y_0 \mid X) = E(\Delta \mid X) \tag{3}$$

Or equivalently, the coefficient on D in the following regression equation:

$$Y = X\beta_0 + DX(\beta_1 - \beta_0) + [U_0 + D(U_1 - U_0)] \tag{4}$$

Another parameter that is used more often, and the one on which the authors focus, is the effect of the Treatment on the Treated (TT), defined as

$$TT = E(\Delta \mid X, D=1) = X(\beta_1 - \beta_0) + E(U_1 - U_0 \mid X, D=1) \tag{5}$$

Or equivalently, the coefficient on D of the following regression equation:

$$Y = X\beta_0 + D[X(\beta_1 - \beta_0) + E(U_1 - U_0 \mid X, D=1)] + \{U_0 + D[(U_1 - U_0) - E(U_1 - U_0 \mid X, D=1)]\} \tag{6}$$

This term measures the extent to which individuals who attended job training programs benefited, relative to what their circumstances would have been without the training. The first term can be constructed from the data; the second is the required counterfactual, and some convenient identifying assumptions are used in order to calculate it from the data by matching methods.

3.2 The Matching Estimators

An averaged "treatment on the treated" may be defined over a subset of the support of X, S_X:

$$M(S_X) = \frac{\int_{S_X} E(Y_1 - Y_0 | X, D = 1) f_X(X|D = 1) dX}{\int_{S_X} f_X(X|D = 1) dX} \tag{7}$$

Here, $f_X(X|D = 1)$ is the conditional density of X. $M(S_X)$ is the parameter that will be estimated by the matching methods.

To implement the method empirically, let there be N_0 persons in the comparison group and N_1 in the treatment group. The method matches "comparable" members of the comparison group with each of the treated persons. These members of the comparison group are members j, for whom X_j belongs to $C(X_i)$, the neighborhood of persons in the comparison group with characteristics similar to those of i, X_i—that is, the set of persons $I_{0i} = \{j | X_j \in C(X_i)\}$. Since longitudinal data is unavailable, only cross-sectional estimators will be discussed.

3.3 Identifying Assumptions for the Cross-sectional Matching Estimator

The identifying assumptions are now described for the cross-sectional matching estimators, $M(S_x)$, defined over a subset of the support of X, S_x.

To estimate the missing counterfactual, $E(Y_1|X,D = 0)$, analysts make use of $E(Y_0|X,D = 0)$. Since participation in the program is voluntary, there is a risk of selection bias when using this approximation. The bias in estimating $E(Y_1-Y_0|X,D = 1)$ is given by

$$B(X) = E(Y_0|X,D = 1) - E(Y_0|X,D = 0)$$

This method assumes that individuals chose to take part in the program only on the basis of observable variables. Hence the analyst must have access to a set of conditioning variables, X,

such that the distribution of individuals who did not undergo training is similar to what the distribution of those who were trained would have been if they had not undergone the training, given that they have similar characteristics X. The estimator assumes that conditional on X, (Y_0, Y_1) is independent of D—that is,

$$(Y_0, Y_1) \perp D \mid X \qquad \text{(A-1)}$$

Here, "$\perp$" denotes independence and X denotes variables on which conditioning is conducted. It follows from the assumption that $F(Y_0|D = 1, X) = F(Y_0|D = 0, X)$ and $F(Y_1|D = 1, X) = F(Y_1|D = 0, X) = F(Y_1|X)$. That is, the missing counterfactual can be recovered from the outcome of non-participants. This assumption would be defined for all X that satisfy

$$\Pr(D = 1|X) < 1 \qquad \text{(A-2)}$$

That is, there must be both participants and non-participants for each X on which it is desirable to calculate $E(Y_1 - Y_0|X, D = 1)$. Clearly, to estimate the *treatment on the treated* parameter, it is only necessary to have the weaker assumption

$$Y_0 \perp D \mid X \qquad \text{(A-3)}$$

In order to avoid having to match on multidimensional X, the Rosenbaum and Rubin (1983) result can be used, which shows that (A-1) and (A-2) together imply that $(Y_0, Y_1) \perp D|P(X)$, according to which matching can be performed on $P(X)$ alone. Thus, only a weaker mean independence version is required:

$$E(Y_0|D = 1, P(X)) = E(Y_0|D = 0, P(X)) \qquad \text{(A-4)}$$

Under these assumptions, the matching estimator can be assessed as

$$M(X_S)^{CS} = n_1^{-1} \sum_{\substack{i=1 \\ \{D=1\}}}^{n_i} \left[Y_{1i} - \hat{E}(Y_{0i} \mid D_i = 0, P(X)) \right] \qquad \text{(8)}$$

where $\hat{E}(Y_{0i}|D_i = 0, P(X))$ is defined as

$$\hat{E}(Y_{0i} \mid D_i = 0, P(X)) = \sum_{j \in I_{0i}} W_j(P(X_i)) Y_{oj} \qquad \text{(9)}$$

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where the weights, W_j, are

$$W_j(P(X_i)) = \frac{K\left[\dfrac{P(X_i)-P(X_j)}{h_n}\right]}{\sum\limits_{j\in I_{0i}} K\left[\dfrac{P(X_i)-P(X_j)}{h_n}\right]} \tag{10}$$

$\forall j \in I_{0i}$, $i = 1,\dots,n_1$, and for a specified kernel function K(.), and bandwidth, h_n.

3.4 Matching Estimators Used

The matching estimators to be evaluated are those of the simple average nearest neighbor and the kernel regression. There follows a detailed description of each of them.

3.4.1 Simple Average Nearest Neighbor Matching Estimator

This estimator is built by choosing a number n of neighbors from the comparison group, from which to match each treated person according to the distances of their propensity scores. Thus the set of neighbors $j=1,\dots,n$, from the comparison group, of treated person i, is I_{0i} = {set of n neighbors with the lowest distances $|P(X_i)-P(X_j)|$}. The estimator becomes

$$\hat{E}(Y_{oi} \mid D_i = 0, F(X_i)) = \frac{1}{n} \sum_{\substack{j=1 \\ j\in I_{oi}}}^{n} Y_{oj} \tag{11}$$

Note that the summation is on all neighbors belonging to I_{oi}, which would be equivalent to weighting over everyone, setting weights equal to "1" if $j \in I_{oi}$, and "0" otherwise.

3.4.2 Kernel Regression Matching Estimator

This estimator is built by choosing a bandwidth h_n upon which basis the individuals who comprise the comparison group of treated person i is determined according to I_{oi}={j ∍ $|P(X_i)-P(X_j)| \leq h_n$}. Additionally in this case, the comparison members closest to the treated person receive greater weight. The kernel used to weight the comparison members in the calculations is given by

$$K\left(\frac{P(X_i)-P(X_j)}{h_n}\right) = \begin{cases} \dfrac{15}{16}\left[\left(\dfrac{P(X_i)-P(X_j)}{h_n}\right)^2 - 1\right]^2 & for \quad |s| < 1 \\ 0 & otherwise \end{cases} \tag{12}$$

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where the bandwidths used in the calculations are 0.1 and 0.2. Thus

$$\hat{E}(Y_{oi} \mid D_i = 0, P(X_i)) = \frac{1}{\sum\limits_{\substack{j=1 \\ j \in I_{oi}}}^{n} K\left(\dfrac{P(x_i) - P(X_j)}{h_n}\right)} \sum\limits_{\substack{j=1 \\ j \in I_{oi}}}^{n} K\left(\frac{P(X_i) - P(X_j)}{h_n}\right) Y_{oj} \tag{13}$$

3.4.3 Local Linear Regression Matching Estimator

In this case the weights of (5) are given by

$$W_j(P(X_i)) = \frac{K_{ij}\left\{\sum\limits_{k \in Ioi} K_{ik}(P_k - p_i)^2 - \left[K_{ij}(P_j - P_i)\right]\sum\limits_{k \in I\,io} K_{ik}(P_k - P_i)\right\}}{\sum\limits_{j \in I\,io} K_{ij} \sum\limits_{k \in I\,io} K_{ik}(P_k - P_i)^2 - \left[\sum\limits_{k \in I\,io} K_{ik}(P_k - P_i)\right]^2} \tag{14}$$

where

$$K_{ij} = K\left(\frac{P(X_i) - P(X_j)}{h_{ni}}\right). \tag{15}$$

4. Previous Studies

Perhaps the first serious study of the impact of job training in Colombia was that by Puryear (1977), who studied the impact on wages of SENA's industrial training programs in Bogotá.[3] His study had three goals: first, to analyze the socioeconomic characteristics of people who enrolled with SENA relative to those who did not, with a view to identifying the kind of candidates that the programs attracted; second, to estimate the impact of SENA training on the wages of a randomly-chosen individual who had undergone no training before taking part in a SENA program; and third, to calculate the private and social benefits of the SENA program.

Puryear's study used data on two groups: (i) all males who graduated from the SENA program in Bogotá between 1965 and 1967;[4] and (ii) a random sample of men in Bogotá aged 20 to 29 who had at least completed primary education but not secondary education. Members of each group answered identical questionnaires in the first half of 1972.[5]

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[3] The book is a reproduction of the doctoral dissertation presented by Jeffrey Puryear to the Department of Education of the University of Chicago in 1974.
[4] The program lasted three years.
[5] It was possible to interview some 79 percent of all graduates of these programs.

Clearly, labor market conditions at the time of Puryear's study were very different from those now prevailing, as were SENA's goals and requirements. First, education coverage was poor: in 1964, some 27 percent of people aged 15 and older had no formal education; only 12 percent had completed primary school; and less than 2 percent had finished secondary education. In 1968, some 78 percent of people studying were enrolled in primary school; 17 percent were in secondary school; and only 1.8 percent were in higher education. Moreover, while 81 percent of primary education enrollment was in public schools, the corresponding share for secondary enrollment was only 46 percent. This circumstance, in tandem with the population's low level of earnings, largely explains the differences between enrollment in primary and secondary education. Given the population's low educational levels, SENA's only schooling requirement was complete primary education. By the time of Puryear's study, SENA's programs were a very interesting alternative for individuals who had completed primary education. SENA freely provided basic tools for them to find work, and thus to earn so that they could meet their own expenses. It also opened the door to the possibility of further, formal education, which was less likely to be free. The skills acquired at SENA were competitive relative to other alternatives in the market at that time, since only a small proportion of the population could have undergone higher education or even completed secondary school.

When matching the characteristics of SENA trainees with those of possible candidates for SENA training, Puryear found that individuals with some secondary education had similar traits to SENA trainees. Individuals with only complete primary schooling, however, were more likely to have been born in rural areas, studied at a public school and received lower grades. Additionally, their fathers had less education, were in a lower socioeconomic level and worked in firms with fewer employees. The SENA trainees' academic aspirations suggested that they had enrolled at SENA temporarily, perhaps to secure funds to meet their expenses and receive further formal education.

To assess the impact of SENA's industrial training on wages, Puryear assumed that earnings are a linear function of a set of conditioning variables, *X*, and that SENA training took the following form:

$$Y_i = \beta X_i + \alpha D_i + U_i$$

where Y_i represents the log of hourly wage of individual *i*, X_i is the set of conditioning variables, and u_i an error term. The regression included only individuals who were employed at the time of

the interview. The set of conditioning variables included in the best model estimated were: education squared, log of experience, log of socioeconomic status, and hours trained in courses other than formal education and in SENA. With this equation, Puryear attempted to measure the impact of SENA's industrial training courses. Note that if he had wanted to obtain the *ATE*, he would have had to specify an equation like (4) and, if he wanted to obtain the *TT*, an equation like (6). For Puryear's equation to produce the same estimate as equation (4) or (6), additional assumptions need to be made. In particular, if $\beta_0=(\beta_{00},...,\beta_{0K})$ and $\beta_1=(\beta_{10},...,\beta_{1K})$, where the intercepts occupied the first position, all the slope coefficients would have to be the same in both regimes—that is, $\beta_{0j}=\beta_{1j}$, $j=1,...,K$—so that the parameter of interest would be reduced to $\beta_{10}-\beta_{00}=\alpha$.

In addition, this specification leads to a bias from the dependence between *U* and *D*. Thus additional assumptions must be made. First, Puryear could have assumed no heterogeneity, so that $U_1-U_0=0$. Second, he could have assumed that $E(U_1-U_0|X,D=1)=0$, and under this assumption the only correction to be made was for heteroskedasticity in order to determine the coefficients' correct standard errors. Under either of these assumptions, *ATE=TT*. Since no correction for heteroskedasticity was included in Puryear's study, his results should be interpreted under the first, more restrictive assumption. Since he only considers working individuals, moreover, and since working status is an output itself, interpretation of the impact estimates is complicated yet further.

The α coefficient estimated in this regression was 0.48 when the number of employees in the firm was included in the regression, and 0.56 when it was omitted. This means that graduates of a SENA industrial training program had on average hourly wages 14 percent and 15 percent higher, respectively, than those who did not receive such training. To correct for the fact that the regression had been conducted only for individuals who were employed at the time of the interview, Puryear adjusted the hourly wage, multiplying it by the amount of time the individuals had been employed since graduating from SENA. The α coefficient estimated in this new regression was again 0.56. He found that the impact of SENA's industrial training program decreased during secondary education. He also found that the impact on earnings of these programs' trainees fell with the increase in the trainees' years of secondary education, prompting the conclusion that secondary education and SENA programs were, to some extent, substitutes for each other.

Finally, he used individuals' earnings histories during the ten years after their graduation from SENA courses and adjusted them to calculate the private and social rates of return on SENA's industrial training programs, assuming that after the tenth year their earnings would be the same. Private rates of return for trainees with 10-11 (5-9) years of formal education, compared to other individuals with the same level of formal education (6-9 years), were 82 percent (96 percent). Social rates of return for trainees with 10-11 (5-9) years of formal education, compared to other individuals with the same level of formal education (6-9 years), were 32 percent (29 percent).

A second study assessing the impact of the SENA programs is that by Gómez and Libreros (1984). Their study was based on data from SENA's *Proyecto de Recursos Humanos*, which took place between 1978 and 1982. More than 28,000 people were interviewed in Colombia's eight most important cities. A sample of 9,915 SENA graduates was interviewed, and then 6,411 of the firms where they worked (randomly chosen) were visited. In these firms, interviews were held with each SENA graduate's immediate superior and with another worker under his or her supervision (a total of 7,843). In some cases, the director of personnel and the head of the company were interviewed (2,133). Finally, 1,736 graduates from other institutions were also interviewed.

First, Gómez and Libreros presented some qualitative evidence in favor of SENA graduates, based on the opinions of the interviewees. Second, they used the information on graduates and their colleagues to estimate equations similar to that used by Puryear (1977), controlling for years of formal education, years of experience, years of experience squared, gender and hours of training in an institution other than SENA. They estimated separate equations per occupation to assess the impact of SENA's industrial training courses by occupation, and found that in 66.3 percent of occupations the courses had no significant effect; in 30.5 percent, SENA's graduates earned more; and in only 3.2 percent did they earn less. Earnings discrepancies were mostly less than 17 percent in either direction. Gómez and Libreros then assessed the courses' impact when graduates were grouped by levels of formal education rather than by occupation. After controlling for the same variables used in the previous exercise, they found that SENA graduates earned 17 percent more than their colleagues when both had completed the fourth year of secondary education, 6.7 percent more when both had completed primary schooling and 38 percent less when neither had completed primary.

Surprisingly, this result is contrary to that of Puryear (1977), perhaps because of differences in the data used in the two studies. Puryear's study used most of the SENA graduates during a given period and a random sample of comparable individuals; rather than a random sample of comparable individuals, Gómez and Libreros used those whose labor market conditions are similar to those of the SENA graduates. It might be the case that among the individuals in the comparison group with complete primary education, the most able were people who worked in places similar to those employing the SENA graduates. In this case, contrasting SENA graduates who had primary education with a random sample of individuals with primary education in the comparison group would yield higher returns to SENA graduates than would a comparison with their workplace colleagues. The obverse might obtain for individuals with four years of secondary education.

The regressions used by Gómez and Libreros have the same limitations as those in Puryear's study. Additionally, their use of a specific sample of the comparison group calls for a different interpretation of their results.

A third study is by Jimenez and Kugler (1987). They drew on data similar to that of Gómez and Libreros (1984), in that they used a random sample of SENA graduates along with information on their colleagues. They estimated separate earnings equations for individuals who did not receive SENA training, those who took short courses and those who took long courses, and they corrected for self-selection using a polychotomous choice model. The choice model was conditioned on the father's educational level, occupational status, spatial mobility and primary school location (urban or rural). The earnings equations were conditioned on education, experience, experience squared and the cross product of education and experience. They found that OLS estimates overvalued the impact of SENA courses. Like Gómez and Libreros (1984), they found that the impact of these courses increases with the graduates' educational levels and experience. For short courses, the impact changes from -14.6 percent (when graduates with 10 years of schooling and 19 years of experience are compared to individuals with the same education and experience) to 16.4 percent (when education and experience are 12 and 29 years, respectively). For long courses, the impact changes from -1.8 percent (when graduates with 10 years of schooling and 12 years of experience are compared to individuals with the same education and experience) to 3.5 percent (when education and experience are 12 and 16 years, respectively).

A more recent study by Jimenez et al. (1989) undertook an economic assessment of SENA's courses. They used a survey conducted between 1979 and 1981 with data on 2,202 SENA graduates and one colleague of each, as in the studies by Gómez and Libreros (1984) and Jimenez and Kugler (1987). Their aim was to gauge social and private rates of return on SENA training. First, they divided the sample of SENA graduates according which of four types of course they took. Long courses lasted more than 2,000 hours and included apprenticeship, promotional, and complementary programs. Short courses were a little more than 200 hours and included qualifying courses. They then estimated regressions of the following form,

$$\ln(Y) = \alpha X + \beta DX + \gamma Z + \varepsilon$$

where Y represents yearly earnings, X is a set of conditioning variables that include a constant, schooling, experience, and experience squared, and Z includes the father's schooling and occupation. D is a dummy variable equal to 1 when the individual had received SENA training. The equation was estimated separately for each of the four groups of graduates, and the same comparison group was used in each estimation. The equations were not corrected for selection. Thus correlation between D and ε was expected to yield biased estimates and, according to Jimenez and Kugler (1987), to overestimate SENA's impact.

Jimenez et al. used administrative information on direct costs per trainee for each type of course, and coupled this information with the estimated earnings of SENA and non-SENA individuals to estimate the rates of return for each type.

Even under the less favorable assumptions for SENA courses, Jimenez et al. found them to be socially profitable, with rates of return higher than the 10 percent of capital investment and 9.6 percent of Colombian secondary education previously found by Psacharopoulos and Loxley (1985). Long courses were always more socially profitable than short courses and in some cases, such as the promotional course, more profitable than higher education. Private rates of return were found to be above social rates by at least 40 percent, providing an excellent option for potential candidates in the market.

Other studies have emphasized SENA's importance and made policy recommendations for improving it. These include López (1994a, b), Vélez (1994) and Ramírez and Reyes (1989). Some of the recommendations suggest that there is a need to invest more in SENA's physical

and human capital endowment so that the institution can better meet the needs of the economy, and to develop schemes whereby the private and public sectors work together to provide training.

The aim of this study is to implement a methodology that makes it possible to overcome the limitations of these previous studies of SENA's programs and assess the impact of private training in Colombia. In both cases the goal is to identify the differential effects of the programs on four demographic groups: male youths, adult males, female youths and adult females. Some studies have estimated differential impacts of SENA's courses according to their length; these will be complemented with an analysis by gender.

5. Data

This paper contains cross-section matching estimates based on general survey data. In an effort to improve Colombians' living conditions the government designed the *Encuesta Nacional de Calidad de Vida* (ECV) to assess living standards, with special emphasis on housing, health, education, employment and poverty. [7] The survey was conducted in 1997. The sample is random, based on the 1993 population census, and comprises 10,000 households in 75 municipalities. It is representative at the national level, at the level of urban-rural regions, and at the level of some regions.[8]

The ECV is an excellent source of information, since it contains a special section on to job training (Section I). Appendix 1 of this study describes that section. The survey has 14 chapters on the characteristics of the individuals, their households and dwellings.

As Figure 1 shows, the survey first asks individuals whether they received training in the year before the interview; if they did, they are then asked where they received it and whether they had received training before that year. If they had not received training the previous year, they are also asked whether they ever underwent training before that, in which case the place of training is unknown. This sequence of questions makes it possible to identify four different sources of training in Colombia: (i) SENA training; (ii) training provided by another public institution; (iii) training provided by the private sector; and (iv) training taken more than a year earlier, irrespective of the provider.

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[6] Living Standard Measure Survey (LSMS).
[7] Living Standard Measure Survey (LSMS).
[8] The regions are Caribbean, Eastern, Pacific, Central, Antioquia, Orinoquia, San Andrés, and Bogotá.

Figure 1. Information Provided by the *Encuesta de Calidad de Vida*, 1997
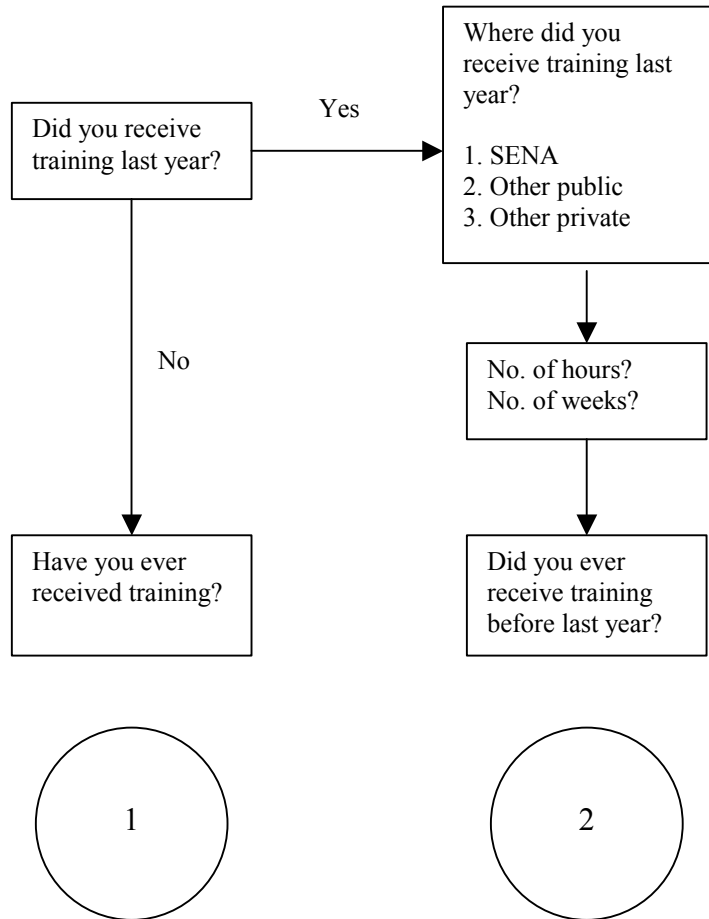
To isolate the most recent course's impact on earnings, the first step is to compare the individuals who received training from any institution for the first time in the previous year with those who had never participated in a training course. This second group, those who had received no training, were the comparison group used for all institutions. By this means Sample 1 is arrived at, as shown in Table 2.[9] The same comparison group is then used, but added to Sample 1 are all those individuals who received training before the previous year. This yields Sample 2. In both cases the samples are divided into four demographic groups: adult male, male youth, adult female, and female youth, to assess the earnings impact of each institution's courses.[10]

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[9] Those who report ever having taken training courses before last year do not specify they institution in which they were trained.

[10] Youths are aged 14 to 22 and adults are aged 23 to 55.

Table 2. Samples Used in the Analysis

Training last year	Training before last year	Sample 1				Sample 2			
		SENA	Public	Private	Ever	SENA	Public	Private	Ever
SENA	Ever					[			[
SENA		[				[			
Public	Ever						[		[
Public			[				[		
Private	Ever							[	[
Private				[				[	
No training	Ever				[				[
No training	No training	]	]	]	]	]	]	]	]

Tables 3 to 6 in Appendix 4 present summary statistics of the main variables from the ECV for each of the four demographic groups analyzed: male youth, adult male, female youth and adult female, respectively. For all demographic groups, the statistics are presented for each group of trainees analyzed: SENA trainees, Public (including SENA) or Private in the previous year, and those who ever took training before the previous year (Ever). Finally, the group of individuals who never received training is presented in each table as the comparison group. The sets *Public* and *Private* are mutually exclusive. Individuals could belong to either of these and also to the group labeled Ever. These tables, however, present statistics based on Sample 1 in Table 2, such that each group (SENA, Public and Private) contains solely those who only received training during the previous year in the corresponding institution and never before. Statistics based on Sample 2 are not presented, but in this case means of the variables are included in Tables 11 to 14 (see Appendix 4). The classification *Ever* does not distinguish between long or short courses, nor whether the course was taken at a private or public institution. Appendix 2 provides a more detailed description of some of the variables used in the analysis and the way they were built. The discussion now turns to the values presented in these tables in an effort to gain some insight into the kind of people attending each institution.

6. Determinants of Program Participation

To assess the probability of participation in training programs, the literature's main recommendations are followed, as summarized in Heckman, LaLonde and Smith (1999), on the importance of background characteristics and recent labor force status.

To determine which variables can contribute to the prediction of the propensity score ($P(X)$), it is important to take account of the eligibility criteria of the institutions providing training. Individuals trained in SENA display a wide variety of characteristics. Although SENA seeks to provide training to the disadvantaged, some people in more comfortable economic circumstances attend its courses. This is because most of SENA's revenue comes from mandatory levies on employers, who must pay 2 percent of their payroll to the institution. Additionally, SENA generates other revenue by providing technological services to firms. As compensation for their contributions to SENA, firms have the right to establish training programs for their employees. SENA therefore trains both the disadvantaged, who might not even be employed, and employees in firms that are seeking to upgrade their workers' technical skills. Hence it is expected that changes in labor force status might pose a serious constraint to predictions of SENA program participation. Finally, most SENA programs require candidates to have completed at least nine years of schooling.

Analysis of the training provided to the aggregate public sector must take account of two points. First, about 60 percent of trained public sector workers attended SENA courses, and thus their behavior can be expected to be strongly associated with that described for SENA trainees. Second, the population of public sector workers who receive SENA training is not limited to the economically disadvantaged. In this case, therefore, the above-mentioned constraints apply. Nonetheless, the impact of both is assessed in order to determine—to the extent that the data allow—the impact of SENA courses relative to other public courses in Colombia. Since many forms of private training differ markedly from public training, the public *versus* SENA comparison is useful and relevant.

Finally, in the study of training provided by private institutions, the market largely determines who takes training and where, and thus standard economic incentives shape program participation. As is to be expected, these programs are generally attended by better-prepared individuals who are willing to pay for better-quality training than the subsidized kind mostly provided by the public sector.

Table 3 in Appendix 4 presents means and standard errors of male youth. Young males who received training in the previous year in any institution, or who had received training before the previous year, have a higher mean income and wider income dispersion than those who have received no training (the comparison group). They have more years of schooling and fewer

children. They are slightly older and come from families that have approximately the same educational level (in the case of those in public institutions) and a higher level (in the case of those in private institutions). Most of them live and were born in urban areas, are less mobile and less likely to be single. The characteristics change somewhat across demographic groups. Adult males who attended a public institution, for example, earned about the same mean income as the comparison group, and with a lesser variance.

A clear pattern emerges from Tables 1 to 4. For all demographic groups it is found that:

(i)   Individuals who received training in SENA have the lowest mean income, followed by those who trained in any public institution (*P*). Those who trained in a private institution (*Pr*) have the highest mean income.

(ii)   The mean education of SENA trainees and *P* is similar, as is the parents' educational level, though they are lower than the education of those who attended *Pr*.

(iii)   Mean age is about the same, irrespective of where the training was imparted.

(iv)   In general, living in an urban area, having moved in the last five years and being single do not produce significant variations among trainees in the different types of institution. Single adult women tend to be more likely to train at *Pr*.

(v)   The regional dummies show some variations. In general, individuals who receive training in the poorest regions are more likely to attend a public institution (SENA or *P*)—Orinoquía and San Andrés—while the reverse is true in Bogotá. This reflects a shortage of private training in the poorest regions.

There are some differences between men and women: men who attended *Pr* are less likely than those who went to any public institution to have less than 10 years of education; among women who were trained in different institutions, the level of schooling is similar.

7. Estimates of the Propensity Scores

Logit models of program participation were estimated to calculate the propensity scores. models of program participation. Since the institutions analyzed offer a wide range of programs catering to a variety of potential trainees, all persons in the survey for each demographic group are included. For the non-participating comparison group, therefore, all of those who received no training are considered, irrespective of their eligibility.

To arrive at the estimates, variables are included in the model according to their ability to correctly predict participation and non-participation, as well their statistical significance. Coefficient estimates and z values from marginal effects of logit regressions are presented in Tables 7 to 10 for Sample 1, and Tables 11 to 14 for Sample 2 (see Appendix 4). There follows a description of some of the main results for each sample.

Estimating the propensity scores using Sample 1, a general result is found for all demographic groups and institutions (I). First, the number of years of formal education is a key variable, and estimates suggest that the probability of having *taken training _only_ within the last 12 months* (*TTO12*) is monotonically increasing in education. Second, individuals who live in urban areas are more likely to have *TTO12* at any *Pr I*, while there is no difference in the case of *P I*. This might signal the need for high-quality *Pr* training in the more competitive urban labor markets, a shortage of *Pr* training in rural areas, or both.

In addition, it is found that adult males are more likely to have *TTO12* at SENA as their age increases, although at a declining rate. Male youths are more likely to have *TTO12* if their fathers had some primary or secondary education than if they had no formal education or some college. In areas where regional unemployment rates are higher, adult males are more likely to have *TTO12*

The limited number of observations available in Sample 1, particularly for youths, precludes as accurate an understanding as would be desired of the variables' effect of the variables. Analysis of the results obtained with Sample 2 provides a much clearer picture, since many more observations are available. In this case, the two general results previously found for all *I,* and all demographic groups, are confirmed. As an adult male (or female) moves from primary to complete secondary education, the probability of his (or her) having *TT12* increases by 5.6 percent (6 percent) and 7 percent (9 percent) in any *P* or *Pr I*, respectively. For adults,

moreover, age is now more positively associated with *having received training during the last 12 months, or during the last 12 months and ever before* (*TT12*).

For youths, those whose fathers have primary or secondary education are more likely to have *TT12* at SENA or *P*, and those females whose parents have more than 12 years of formal education are more likely to have *TT12* at any *Pr I*. There is a similar result among adults for SENA or *P I*, while the probability of having attended any *Pr I* monotonically increases with the parents' educational level. For adults, the importance of the parents' education in determining the probability of *TT12* is striking. Adult males (females) whose mothers have more than 12 years of education are 10 percent (11 percent) and 28 percent (21 percent) more likely to have *TT12* at any *Pr I* or ever before, respectively, than those with a mother who has no education. Being single seems to have an effect only on adult males' probability of having *TT12* at any *Pr I*, reducing it by 3 percent.

Adult males who moved in the last five years are 1 percent less likely to take *P* training. Adult males who are single are 3 percent less likely to take training at *Pr*.

To lessen the potential bias arising from geographical mismatch, regional variables are included for all the regions for which the survey is statistically representative. The information derived from the use of these variables is particularly informative for adult males. Adult males who live in the Orinoquia, Eastern or San Andrés regions are more likely to have *TT12* at SENA or *P* than those living in Bogotá. In particular, those living in Orinoquia are 7 percent more likely to have TT12 than those in Bogotá. As an aid to understanding this order of magnitude, we could say that moving an adult male from Bogotá to Orinoquia has about the same effect on the probability of his having *TT12* as a simultaneous increase in his father's education from none to secondary, and in his mother's from none to some college.

Young females in households with children under six are less likely to train. The effect of the presence of children under six in the household seems to be similar across demographic groups and institutions, although not significant. The number of people in the household has a similar effect on the probability of receiving training as does the number of children under six. In this case, however, its effect on *Pr* training is significant.

Finally, individuals who worked for pay for the first time at an older age are more likely to take training at any *Pr I*. This effect is particularly important for adult females.

8. Determining a Common Support

To assess the possible severity of the bias arising from a failure to compare "comparable people," the densities of $P(X)$ are studied for participants and non-participants in training for all demographic groups and in all types of institution analyzed. Figure 2 in Appendix 4 presents three overlapping figures for all demographic groups and institutions. The first is the estimated density of $P(X)$ for trainees, and is represented by the blank bars. The second is the estimated density of $P(X)$ for the comparison group, and is represented by the black bars. Finally, the gray bars represent the share of individuals used to calculate the impact estimates, which constitute the trimmed sample.[11] The way in which densities are defined over different supports is clearly evident. In particular, in the sample of the comparison group, the support of $P(X)$ is contained in an interval that is bounded by a smaller value of $P(X)$ than the one that bounds the interval of the comparison group. For high values of $P(X)$ among members of the comparison group, therefore, close matches could not be found. The few matches found (those with the largest values of $P(X)$) would make the results sensitive to their inclusion or omission, since they would be used as matches of many trainees. It follows that matching members from the comparison group with high $P(X)$ is likely to yield not only biased estimates but also an estimator that does not compare "comparable people." For adult females in the group *Ever* (male youth in the group SENA) and female youth in the group SENA (female youth in the group SENA),the share of observations that are dropped once the common support condition is imposed varied between 3.8 percent (3.2 percent) and 17.9 percent (20.9 percent) in Sample 1 (Sample 2), respectively (See Tables 15 and 16 in Appendix 4).

9. Impact Estimates

This section presents the *simple average nearest neighbor* (*N*)*, kernel regression* (*K*) and *local linear regression* (*LLR*) matching estimators obtained. The *N* is calculated for one, five and ten nearest neighbors, the *K* for bandwidths of 0.1 and 0.2, and the *LLR* for bandwidths of 0.05 and 0.01.

Table 15 in Appendix 4 presents the estimates of the matching estimators for Sample 1. The table contains the results for all demographic groups and institutions. The third column shows the number of observations in the dataset of individuals who did not receive training and

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[11] See Appendix 3 for details of the trimming of the sample.

those who received training in each of the institutions. The numbers in parentheses are the original number of observations in the sample for that specific line, while those above are the trimmed number of observations obtained after imposing the common support condition.[12] The next two columns present the mean incomes of the comparison and the treated group. For each demographic group, the first line of the fourth column corresponds to the mean income of *all* individuals who never received training (Y_0), while the figures in front of each institution are the mean incomes of the individuals used as the comparison group to obtain the impact estimates of its respective trainees (Y_{0c}). The fifth column contains the corresponding figures for trainees who were actually included in the calculation of the *treatment of the treated* parameter—that is, those selected after imposing the common support condition (Y_1). Column six shows the difference between the mean income of trainees and the mean income of all who did not receive training in each specific demographic group, while column seven presents average estimates over all estimators presented (*N*, *K* and *LLR*) of the *treatment on the treated* parameter.

First, note that the mean income of the individuals used as the comparison group is always higher than that of *all* untrained individuals for each demographic group. Differences between these incomes (Y_0-Y_{0c}), reveal the importance of self-selection when trying to estimate impacts based on Y_1-Y_0. Consequently, estimates based on column six are an overestimate of the true *treatment on the treated* parameter presented in column seven.

Training in all institutions, and for all demographic groups, seems to have a positive effect in the long run, as measured by the impact on those who received training before last year. As Table 15 shows, on average the impact on the treated is positive and significant for adult males and close to significant for female youths, while not significant for adult females and male youths.

Table 16 presents the estimates of the matching estimators for Sample 2. In this case, the line labeled *Ever* corresponds to those individuals who reported having received training before last year, irrespective of whether they received training last year. Again, the impact on the treated is on average positive, and even greater. Additionally, it is significant for all demographic groups except female youths.

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[12] The number of trimmed observations was obtained for a specific replication of the data.

9.1. Differences Across Institutions

This section presents the effects of the training courses on individuals' earnings by demographic group and institution. Again, the results presented are derived from the two samples considered earlier. It is important to remember that for Sample 2 the institution at which individuals attended training before last year is unknown. Hence there is no guarantee that trained individuals attended the same institution last year and the year before, although it is likely.

The sample is divided into these two groups in order to capture the training impact attributable to attendance at a particular training institution last year and distinguish it from impacts that include prior training. The impact of the first sample is labeled as the short-run effect of training, and that of the second as the short- and long-run effect. Finally, in order to determine if the results for SENA vary according to the lengths of the courses taken at that institution, the impact estimates are presented for SENA's courses that are derived from splitting the data according to course length. Each of these cases is treated separately below.

9.1.1. Effects on Individuals Who Received Training Only Last Year

As mentioned earlier, it is possible to distinguish the institution in which individuals trained only for those who received training last year. This section studies the impact of training on those who received training only last year, not previously. For the purpose of evaluating the impact of training, an immediate implication of the fact that training was imparted last year is related to what Ashenfelter (1978) defined as the "pre-program dip in earnings." If earnings fell before training enrollment for many individuals in the survey used here, the impact of the training they took (as measured by their current income) might be underestimated. Thus there might be a downward bias in this exercise.

The results obtained for the impact of training at SENA or public institutions are not statistically different from zero for any demographic group. On the other hand, private institutions have a positive and statistically significant effect for all demographic groups except female youths. Additionally, the magnitudes calculated are always greater for all other public institutions than for SENA, and for private institutions than for all other public institutions, with the exception of the impact on female youths. The impacts of the public institutions, however, vary greatly by gender. *SENA* and *P* have a negative impact on earnings for males, while the impact on earnings for females is positive.

9.1.2. Effects on Individuals Who Received Training Last Year or Earlier

Table 16 presents impact estimates for those individuals who received training last year only, and those who were trained last year and any time before. In this case, the impact for adult males trained at SENA is negative, but again it is not statistically significant. The aggregate of public institutions in this case has a positive but not significant effect. For adult males, training in private institutions has a highly significant impact.

The effect on SENA-trained adult females is greater but still insignificant. The effect is greater and highly significant now in both cases for the aggregate of public institutions and for private agencies. The result for private institutions is similar to that for adult males, but with a much greater impact. Adult females record greater impacts than males for all institutions. For youths, the impact is not significant across demographic groups and institutions. It is closest to significant for males in private institutions. Finally, impact estimates calculated for adults in Sample 2 are always greater than those in Sample 1. Thus short-run effects might signal that trainees experienced a dip in earnings.

If it is assumed that in most cases individuals who received training last year and earlier did so in the same institution, combining these results with those in Table 15 and referring to the former as the long-run effects of training and the latter as the short-run effects, it can be concluded that:

(i)   For youths, no institution has a significant impact in the short or long run except private institutions for males; the scope of the data, however, limits the reliability of the result.

(ii)   For adult males, neither SENA nor other public institutions have a significant impact in the short or long run.

(iii)   For adult females trained at SENA, there are positive but not significant impacts in the short run, and greater and close to significant impacts in the long run. All other public institutions have a greater impact that is significant in the long run.

(iv)   For adults trained at private institutions, there are large and significant effects in both the short and long run, but for adult males in the short run the effects are smaller and only barely significant.

9.1.3 Effects of Training by Course Length

Studies by Puryear (1977), and by Jimenez et al. (1989) found that long SENA courses had a positive effect on earnings at the moment of their evaluations. In addition, Jimenez and Kugler (1987) found that long courses led to higher earnings increases than short courses, while Gómez and Libreros (1984) present mixed evidence in this area. The estimates in Tables 15 and 16 pool individuals by demographic group but do not distinguish by course length, and thus it is not possible to estimate any differences by the length of SENA's courses. To assess the impact of SENA's courses according to length, Table 17 (see Appendix 4) presents estimates derived from each of the two samples analyzed. Each sample was divided by gender, and for each gender the impact of short and long courses was estimated. The estimates in Table 17, like those in Tables 15 and 16, consistently find no significant length-dependent impact of SENA courses. This indicates that the results in Tables 15 and 16 do not stem from a positive impact of courses of a given length, offset by a negative impact of courses of another length. Though not significant, the estimated impacts for females are always greater than those for males. Again, this result is consistent with those in the previous tables for adults, which group is expected to drive the aggregate gender results. Surprisingly, males seem to benefit more from short courses while females benefit more from long courses.

In short, neither SENA's short nor long courses seem to have a significant impact on the earnings of those who take them. In general, females benefit more from both kinds of courses than males, and particularly from long courses.

10. Cost-Benefit Analysis

This section assesses the profitability of SENA's and public's courses on the basis of the previous results. First, impact estimates of SENA's courses are used, and the net present value (*NPV*) is calculated of the change in earnings for those who took courses at SENA under different assumptions of benefit persistence and discounting, subtracting the opportunity cost in all cases. As mentioned earlier, these estimates are not significantly different from zero, but in this section they are used as face value of the earnings impacts. Next, for each scenario, the *NPV* net of the direct costs of the courses is calculated. The first set of estimates can be considered the highest **private** *NPV* an individual attending SENA training can attain, since it is assumed that

they will not have to pay a share of the direct costs, even through taxes. The second set of estimates can be considered the **social** *NPV* of training.

To calculate the opportunity cost of training, the average number of hours the courses lasted is calculated, and that number is multiplied that by the income per hour of the comparison group (using monthly income and assuming an average of 200 work hours per month).

The direct cost of training is based on the average cost per hour of each course, estimated at 35,000 pesos (2000 value), or around 25,266 pesos (1997 value) divided by the average number of students (20 students per course), leading to a direct cost per student per hour of 1,263 pesos (1997 value). Thus the total direct cost per trainee is the product of the average number of hours and the cost per student per hour. For comparative purposes, direct costs for all other public and private institutions are calculated in a similar manner.

Table 18 presents the results for Sample 1. For males, SENA and all other public institutions are very costly, both privately and socially, SENA's performance being the poorest. For adult females, SENA's programs become privately profitable after the first year, but socially profitable only after the third year of benefits when discounting is below 3 percent annually, and after the sixth year when discounting is around 6 percent. The aggregate of public training is always profitable, both privately and socially. For female youths, training is always privately profitable, but socially profitable only after the third year of benefits. SENA is always privately more profitable than all other public institutions, but it becomes socially more profitable only after the third year of benefits.

Table 19 presents the results for Sample 2. In all cases except male youths, graduates from all other public institutions perform better than SENA graduates. Again, adult male SENA graduates have negative returns on their investment, and female youth graduates from SENA or any public institution also have negative returns. In the other cases, returns to training turn positive very shortly.

Finally, in order to assess the profitability of SENA's courses by length, Table 20 presents the results for trainees who took courses of different lengths. For males, only those who took short courses last year, irrespective of whether they had taken courses previously, found SENA training profitable. Short courses were either less costly or more profitable than long courses. Females taking both short and long courses found training at SENA profitable. For those who trained at SENA *only* last year, long courses are privately more profitable than short ones,

but because of their much greater opportunity and direct costs they become socially more profitable only after more than three years of benefits. For the females in Sample 2, short courses are privately more profitable only in the first three years, even though they are socially more profitable for more than the first ten years of benefits.

11. Conclusions

This paper presents various estimators of the earnings impact of job training programs in Colombia. To assess the impact, matching estimators are calculated of the impact of the "treatment on the treated." The paper follows the methodology presented by Heckman, LaLonde and Smith (1999) to secure accurate estimates of propensity scores, a key step towards securing the impact estimates and matching estimators.

It is found that personal variables such as education, age, and marital status, as well as socioeconomic background variables such as parents' educational level, number of children under six and number of people in the household, are very important in determining program participation. The age at which individuals first worked for pay was included, which proved useful in distinguishing those who had received training before last year from their counterparts across demographic groups. This was also very useful in predicting the participation of adult females in any of the institutions. Other variables, such as whether individuals lived in urban or rural areas and whether they changed their place of residence, were also included; these proved to be important in some cases. Geographical dummies were used to capture spatial differences in the supply of training.

As measured by the mean impact of the treatment on the treated, the observed effects of training are as follows:

(i)   For youths, no institution has a significant impact in the short or long run except private institutions for males; the scope of the data, however, limits the reliability of the result.

(ii)   For adult males, neither SENA nor other public institutions have a significant impact in the short or long run.

(iii)   For SENA-trained adult females there are positive but not significant impacts in the short run and greater and close to significant effects in the

long run. All other public institutions have a higher impact that is significant in the long run.

(iv) For adults trained at private institutions there are large and significant effects in both the short and long run, but for adult males in the short run the effects are smaller and only barely significant.

Additionally, neither SENA's short nor long courses seem to have a significant impact on their graduates' earnings. In general, females benefit more from both kinds of courses than males, and particularly from long courses. Finally, a cost-benefit analysis shows that the aggregate of public institutions is generally more profitable than SENA, and that both SENA and the aggregate of public institutions are more profitable for females than for males. Under the assumption of equal unitary costs, private institutions are more profitable than SENA.

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Appendix 1. The *Encuesta Nacional de Calidad de Vida*, 1997

Section I. Job Training[13]
Length

1.   Did you receive any training last year? (Yes. No).

2.   Have you received any training at some point in your life? (Yes. No).

3.   In which institution did you receive the most recent training?

- SENA.
- Firm where you work or worked.
- NGO.
- Specialized firm.
- University.
- Another public institution.
- Private institution/person.
- Compensation fund (*Caja de compensación*).
- Foreign institution or firm.

4.   How many weeks did your last training course last, and how many hours a week did you spend in training? (weeks, hours).

5.   Did you pay for the last training you received? (Yes, full amount: value. Yes, partial amount: value. No).

6.   Who paid partially or wholly for your last training course? (Parents or relatives. Firm where you work or worked. Scholarship. Free course. Other).

7.   If you work, did your employer give you the necessary time for training? (Yes: hours a week. No: n/a).

8.   What was the main benefit you derived or expect to derive from your training other than what you learned or are going to learn? (Applying it at work. Get a job or a promotion. Set up a firm. Increase earnings. Get a certificate. Improve performance of own business. Better results in own tasks. Other. None).

9.   Did you receive any training at some point in your life other than that which received last year? (Yes. No).

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[13] For persons aged 12 and older.

Appendix 2. Generating the Variables Used in the Analysis

Monthly labor earnings for both employed and self-employed individuals are used. The variable is built in various stages. First, the reported earnings and reported time period in which these earnings were received are used to calculate an initial estimate of monthly earnings. These earnings include wages, bonuses and tips for employees and income net of business-related expenditures for self-employed individuals. The monetary value of in-kind payments such as alimony and housing is then added.

The regional unemployment rate in region i, for individual j, $\mu_{i,j}$, was calculated for each individual in each region by computing $\mu_{i,j} = U_{i,-j}/(E_{i,-j}+U_{i,-j})$, where $U_{i,-j}$ and $E_{i,-j}$ are the number of unemployed and employed in the region, excluding individual j, respectively.

Appendix 3. Operational Definition of Common Support[14]

Since the matching estimator requires to be defined over a region of overlapping, we begin by defining S_{10}, the region over which the supports of $P(X)$ overlap the $D = 1$ and $D = 0$ groups, as

$$f(P) = \begin{cases} \dfrac{15}{16}\left(1 - P^2\right)^2 & for & |P| < 1 \\ 0 & & otherwise \end{cases}$$

the region where $f(P|D = 1) > 0$ and $f(P|D = 0) > 0$. We determine these densities of the sample P values using a Biweight kernel density estimator defined as:

To get the densities, we use Silverman's "rule of thumb" bandwidth: $h = A(R/1.34)N^{-1/5}$.[15] Then we define the estimated region of overlapping support as:

$$\hat{S}_{10} = \left\{ P \in \hat{S}_1 \cap \hat{S}_0 : \hat{f}(P|D = 1) > 0 \quad and \quad \hat{f}(P|D = 0) > 0 \right\}$$

Where $\hat{S}_1$ and $\hat{S}_0$ are the estimated smoothed supports. To avoid the possible inaccuracy that can emerge from very low densities in some intervals of the common support, we require that the points contained in Ŝ10 have a positive density that exceeds zero by some amount determined by a trimming level $\hat{q}$.[16] The new set is defined as:

$$\hat{S}_q = \left\{ P \in \hat{S}_{10} : \hat{f}(P|D = 1) > c_q \quad and \quad \hat{f}(P|D = 0) > c_q \right\}$$

Where c_q satisfies

$$\underset{c_q}{Sup} \frac{1}{2J} \sum_{\substack{i=1 \\ \{i \in \bar{I}_1\}}}^{J} \left\{ 1\left[\hat{f}(P_i | D = 1) < c_q\right] + 1\left[\hat{f}(P_i | D = 0) < c_q\right] \right\} \leq q$$

Where $\bar{I}_1$ is the set of values of P that lie in S_{10} and J is the cardinality of $\bar{I}_1$.

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[14] Based on Heckman, Ichimura and Todd (1997); and Heckman, Ichimura, Smith and Todd (1998).
[15] Where A is a constant that depends on the kernel: $A = k_2^{-2/5} * k_3^{1/5} * k_4^{-1/5}$, where in this case: $k_2 = 0.1428572$, $k_3 = 0.7142857$, and $k_4 = 0.212$.
[16] Using $q = 0.02$.

Appendix 4. Tables and Figures

Table 3. Descriptive Statistics of Individuals Who Took Courses Only Last Year, Male Youths

Variable	SENA **		Public **		Private **		Ever **		No Training	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Err.
Monthly Labor Income in Colombian $1997[1]	75,053	147,841	77,615	139,598	118,402	153,806	107,693	145,894	57,368	135,057
0 to 5 years of education	0.523	0.505	0.522	0.504	0.591	0.496	0.523	0.501	0.793	0.405
6 to 10 years of education	0.233	0.428	0.214	0.414	0.081	0.276	0.203	0.403	0.127	0.333
More than 11 years of education	0.052	0.224	0.079	0.273	0.015	0.123	0.006	0.079	0.010	0.098
Age	18.609	2.003	18.526	2.108	18.921	2.261	19.414	2.296	17.453	2.460
Age 2	350.2	74.8	347.6	77.7	363.0	82.9	382.1	85.7	310.7	87.7
Father's education (1-5 years)	0.712	0.458	0.671	0.474	0.549	0.502	0.466	0.500	0.433	0.496
Father's education (6-11 years)	0.239	0.432	0.266	0.446	0.148	0.358	0.261	0.440	0.240	0.427
Father's education (more than 12 years)	0.000	0.000	0.018	0.135	0.173	0.382	0.141	0.349	0.092	0.289
Mother's education (1-5 years)	0.688	0.469	0.653	0.480	0.363	0.485	0.510	0.501	0.506	0.500
Mother's education (6-11 years)	0.259	0.443	0.298	0.462	0.518	0.504	0.261	0.440	0.253	0.435
Mother's education (more than 12 years)	0.002	0.040	0.001	0.036	0.076	0.267	0.112	0.316	0.069	0.253
Regional unemployment rate	7.470	2.315	7.244	2.365	7.619	1.740	7.137	1.988	6.941	2.368
Living in urban area	0.734	0.447	0.731	0.448	0.882	0.325	0.856	0.352	0.692	0.462
Moved in last 5 years	0.794	0.410	0.714	0.456	0.869	0.340	0.840	0.368	0.847	0.360
Single	0.875	0.334	0.872	0.337	0.934	0.250	0.879	0.326	0.934	0.248
Caribbean*	0.363	0.486	0.314	0.468	0.364	0.485	0.121	0.327	0.260	0.439
Eastern*	0.144	0.355	0.156	0.366	0.130	0.340	0.174	0.380	0.147	0.355
Pacific*	0.180	0.388	0.172	0.381	0.116	0.323	0.165	0.372	0.174	0.379
Central*	0.163	0.374	0.157	0.367	0.090	0.289	0.148	0.356	0.129	0.335
Antioquia*	0.067	0.253	0.096	0.297	0.063	0.245	0.120	0.326	0.123	0.328
Orinoquia*	0.000	0.000	0.000	0.000	0.008	0.092	0.023	0.149	0.010	0.098
San Andrés*	0.002	0.040	0.001	0.036	0.001	0.035	0.002	0.041	0.001	0.038
Number of children under age 6	0.107	0.313	0.130	0.382	0.083	0.382	0.177	0.412	0.230	0.555
Number of people in household	5.605	1.893	5.411	1.864	4.914	1.967	4.904	1.888	5.630	2.351
Age at which worked for payment for first time	8.867	7.568	8.959	7.391	11.652	16.659	12.986	8.742	8.925	9.203
Number of Observations	43		54		61		200		2,907	
Weighted Observations	52,183		63,886		82,900		250,445		2,964,036	

Source: *Encuesta Nacional de Calidad de Vida 1997* (DANE). All variables measured at the time of the interview.

*Regions in which the survey is statistically representative.

** Institution attended relative to never having received taken training. Ever: attended any institution only before last year.

1. Average exchange rate in 1997: $1,180.00/US$1.

2. Education dummy excluded: 11 years (completed high school).

3. Father education dummy excluded: No education.

4. Mother education dummy excluded: No education.

5. Regional dummy excluded: Bogotá.

Table 4. Descriptive Statistics of Individuals Who Took Courses Only Last Year, Adult Males

Variable	SENA **		Public **		Private **		Ever **		No Training	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Monthly Labor Income in Colombian $1997[1]	212,266	190,331	232,775	196,823	469,683	644,552	409,081	577,998	214,738	313,480
0 to 5 years of education	0.375	0.487	0.351	0.479	0.286	0.453	0.293	0.455	0.626	0.484
6 to 10 years of education	0.218	0.415	0.239	0.428	0.223	0.417	0.262	0.440	0.231	0.421
12 to 15 years of education	0.113	0.319	0.103	0.305	0.139	0.347	0.104	0.305	0.022	0.148
More than 15 years of education	0.029	0.167	0.022	0.148	0.153	0.361	0.120	0.325	0.018	0.133
Age	35.2	7.6	34.7	7.7	33.8	7.8	38.0	8.9	36.3	9.2
Father's education (1-5 years)	1,297.7	553.8	1,262.0	564.3	1,203.5	579.1	1,526.1	693.9	1,400.4	699.7
Father's education (1-5 years)	0.418	0.496	0.475	0.501	0.517	0.501	0.509	0.500	0.487	0.500
Father's education (6-11 years)	0.180	0.386	0.191	0.395	0.169	0.375	0.160	0.367	0.078	0.269
Father's education (more than 12 years)	0.025	0.157	0.016	0.126	0.082	0.276	0.077	0.266	0.015	0.122
Mother's education (1-5 years)	0.616	0.489	0.625	0.486	0.594	0.492	0.581	0.494	0.533	0.499
Mother's education (6-11 years)	0.161	0.369	0.148	0.356	0.239	0.428	0.186	0.389	0.077	0.267
Mother's education (more than 12 years)	0.011	0.104	0.014	0.117	0.023	0.149	0.035	0.184	0.006	0.080
Regional unemployment rate	7.391	1.988	7.050	2.230	7.750	1.572	7.209	1.817	6.685	2.487
Living in urban area	0.780	0.416	0.755	0.432	0.891	0.313	0.856	0.351	0.643	0.479
Moved in last 5 years	0.506	0.503	0.536	0.501	0.568	0.497	0.545	0.498	0.605	0.489
Single	0.291	0.457	0.282	0.452	0.200	0.401	0.207	0.405	0.241	0.428
Caribbean*	0.266	0.445	0.229	0.422	0.282	0.451	0.159	0.366	0.241	0.428
Eastern*	0.094	0.294	0.183	0.388	0.063	0.243	0.153	0.360	0.170	0.376
Pacific*	0.201	0.403	0.213	0.411	0.126	0.333	0.195	0.397	0.190	0.392
Central*	0.167	0.375	0.154	0.363	0.079	0.271	0.118	0.323	0.132	0.339
Antioquia*	0.143	0.352	0.108	0.312	0.172	0.379	0.124	0.329	0.132	0.339
Orinoquia*	0.021	0.145	0.016	0.127	0.009	0.095	0.015	0.122	0.008	0.089
San Andrés*	0.005	0.072	0.004	0.061	0.002	0.041	0.002	0.048	0.002	0.046
Number of children under age 6	0.443	0.700	0.467	0.717	0.424	0.665	0.392	0.676	0.501	0.808
Number of people in household	4.46	1.93	4.66	1.93	4.16	1.92	4.53	2.04	4.96	2.33
Age at which worked for payment for first time	14.98	5.57	14.88	5.01	17.02	4.96	16.32	7.07	14.57	7.02
Number of Observations	87		129		199		1,439		4,727	
Weighted Observations	87,219		135,197		236,607		1,784,995		4,505,283	

Source: *Encuesta Nacional de Calidad de Vida 1997* (DANE). All variables measured at the time of the interview.

* Regions in which the survey is statistically representative.

** Institution attended relative to never having received taken training. Ever: attended any institution only before last year.

1. Average exchange rate in 1997: $1,180.00/US$1.

2. Education dummy excluded: 11 years (completed high school).

3. Father education dummy excluded: No education.

4. Mother education dummy excluded: No education.

5. Regional dummy excluded: Bogotá.

Table 5. Descriptive Statistics of Individuals Who Took Courses Only Last Year, Female Youths

Variable	SENA **		Public **		Private **		Ever **		No Training	
	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Mean	Std.Dev.
Monthly Labor Income in Colombian $1997[1]	39,376	107,115	42,052	96,658	61,424	114,210	72,414	133,711	32,842	85,395
0 to 5 years of education	0.509	0.509	0.652	0.481	0.512	0.503	0.521	0.501	0.785	0.411
6 to 10 years of education	0.098	0.303	0.070	0.257	0.121	0.327	0.176	0.382	0.130	0.336
12 to 15 years of education	0.076	0.270	0.045	0.209	0.055	0.230	0.056	0.230	0.004	0.066
Age	18.463	2.184	18.509	2.428	18.332	2.422	19.457	2.191	17.427	2.526
Age 2	345.5	81.1	348.4	89.5	341.9	87.9	383.4	82.1	310.1	90.1
Father's education (1-5 years)	0.579	0.503	0.536	0.504	0.419	0.496	0.428	0.496	0.445	0.497
Father's education (6-11 years)	0.285	0.460	0.255	0.440	0.253	0.437	0.270	0.445	0.239	0.426
Father's education (more than 12 years)	0.058	0.238	0.034	0.183	0.147	0.356	0.115	0.320	0.091	0.287
Mother's education (1-5 years)	0.525	0.509	0.527	0.504	0.500	0.503	0.539	0.500	0.526	0.499
Mother's education (6-11 years)	0.334	0.480	0.257	0.441	0.364	0.484	0.299	0.459	0.233	0.423
Mother's education (more than 12 years)	0.058	0.238	0.034	0.183	0.031	0.174	0.059	0.237	0.066	0.249
Regional unemployment rate	7.145	1.973	7.073	2.244	7.602	1.533	7.156	1.941	7.001	2.234
Living in urban area	0.805	0.404	0.750	0.437	0.928	0.260	0.822	0.383	0.740	0.439
Moved in last 5 years	0.736	0.449	0.671	0.475	0.891	0.313	0.802	0.400	0.810	0.392
Single	0.833	0.380	0.806	0.399	0.828	0.380	0.698	0.460	0.801	0.399
Caribbean*	0.186	0.396	0.175	0.384	0.281	0.452	0.150	0.358	0.226	0.418
Eastern*	0.235	0.432	0.164	0.374	0.122	0.330	0.211	0.409	0.170	0.376
Pacific*	0.211	0.415	0.149	0.359	0.119	0.326	0.187	0.391	0.176	0.381
Central*	0.105	0.313	0.154	0.365	0.096	0.297	0.184	0.388	0.121	0.326
Antioquia*	0.173	0.385	0.109	0.315	0.134	0.343	0.091	0.289	0.124	0.330
Orinoquia*	0.000	0.000	0.016	0.127	0.016	0.126	0.019	0.136	0.008	0.090
San Andrés*	0.008	0.092	0.006	0.079	0.000	0.020	0.003	0.053	0.002	0.043
Number of children under age 6	0.216	0.683	0.263	0.664	0.076	0.296	0.390	0.688	0.336	0.649
Number of people in household	4.318	1.503	4.882	2.577	4.545	2.059	4.920	2.169	5.413	2.357
Age at which worked for payment for first time	6.225	7.814	7.395	7.848	9.689	8.632	11.981	9.596	6.867	8.706
Number of Observations	28		51		89		220		2,823	
Weighted Observations	32,391		55,245		121,025		245,993		3,018,902	

Source: *Encuesta Nacional de Calidad de Vida 1997* (DANE). All variables measured at the time of the interview.

* Regions in which the survey is statistically representative.

** Institution attended relative to never having received taken training. Ever: attended any institution only before last year.

1. Average exchange rate in 1997: $1,180.00/US$1.

2. Education dummy excluded: 11 years (completed high school).

3. Father education dummy excluded: No education.

4. Mother education dummy excluded: No education.

5. Regional dummy excluded: Bogotá.

Table 6. Descriptive Statistics of Individuals Who Took Courses Only Last Year, Adult Females

Variable	SENA **		Public **		Private **		Ever **		No Training	
	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Mean	Std.Dev.
Monthly Labor Income in Colombian $1997[1]	157,574	169,468	143,081	160,008	294,212	605,973	167,827	293,137	77,178	247,676
0 to 5 years of education	0.202	0.404	0.300	0.460	0.244	0.430	0.330	0.470	0.625	0.484
6 to 10 years of education	0.225	0.420	0.218	0.414	0.185	0.389	0.258	0.438	0.215	0.411
12 to 15 years of education	0.178	0.385	0.133	0.340	0.177	0.382	0.094	0.292	0.032	0.177
More than 15 years of education	0.001	0.027	0.003	0.058	0.118	0.324	0.082	0.275	0.017	0.129
Age	31.0	7.6	31.6	7.7	33.2	7.7	37.1	8.6	36.8	9.4
Father's education (1-5 years)	1,018.6	521.9	1,060.4	544.5	1,159.2	550.5	1,449.6	661.1	1,442.6	723.9
Father's education (1-5 years)	0.515	0.503	0.539	0.500	0.521	0.501	0.538	0.499	0.468	0.499
Father's education (6-11 years)	0.131	0.340	0.126	0.333	0.229	0.421	0.161	0.367	0.082	0.274
Father's education (more than 12 years)	0.103	0.306	0.073	0.262	0.042	0.201	0.038	0.190	0.023	0.151
Mother's education (1-5 years)	0.702	0.460	0.713	0.454	0.567	0.497	0.602	0.490	0.540	0.498
Mother's education (6-11 years)	0.125	0.333	0.092	0.290	0.264	0.442	0.190	0.393	0.097	0.296
Mother's education (more than 12 years)	0.022	0.148	0.017	0.131	0.025	0.156	0.018	0.132	0.008	0.087
Regional unemployment rate	7.106	1.626	6.736	2.000	7.513	1.596	7.278	1.750	6.917	2.297
Living in urban area	0.945	0.228	0.865	0.343	0.881	0.324	0.869	0.338	0.719	0.450
Moved in last 5 years	0.479	0.503	0.503	0.502	0.632	0.483	0.501	0.500	0.544	0.498
Single	0.279	0.451	0.259	0.440	0.277	0.448	0.204	0.403	0.169	0.375
Caribbean*	0.149	0.358	0.125	0.332	0.216	0.412	0.162	0.369	0.216	0.412
Eastern*	0.250	0.436	0.306	0.463	0.123	0.329	0.165	0.372	0.154	0.361
Pacific*	0.116	0.322	0.110	0.315	0.130	0.337	0.183	0.387	0.190	0.392
Central*	0.063	0.244	0.115	0.321	0.094	0.292	0.129	0.335	0.136	0.343
Antioquia*	0.145	0.354	0.123	0.330	0.156	0.364	0.142	0.349	0.142	0.349
Orinoquia*	0.017	0.129	0.017	0.131	0.009	0.093	0.013	0.113	0.010	0.097
San Andrés*	0.021	0.144	0.015	0.121	0.001	0.036	0.003	0.054	0.002	0.043
Number of children under age 6	0.323	0.568	0.359	0.600	0.416	0.691	0.359	0.633	0.437	0.763
Number of people in household	4.87	1.95	4.81	1.83	4.93	2.03	4.54	1.97	4.95	2.21
Age at which worked for payment for first time	16.68	7.14	16.84	8.10	17.76	9.10	17.95	9.96	14.50	12.97
Number of Observations	81		125		254		1,568		5,237	
Weighted Observations	68,137		107,509		342,431		1,887,565		5,362,354	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.

* Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution only before last year.

1. Average exchange rate in 1997: $1,180.00/US$1

2. Education dummy excluded: 11 years (completed high school)

3. Father education dummy excluded : No education

4. Mother education dummy excluded: No education

5. Regional dummy excluded: Bogotá.

Table 7. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Only Last Year, Male Youths

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.803	-0.0076	-2.306	0.802	-0.0127	-2.841	0.802	-0.0121	-3.096	0.792	-0.0341	-3.836
6 to 10 years of education	0.124	-0.0022	-0.729	0.124	-0.0047	-1.070	0.123	-0.0103	-2.248	0.127	-0.0188	-1.849
More than 11 years of education	0.008	0.0092	1.742	0.008	0.0150	2.098	0.007	-0.0102	-0.979	0.007	-0.0331	-1.260
Age	17.5	0.0109	1.598	17.5	0.0125	1.396	17.5	0.0068	0.766	17.6	-0.0116	-0.584
Age 2	311.6	-0.0003	-1.523	311.6	-0.0003	-1.352	312.2	-0.0001	-0.551	315.3	0.0006	1.034
Father's education (1-5 years)	0.475	0.0120	3.495	0.475	0.0146	3.091	0.472	0.0012	0.357	0.471	0.0138	1.596
Father's education (1-5 years)	0.195	0.0079	2.020	0.195	0.0112	2.023	0.194	-0.0099	-2.083	0.198	0.0180	1.722
Father's education (more than 12 years)	0.058	0.0000	0.000	0.058	0.0000	-0.001	0.060	-0.0036	-0.666	0.063	0.0337	2.373
Mother's education (1-5 years)	0.544	0.0051	1.374	0.544	0.0072	1.415	0.540	0.0073	1.402	0.540	0.0024	0.260
Mother's education (6-11 years)	0.212	0.0057	1.338	0.212	0.0085	1.468	0.215	0.0167	2.950	0.215	0.0035	0.320
Mother's education (more than 12 years)	0.042	0.0056	0.754	0.042	0.0044	0.384	0.043	0.0160	2.162	0.045	0.0079	0.480
Regional unemployment rate	6.211	0.0008	1.459	6.209	0.0008	1.150	6.213	-0.0003	-0.313	6.210	-0.0048	-2.032
Living in urban area	0.527	-0.0017	-0.748	0.527	-0.0029	-0.924	0.532	0.0078	1.955	0.541	0.0408	3.857
Moved in last 5 years	0.843	-0.0012	-0.516	0.842	-0.0053	-1.686	0.842	-0.0032	-1.025	0.842	0.0015	0.185
Single	0.939	-0.0034	-1.016	0.939	-0.0070	-1.531	0.939	0.0025	0.483	0.935	-0.0090	-0.859
Caribbean*	0.220	0.0077	1.572	0.220	0.0104	1.633	0.219	0.0068	1.380	0.211	-0.0123	-0.964
Eastern*	0.149	0.0080	1.506	0.150	0.0115	1.682	0.149	0.0035	0.585	0.149	-0.0034	-0.245
Pacific*	0.175	0.0018	0.343	0.175	0.0031	0.455	0.175	0.0003	0.058	0.174	-0.0033	-0.276
Central*	0.147	0.0064	1.289	0.147	0.0089	1.383	0.146	0.0003	0.059	0.147	0.0046	0.379
Antioquia*	0.170	0.0022	0.412	0.170	0.0040	0.572	0.170	-0.0030	-0.548	0.172	0.0044	0.373
Orinoquia*	0.033	0.0000	0.000	0.033	0.0000	0.000	0.034	0.0018	0.251	0.038	0.0288	1.885
San Andrés*	0.023	0.0070	0.877	0.023	0.0064	0.555	0.023	0.0005	0.053	0.023	-0.0185	-0.788
Number of children under age 6	0.258	-0.0036	-1.432	0.258	-0.0038	-1.228	0.257	-0.0031	-0.887	0.257	0.0026	0.421
Number of people in household	5.814	0.0006	1.491	5.809	0.0005	0.817	5.788	-0.0016	-2.384	5.755	-0.0040	-2.685
Age at which worked for payment for first time	9.388	-0.0001	-1.026	9.390	-0.0002	-0.928	9.467	0.0002	1.670	9.631	0.0007	2.713
Constant	1.000	-0.1437	-2.239	1.000	-0.1624	-1.974	1.000	-0.1124	-1.371	1.000	-0.0482	-0.264
Number of Observations		2,950			2,961			2,968			3,107	

Source: *Encuesta Nacional de Calidad de Vida 1997* (DANE).

* Regions in which the survey is statistically representative.

** Institution attended relative to never having received taken training. Ever: attended any institution <u>only</u> before last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 8. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Only Last Year, Adult Males

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.687	-0.0167	-4.163	0.684	-0.0271	-5.311	0.678	-0.0201	-3.591	0.615	-0.2137	-12.963
6 to 10 years of education	0.198	-0.0098	-2.532	0.198	-0.0165	-3.285	0.199	-0.0094	-1.737	0.210	-0.0982	-5.980
More than 11 years of education	0.030	0.0035	0.711	0.031	0.0029	0.439	0.036	0.0254	3.894	0.063	0.0841	3.730
Age	36.3	0.0029	2.001	36.3	0.0033	1.777	36.3	0.0008	0.437	36.8	0.0242	4.467
Age 2	1405.4	-0.00004	-2.084	1404.0	-0.00005	-1.893	1401.2	-0.00002	-0.763	1436.3	-0.0002	-3.536
Father's education (1-5 years)	0.470	-0.0031	-0.964	0.471	0.0004	0.093	0.473	-0.0009	-0.214	0.484	0.0193	1.499
Father's education (1-5 years)	0.063	0.0061	1.330	0.064	0.0137	2.273	0.064	-0.0039	-0.563	0.081	0.0554	2.633
Father's education (more than 12 years)	0.012	-0.0003	-0.027	0.012	-0.0043	-0.296	0.014	0.0115	1.166	0.020	0.0758	1.972
Mother's education (1-5 years)	0.521	0.0004	0.121	0.522	0.0040	0.924	0.524	0.0144	2.942	0.539	0.0679	5.061
Mother's education (6-11 years)	0.065	-0.0010	-0.201	0.066	0.0047	0.714	0.068	0.0184	2.661	0.087	0.0947	4.401
Mother's education (more than 12 years)	0.005	0.0026	0.195	0.005	0.0173	1.107	0.005	0.0277	1.739	0.008	0.1991	3.440
Regional unemployment rate	6.019	0.0017	2.271	6.018	0.0021	2.275	6.051	0.0016	1.506	6.133	0.0017	0.547
Living in urban area	0.476	-0.0009	-0.283	0.477	-0.0056	-1.324	0.484	0.0094	1.942	0.531	0.0458	3.101
Moved in last 5 years	0.632	-0.0062	-2.273	0.632	-0.0086	-2.459	0.633	-0.0009	-0.250	0.615	-0.0129	-1.165
Single	0.245	0.0007	0.218	0.245	-0.0015	-0.335	0.242	-0.0173	-3.406	0.233	-0.0314	-2.116
Caribbean*	0.220	0.0127	1.668	0.219	0.0138	1.441	0.219	-0.0086	-1.342	0.198	-0.1040	-4.716
Eastern*	0.151	0.0162	1.931	0.152	0.0308	3.141	0.148	-0.0204	-2.235	0.150	0.0104	0.437
Pacific*	0.176	0.0140	1.846	0.176	0.0179	1.900	0.175	-0.0065	-1.012	0.175	-0.0352	-1.694
Central*	0.157	0.0163	2.111	0.158	0.0232	2.443	0.156	-0.0098	-1.403	0.156	-0.0057	-0.263
Antioquia*	0.174	0.0130	1.654	0.174	0.0149	1.513	0.178	0.0069	1.137	0.173	-0.0070	-0.324
Orinoquia*	0.028	0.0260	2.979	0.028	0.0333	2.928	0.028	-0.0028	-0.268	0.035	0.0640	2.147
San Andrés*	0.029	0.0249	2.770	0.029	0.0284	2.426	0.028	-0.0127	-1.051	0.031	-0.0547	-1.584
Number of children under age 6	0.516	-0.0018	-0.913	0.517	-0.0013	-0.528	0.516	-0.0019	-0.714	0.495	-0.0077	-0.990
Number of people in household	5.013	-0.0005	-0.842	5.011	-0.0005	-0.580	4.988	-0.0032	-3.413	4.914	-0.0036	-1.432
Age at which worked for payment for first time	14.467	0.0000	-0.134	14.474	0.0000	-0.131	14.525	0.0002	1.073	14.807	0.0012	1.754
Constant	1.000	-0.1030	-3.518	1.000	-0.1284	-3.492	1.000	-0.0711	-1.954	1.000	-0.6631	-6.124
Number of Observations		4,814			4,856			4,926			6,166	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE).

* Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution <u>only</u> before last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 9. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Only Last Year, Female Youths

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.792	-0.0071	-2.536	0.792	-0.0177	-3.366	0.787	-0.0193	-3.757	0.777	-0.0330	-3.459
6 to 10 years of education	0.128	-0.0047	-1.645	0.127	-0.0175	-2.609	0.127	-0.0193	-2.895	0.131	-0.0253	-2.265
More than 11 years of education	0.005	0.0072	1.746	0.005	0.0157	1.452	0.005	0.0036	0.336	0.008	0.0516	2.475
Age	17.4	0.0107	1.840	17.4	0.0132	1.129	17.4	0.0092	0.816	17.5	0.0434	1.900
Age 2	309.6	-0.0003	-1.750	309.7	-0.0003	-1.064	310.6	-0.0002	-0.663	314.3	-0.0009	-1.415
Father's education (1-5 years)	0.475	0.0046	1.778	0.475	0.0037	0.775	0.473	0.0041	0.810	0.473	0.0080	0.906
Father's education (1-5 years)	0.202	0.0015	0.497	0.202	-0.0003	-0.042	0.204	0.0030	0.512	0.203	0.0022	0.194
Father's education (more than 12 years)	0.060	-0.0019	-0.360	0.059	-0.0154	-1.126	0.061	0.0127	1.651	0.062	0.0182	1.116
Mother's education (1-5 years)	0.555	-0.0005	-0.194	0.555	-0.0031	-0.592	0.554	0.0043	0.726	0.553	0.0101	0.991
Mother's education (6-11 years)	0.205	0.0024	0.819	0.205	0.0020	0.325	0.208	0.0082	1.258	0.210	0.0253	2.055
Mother's education (more than 12 years)	0.041	0.0016	0.318	0.041	-0.0044	-0.312	0.041	-0.0128	-0.985	0.042	0.0190	0.954
Regional unemployment rate	6.312	0.0000	0.086	6.309	-0.0004	-0.333	6.341	0.0004	0.245	6.346	0.0036	1.745
Living in urban area	0.583	0.0012	0.598	0.582	-0.0010	-0.204	0.590	0.0156	2.684	0.592	0.0045	0.503
Moved in last 5 years	0.817	-0.0009	-0.476	0.816	-0.0063	-1.578	0.819	0.0054	1.117	0.817	0.0055	0.645
Single	0.782	0.0024	0.992	0.781	0.0015	0.294	0.783	0.0047	0.893	0.774	0.0006	0.073
Caribbean*	0.198	0.0060	1.367	0.197	-0.0018	-0.232	0.198	0.0045	0.728	0.195	0.0029	0.207
Eastern*	0.162	0.0076	1.722	0.161	-0.0018	-0.220	0.160	-0.0025	-0.301	0.161	0.0252	1.704
Pacific*	0.175	0.0047	1.066	0.174	-0.0066	-0.826	0.174	0.0003	0.040	0.173	0.0081	0.592
Central*	0.144	0.0053	1.212	0.145	0.0034	0.461	0.143	0.0014	0.202	0.147	0.0327	2.456
Antioquia*	0.165	0.0067	1.553	0.164	-0.0045	-0.567	0.165	0.0041	0.658	0.163	0.0120	0.852
Orinoquia*	0.033	0.0000	0.000	0.033	0.0072	0.750	0.035	0.0135	1.646	0.036	0.0555	3.262
San Andrés*	0.029	0.0111	2.072	0.029	0.0104	1.046	0.028	-0.0139	-0.790	0.029	0.0413	1.885
Number of children under age 6	0.369	0.0001	0.065	0.369	-0.0004	-0.112	0.363	-0.0100	-2.289	0.370	-0.0015	-0.265
Number of people in household	5.539	-0.0007	-1.574	5.535	-0.0015	-1.631	5.524	-0.0018	-2.174	5.500	-0.0029	-1.862
Age at which worked for payment for first time	6.613	-0.0002	-1.609	6.632	-0.0001	-0.578	6.741	0.0004	2.076	6.986	0.0010	3.095
Constant	1.000	-0.1218	-2.220	1.000	-0.1437	-1.344	1.000	-0.1596	-1.532	1.000	-0.6459	-3.099
Number of Observations		2,851			2,874			2,912			3,043	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE).

* Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution <u>only</u> before last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education .

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 10. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Only During Last Year, Adult Females

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.681	-0.0093	-4.033	0.679	-0.0172	-4.649	0.670	-0.0377	-6.647	0.613	-0.1985	-12.995
6 to 10 years of education	0.196	-0.0043	-2.288	0.196	-0.0096	-2.767	0.193	-0.0290	-5.031	0.211	-0.0849	-5.589
More than 11 years of education	0.035	0.0025	1.149	0.036	0.0063	1.501	0.042	0.0167	2.830	0.060	0.0702	3.448
Age	36.8	-0.0002	-0.326	36.7	-0.0005	-0.414	36.7	0.0032	1.595	36.9	0.0314	6.247
Age 2	1439.2	-1.34E-07	-0.014	1437.4	0.0000	0.004	1430.1	-0.0001	-2.076	1444.5	-0.0004	-5.811
Father's education (1-5 years)	0.455	-0.0004	-0.215	0.456	0.0006	0.207	0.457	0.0016	0.327	0.476	0.0293	2.438
Father's education (1-5 years)	0.065	0.0016	0.719	0.065	0.0043	0.989	0.069	0.0148	2.253	0.080	0.0625	3.206
Father's education (more than 12 years)	0.014	0.0006	0.129	0.014	0.0040	0.470	0.015	0.0019	0.164	0.017	0.0237	0.635
Mother's education (1-5 years)	0.523	0.0017	0.944	0.525	0.0040	1.226	0.524	0.0096	1.775	0.545	0.0611	4.731
Mother's education (6-11 years)	0.078	-0.0025	-0.961	0.078	-0.0065	-1.285	0.084	0.0131	1.881	0.096	0.0484	2.451
Mother's education (more than 12 years)	0.005	0.0067	1.069	0.005	0.0133	1.262	0.006	0.0403	2.621	0.007	0.1501	2.587
Regional unemployment rate	6.220	0.0003	0.492	6.217	0.0000	-0.010	6.265	0.0024	1.918	6.348	0.0096	3.066
Living in urban area	0.555	0.0051	2.315	0.555	0.0064	1.730	0.561	0.0038	0.723	0.601	0.0428	3.137
Moved in last 5 years	0.578	-0.0006	-0.419	0.578	-0.0019	-0.763	0.580	-0.0007	-0.168	0.565	-0.0120	-1.174
Single	0.156	0.0017	1.069	0.156	0.0021	0.708	0.159	0.0002	0.046	0.163	0.0131	0.967
Caribbean*	0.184	-0.0018	-0.600	0.183	-0.0019	-0.331	0.184	-0.0123	-1.837	0.172	-0.0424	-2.075
Eastern*	0.145	0.0062	1.841	0.146	0.0147	2.503	0.144	0.0065	0.796	0.147	0.0958	4.351
Pacific*	0.183	-0.0005	-0.172	0.183	0.0001	0.012	0.184	-0.0057	-0.861	0.179	0.0005	0.024
Central*	0.160	0.0001	0.018	0.160	0.0069	1.252	0.159	-0.0103	-1.415	0.160	0.0421	2.127
Antioquia*	0.184	0.0030	1.093	0.184	0.0064	1.188	0.184	-0.0003	-0.039	0.182	0.0261	1.349
Orinoquia*	0.033	0.0040	0.968	0.033	0.0118	1.636	0.033	0.0074	0.693	0.038	0.1142	4.144
San Andrés*	0.030	0.0177	3.841	0.031	0.0328	4.544	0.027	0.0047	0.374	0.031	0.0854	2.728
Number of children under age 6	0.469	-0.0011	-1.054	0.468	-0.0025	-1.311	0.469	-0.0007	-0.250	0.447	-0.0022	-0.275
Number of people in household	5.036	0.0006	2.151	5.032	0.0007	1.349	5.027	0.0005	0.616	4.921	-0.0073	-2.955
Age at which worked for payment for first time	13.773	0.0000	0.385	13.794	0.0001	0.949	13.935	0.0004	3.620	14.709	0.0024	6.716
Constant	1.000	-0.0228	-1.643	1.000	-0.0362	-1.507	1.000	-0.1329	-3.491	1.000	-0.8633	-8.701
Number of Observations		5,318			5,362			5,491			6,805	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE).

* Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution only before last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 11. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Last Year Regardless of Whether They Had Ever Taken Them Before, Male Youths

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.800	-0.0131	-3.2	0.799	-0.0206	-3.7	0.797	-0.0192	-4.0	0.785	-0.0486	-5.0
6 to 10 years of education	0.125	-0.0051	-1.3	0.125	-0.0086	-1.6	0.123	-0.0157	-2.8	0.128	-0.0275	-2.5
More than 11 years of education	0.008	0.0065	1.0	0.008	0.0101	1.1	0.009	0.0029	0.4	0.009	-0.0076	-0.3
Age	17.5	0.0194	2.2	17.5	0.0200	1.7	17.5	0.0197	1.8	17.6	0.0088	0.4
Age 2	312.1	-0.0005	-2.0	312.3	-0.0005	-1.6	313.2	-0.0004	-1.5	316.7	0.0001	0.1
Father's education (1-5 years)	0.475	0.0135	3.1	0.475	0.0197	3.4	0.470	0.0005	0.1	0.469	0.0162	1.7
Father's education (1-5 years)	0.195	0.0097	1.9	0.195	0.0152	2.2	0.195	-0.0068	-1.3	0.199	0.0217	1.9
Father's education (more than 12 years)	0.059	0.0084	1.1	0.059	0.0134	1.3	0.062	-0.0021	-0.3	0.064	0.0415	2.7
Mother's education (1-5 years)	0.544	0.0057	1.3	0.544	0.0055	0.9	0.538	0.0003	0.1	0.538	-0.0034	-0.3
Mother's education (6-11 years)	0.212	0.0052	1.0	0.212	0.0054	0.8	0.216	0.0107	1.9	0.216	-0.0028	-0.2
Mother's education (more than 12 years)	0.042	0.0026	0.3	0.042	-0.0028	-0.2	0.045	0.0122	1.6	0.046	0.0025	0.1
Regional unemployment rate	6.212	0.0009	1.2	6.205	0.0006	0.6	6.220	-0.0003	-0.3	6.214	-0.0053	-2.1
Living in urban area	0.529	-0.0011	-0.4	0.529	-0.0019	-0.4	0.535	0.0108	2.3	0.546	0.0452	4.0
Moved in last 5 years	0.843	-0.0010	-0.3	0.842	-0.0052	-1.3	0.840	-0.0067	-1.9	0.840	-0.0026	-0.3
Single	0.938	-0.0045	-1.1	0.938	-0.0071	-1.2	0.939	0.0047	0.8	0.934	-0.0075	-0.6
Caribbean*	0.220	0.0070	1.2	0.219	0.0074	1.0	0.217	0.0018	0.3	0.210	-0.0176	-1.3
Eastern*	0.149	0.0080	1.3	0.151	0.0114	1.4	0.150	0.0019	0.3	0.150	-0.0031	-0.2
Pacific*	0.174	-0.0041	-0.6	0.173	-0.0078	-0.9	0.174	-0.0046	-0.8	0.172	-0.0149	-1.1
Central*	0.147	0.0047	0.8	0.146	0.0033	0.4	0.146	-0.0005	-0.1	0.147	0.0012	0.1
Antioquia*	0.169	-0.0020	-0.3	0.169	-0.0031	-0.4	0.170	-0.0074	-1.2	0.171	-0.0031	-0.2
Orinoquia*	0.035	0.0143	2.0	0.034	0.0143	1.5	0.034	0.0017	0.2	0.039	0.0336	2.1
San Andrés*	0.023	0.0134	1.6	0.023	0.0117	1.0	0.023	-0.0085	-0.7	0.023	-0.0202	-0.8
Number of children under age 6	0.257	-0.0062	-1.8	0.257	-0.0079	-1.7	0.257	-0.0015	-0.4	0.255	0.0002	0.0
Number of people in household	5.808	0.0004	0.7	5.798	-0.0004	-0.5	5.773	-0.0026	-3.2	5.732	-0.0061	-3.7
Age at which worked for payment for first time	9.404	-0.0002	-1.2	9.415	-0.0002	-0.8	9.504	0.0002	1.4	9.686	0.0007	2.4
Constant	1.000	-0.2341	-2.8	1.000	-0.2427	-2.3	1.000	-0.2355	-2.3	1.000	-0.2340	-1.1
Number of Observations		2,969			2,986			3,000			3,164	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE)

* Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution before last year, or: before last year and last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 12. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Last Year Regardless of Whether They Had Ever Taken Them Before, Adult Males

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.678	-0.0126	-4.1	0.671	-0.0558	-7.8	0.641	-0.0691	-7.0	0.581	-0.2611	-14.1
6 to 10 years of education	0.198	-0.0085	-3.1	0.197	-0.0407	-5.7	0.193	-0.0493	-4.9	0.204	-0.1413	-7.5
More than 11 years of education	0.033	0.0014	0.5	0.038	0.0198	2.4	0.071	0.0981	8.3	0.093	0.1639	6.5
Age	36.3	0.0027	2.7	36.3	0.0082	3.2	36.3	0.0062	1.8	36.7	0.0299	4.9
Age 2	1404.2	0.0000	-2.6	1403.9	-0.0001	-3.2	1398.5	-0.0001	-2.0	1431.0	-0.0003	-4.0
Father's education (1-5 years)	0.472	0.0025	1.1	0.474	0.0053	0.9	0.474	0.0173	2.1	0.486	0.0363	2.5
Father's education (1-5 years)	0.066	0.0059	1.9	0.069	0.0251	2.9	0.082	0.0366	3.1	0.097	0.1011	4.3
Father's education (more than 12 years)	0.012	0.0048	1.0	0.013	0.0060	0.4	0.021	0.0509	2.8	0.026	0.1100	2.5
Mother's education (1-5 years)	0.525	0.0128	4.4	0.527	0.0235	3.6	0.526	0.0439	4.7	0.543	0.1001	6.5
Mother's education (6-11 years)	0.068	0.0127	3.5	0.071	0.0276	3.0	0.090	0.0719	5.8	0.106	0.1562	6.5
Mother's education (more than 12 years)	0.005	0.0122	1.4	0.005	0.0461	1.9	0.008	0.1039	3.8	0.011	0.2821	4.3
Regional unemployment rate	6.028	-0.0002	-0.4	6.032	0.0024	1.7	6.128	0.0046	2.3	6.196	0.0042	1.2
Living in urban area	0.482	0.0037	1.4	0.487	0.0001	0.0	0.513	0.0231	2.6	0.557	0.0598	3.6
Moved in last 5 years	0.629	-0.0024	-1.4	0.629	-0.0101	-2.1	0.624	-0.0076	-1.1	0.607	-0.0200	-1.6
Single	0.244	-0.0029	-1.2	0.243	-0.0120	-1.8	0.242	-0.0305	-3.4	0.232	-0.0426	-2.6
Caribbean*	0.219	0.0031	0.8	0.217	0.0182	1.6	0.212	-0.0360	-2.9	0.193	-0.1212	-4.8
Eastern*	0.151	0.0053	1.2	0.153	0.0485	4.0	0.146	-0.0124	-0.9	0.149	0.0269	1.0
Pacific*	0.175	0.0008	0.2	0.175	0.0231	2.0	0.171	-0.0281	-2.3	0.171	-0.0491	-2.0
Central*	0.157	0.0040	1.0	0.157	0.0319	2.7	0.151	-0.0207	-1.6	0.151	-0.0069	-0.3
Antioquia*	0.175	0.0054	1.4	0.173	0.0254	2.2	0.182	0.0265	2.3	0.176	0.0167	0.7
Orinoquia*	0.030	0.0119	2.5	0.031	0.0706	5.2	0.031	0.0264	1.5	0.039	0.1038	3.1
San Andrés*	0.031	0.0060	1.2	0.031	0.0417	2.8	0.030	-0.0263	-1.3	0.033	-0.0506	-1.3
Number of children under age 6	0.515	-0.0012	-0.9	0.514	-0.0040	-1.1	0.506	-0.0079	-1.6	0.487	-0.0128	-1.4
Number of people in household	4.999	-0.0005	-1.0	4.988	-0.0017	-1.5	4.923	-0.0061	-3.6	4.853	-0.0066	-2.3
Age at which worked for payment for first time	14.506	0.0001	0.7	14.550	0.0003	1.0	14.760	0.0008	2.4	15.023	0.0019	2.6
Constant	1.000	-0.0857	-3.9	1.000	-0.2680	-5.2	1.000	-0.2565	-3.8	1.000	-0.7775	-6.3
Number of Observations		4,914			5,029			5,382			6,795	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE)

[*] Regions in which the survey is statistically representative.

[**] Institution attended relative to never having taken training. Ever: attended any institution before last year, or: before last year and last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 13. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Last Year Regardless of Whether They Had Ever Taken Them Before, Female Youths

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.789	-0.0103	-3.0	0.788	-0.0238	-4.2	0.782	-0.0288	-4.5	0.768	-0.0490	-4.7
6 to 10 years of education	0.128	-0.0079	-2.3	0.127	-0.0265	-3.6	0.126	-0.0315	-3.6	0.130	-0.0463	-3.6
More than 11 years of education	0.006	0.0108	2.4	0.006	0.0231	2.3	0.007	0.0244	1.9	0.011	0.0706	3.0
Age	17.4	0.0139	2.2	17.4	0.0179	1.4	17.5	0.0306	2.0	17.6	0.0819	3.2
Age 2	310.1	-0.0004	-2.1	310.5	-0.0004	-1.3	312.1	-0.0007	-1.7	316.4	-0.0018	-2.6
Father's education (1-5 years)	0.477	0.0090	2.8	0.477	0.0067	1.3	0.472	0.0082	1.2	0.474	0.0157	1.6
Father's education (1-5 years)	0.201	0.0031	0.8	0.201	-0.0043	-0.6	0.205	0.0026	0.3	0.203	-0.0027	-0.2
Father's education (more than 12 years)	0.059	-0.0018	-0.3	0.059	-0.0256	-1.5	0.064	0.0184	1.9	0.064	0.0218	1.2
Mother's education (1-5 years)	0.557	0.0020	0.6	0.556	-0.0032	-0.6	0.548	0.0016	0.2	0.548	0.0075	0.7
Mother's education (6-11 years)	0.205	0.0035	1.0	0.205	0.0008	0.1	0.214	0.0187	2.3	0.216	0.0359	2.7
Mother's education (more than 12 years)	0.041	0.0024	0.4	0.041	-0.0090	-0.5	0.042	0.0060	0.5	0.043	0.0319	1.5
Regional unemployment rate	6.316	-0.0001	-0.2	6.315	-0.0006	-0.5	6.352	0.0009	0.5	6.363	0.0036	1.5
Living in urban area	0.584	0.0042	1.6	0.584	0.0036	0.7	0.596	0.0202	2.8	0.599	0.0131	1.3
Moved in last 5 years	0.817	-0.0004	-0.2	0.814	-0.0076	-1.8	0.815	-0.0029	-0.5	0.813	-0.0067	-0.8
Single	0.781	0.0012	0.5	0.781	0.0031	0.6	0.784	0.0143	2.1	0.775	0.0122	1.2
Caribbean*	0.197	0.0031	0.9	0.197	0.0007	0.1	0.197	0.0082	1.0	0.193	0.0079	0.5
Eastern*	0.162	0.0032	0.8	0.161	-0.0042	-0.5	0.159	0.0018	0.2	0.160	0.0267	1.6
Pacific*	0.174	0.0019	0.5	0.174	-0.0029	-0.4	0.174	0.0059	0.7	0.173	0.0160	1.1
Central*	0.144	0.0033	0.9	0.146	0.0076	1.0	0.142	0.0033	0.4	0.147	0.0380	2.6
Antioquia*	0.165	0.0035	1.0	0.163	-0.0046	-0.6	0.165	0.0116	1.4	0.163	0.0181	1.2
Orinoquia*	0.033	0.0006	0.1	0.033	0.0074	0.7	0.037	0.0340	3.2	0.038	0.0759	4.1
San Andrés*	0.029	0.0100	1.9	0.029	0.0145	1.3	0.028	0.0017	0.1	0.030	0.0477	1.9
Number of children under age 6	0.369	0.0007	0.5	0.368	-0.0007	-0.2	0.362	-0.0058	-1.2	0.368	0.0000	0.0
Number of people in household	5.539	-0.0004	-0.9	5.530	-0.0017	-1.8	5.505	-0.0030	-2.7	5.477	-0.0045	-2.5
Age at which worked for payment for first time	6.652	-0.0001	-0.7	6.698	0.0001	0.4	6.861	0.0006	2.5	7.153	0.0013	3.5
Constant	1.000	-0.1588	-2.6	1.000	-0.2034	-1.7	1.000	-0.4098	-2.9	1.000	-1.0467	-4.5
Number of Observations		2,866			2,900			2,974			3,131	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE)

* Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution before last year, or: before last year and last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 14. Coefficient Estimates and z Values from Marginal Effects of Logit Regression for Individuals Who Took Courses Last Year Regardless of Whether They Had Ever Taken Them Before, Adult Females

Variable	SENA **			Public **			Private **			Ever **		
	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z	Mean	Coefficient	z
0 to 5 years of education	0.669	-0.0335	-7.7	0.660	-0.0602	-9.1	0.633	-0.0915	-10.0	0.575	-0.2566	-15.2
6 to 10 years of education	0.195	-0.0207	-5.3	0.194	-0.0435	-6.6	0.190	-0.0705	-7.4	0.206	-0.1341	-7.8
More than 11 years of education	0.039	0.0046	1.2	0.046	0.0240	3.5	0.072	0.0703	6.9	0.089	0.1367	6.1
Age	36.7	0.0022	1.7	36.7	0.0079	3.4	36.6	0.0150	4.6	36.8	0.0449	7.8
Age 2	1435.1	0.0000	-1.9	1430.7	-0.0001	-3.6	1423.1	-0.0002	-4.9	1432.8	-0.0006	-7.6
Father's education (1-5 years)	0.457	-0.0005	-0.2	0.461	0.0055	1.0	0.460	0.0070	0.9	0.480	0.0385	2.8
Father's education (1-5 years)	0.067	0.0039	0.9	0.070	0.0137	1.7	0.083	0.0406	3.7	0.093	0.0899	4.1
Father's education (more than 12 years)	0.015	0.0094	1.4	0.015	0.0135	1.0	0.022	0.0384	2.2	0.024	0.0922	2.3
Mother's education (1-5 years)	0.526	0.0066	1.9	0.530	0.0181	3.0	0.527	0.0378	4.2	0.550	0.0903	6.1
Mother's education (6-11 years)	0.080	-0.0024	-0.5	0.083	0.0021	0.2	0.102	0.0534	4.6	0.112	0.0936	4.2
Mother's education (more than 12 years)	0.005	0.0113	0.9	0.006	0.0387	1.9	0.009	0.1126	4.5	0.010	0.2112	3.5
Regional unemployment rate	6.220	0.0016	1.6	6.229	0.0018	1.1	6.342	0.0092	4.1	6.408	0.0148	4.2
Living in urban area	0.559	0.0054	1.6	0.565	0.0090	1.5	0.588	0.0224	2.6	0.625	0.0587	3.8
Moved in last 5 years	0.578	-0.0009	-0.3	0.576	-0.0025	-0.6	0.573	-0.0097	-1.5	0.560	-0.0165	-1.4
Single	0.159	0.0045	1.5	0.159	0.0024	0.4	0.168	0.0045	0.6	0.172	0.0165	1.1
Caribbean*	0.183	0.0007	0.1	0.181	-0.0011	-0.1	0.179	-0.0410	-3.6	0.167	-0.0685	-3.0
Eastern*	0.145	0.0190	3.2	0.146	0.0351	3.5	0.141	0.0265	1.9	0.145	0.1086	4.4
Pacific*	0.182	0.0022	0.4	0.181	0.0007	0.1	0.183	-0.0090	-0.8	0.177	-0.0111	-0.5
Central*	0.158	0.0007	0.1	0.158	0.0099	1.1	0.153	-0.0228	-1.9	0.155	0.0327	1.5
Antioquia*	0.183	0.0067	1.3	0.182	0.0105	1.2	0.184	0.0028	0.3	0.181	0.0200	0.9
Orinoquia*	0.033	0.0136	1.8	0.035	0.0454	3.9	0.037	0.0528	3.4	0.041	0.1584	5.2
San Andrés*	0.035	0.0484	6.4	0.035	0.0816	6.8	0.029	0.0381	2.0	0.036	0.1386	4.0
Number of children under age 6	0.466	-0.0028	-1.4	0.465	-0.0039	-1.1	0.454	-0.0052	-1.0	0.435	-0.0088	-1.0
Number of people in household	5.021	0.0005	0.8	4.999	-0.0010	-1.0	4.956	-0.0030	-1.9	4.851	-0.0113	-4.0
Age at which worked for payment for first time	13.884	0.0002	1.9	14.024	0.0005	3.5	14.352	0.0011	5.1	15.128	0.0033	8.0
Constant	1.000	-0.0983	-3.8	1.000	-0.2408	-5.4	1.000	-0.4455	-7.1	1.000	-1.1081	-9.8
Number of Observations		5,441			5,611			5,996			7,559	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE)

*Regions in which the survey is statistically representative.

** Institution attended relative to never having taken training. Ever: attended any institution before last year, or: before last year and last year.

1. Education dummy excluded: 11 years (completed high school).

2. Father education dummy excluded: No education.

3. Mother education dummy excluded: No education.

4. Regional dummy excluded: Bogotá.

Table 15. Simple Average Nearest Neighbor, Kernel and Local Linear Regression Estimators of the Impact on Monthly Labor Income for Individuals Who Took Courses Only Last Year

1997 Pesos(i)

Demographic Group	Institution	N [ii]	Mean Income Comparison Group [iii]	Trainees [iv]	Mean Difference (T-NT) [v]	Mean Impact [vi]	Nearest Neighbor (Number of Neighbors) 1	5	10	Kernel (Bandwidth) 0.1	0.2	LLR (Bandwidth) 0.05	0.1	Impact Share [vii]
Adult Male	No Training	4,727	214,738											
	SENA	82	252,081	212,175	-2,563	-39,907	-18,621	-31,227	-43,765	-11,626	-5,615	-85,819	-82,672	-16%
		(87)		(212,266)			(45,557)	(57,250)	(50,360)	(29,459)	(27,839)	(32,284)	(32,679)	
Father's educa	Public	122	247,474	227,615	12,877	-19,859	-24,084	-30,581	-34,916	6,516	18,809	-39,292	-35,466	-8%
		(129)		(232,775)			(47,685)	(41,125)	(37,217)	(23,106)	(20,960)	(25,443)	(25,110)	
	Private	191	363,206	427,679	212,941	64,473	21,691	7,430	40,974	92,687	131,294	70,377	86,859	18%
		(199)		(469,683)			(103,063)	(89,477)	(72,464)	(48,687)	(42,340)	(60,215)	(51,349)	
	Ever	1,380	325,100	377,779	163,041	52,679	60,316	48,039	44,754	49,769	64,088	51,155	50,633	16%
		(1,439)		(409,081)			(32,943)	(30,231)	(27,646)	(26,053)	(25,076)	(23,064)	(22,659)	
Adult Female	No Training	5,237	77,178											
	SENA	71	139,849	146,422	69,244	6,574	-60,210	-17,059	10,561	40,615	62,254	6,705	3,148	5%
		(81)		(157,574)			(111,478)	(67,538)	(53,098)	(36,803)	(29,831)	(37,073)	(34,944)	
	Public	111	98,134	124,788	47,610	26,654	36,560	25,136	20,654	31,938	45,616	13,315	13,357	27%
		(125)		(143,081)			(27,385)	(25,856)	(25,357)	(22,346)	(20,671)	(20,409)	(20,995)	
	Private	238	142,520	277,561	200,384	135,041	135,978	134,478	136,029	134,215	159,424	122,228	122,937	95%
		(254)		(294,212)			(64,244)	(60,222)	(61,705)	(62,571)	(61,965)	(53,497)	(52,847)	
	Ever	1,508	132,329	153,011	75,833	20,682	20,358	15,102	21,759	23,825	34,121	16,715	12,893	16%
		(1,568)		(167,827)			(26,574)	(22,516)	(15,028)	(14,638)	(13,217)	(17,146)	(18,953)	
Male Youth	No Training	2,907	57,368											
	SENA	39	62,822	54,791	-2,577	-8,031	-22,162	-3,149	31	-302	1,750	-12,997	-19,386	-13%
		(43)		(75,053)			(57,319)	(32,188)	(25,213)	(22,910)	(23,397)	(22,216)	(24,271)	
	Public	46	64,062	56,939	-429	-7,123	-6,097	-12,166	-12,221	-2,663	159	-6,655	-10,218	-11%
		(54)		(77,615)			(31,462)	(24,885)	(22,751)	(18,548)	(17,342)	(15,494)	(17,984)	
	Private	58	67,225	115,048	57,680	47,823	46,216	38,026	35,713	49,949	56,085	54,200	54,574	71%
		(61)		(118,402)			(33,187)	(34,915)	(32,995)	(27,857)	(27,317)	(29,013)	(28,429)	
	Ever	191	88,705	104,917	47,549	16,212	8,262	14,472	15,530	19,839	28,688	12,286	14,408	18%
		(200)		(107,693)			(21,409)	(16,059)	(15,870)	(15,163)	(14,666)	(14,650)	(14,289)	
Female Youth	No Training	2,823	32,842											
	SENA	23	34,009	47,442	14,600	13,433	20,537	4,201	6,964	15,708	17,272	15,558	13,791	39%
		(28)		(39,376)			(46,758)	(44,068)	(35,954)	(26,561)	(25,581)	(24,249)	(24,202)	
	Public	44	39,340	45,004	12,162	5,664	13,211	3,077	308	10,478	11,170	671	731	14%
		(51)		(42,052)			(22,078)	(17,663)	(15,426)	(15,485)	(15,466)	(17,035)	(17,226)	
	Private	83	52,239	45,025	12,183	-7,214	4,780	-11,559	-16,569	-6,799	5,435	-13,931	-11,853	-14%
		(89)		(61,424)			(16,302)	(16,807)	(16,899)	(12,358)	(11,223)	(15,718)	(15,380)	
	Ever	203	51,535	68,315	35,473	16,779	22,447	14,915	12,745	18,293	25,575	11,534	11,946	33%
		(220)		(72,414)			(11,833)	(14,376)	(12,682)	(11,890)	(11,912)	(10,907)	(10,582)	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.
[i] Average exchange rate in 1997: $1,180.00/US$1
[ii] Trimmed number of observations after imposing common support, based on a specific replication of the data. Original number of observations are in parenthesis.
[iii] Mean income of comparison group over all estimates.
[iv] Mean Income of trainees after trimming. Mean income of trainees before trimming in parenthesis.
[v] Difference between mean income of trainees and mean income of all non trainees in the demographic group.
[vi] Treatment on the treated
[vii] Mean impact (simple average impact over the seven estimates) as a percentage of mean income of the comparison group.
Bootstrapped standard errors appear in parentheses. They are based on 50 replications of the data with 100% sampling.

Table 16. Simple Average Nearest Neighbor, Kernel and Local Linear Regression Estimators of the Impact on Monthly Labor Income for Individuals Who Took Courses Last Year Regardless of Whether They Had Ever Taken Them Before

1997 Pesos(i)

Demographic Group	Institution	N [ii]	Mean Income		Mean Difference (T-NT) [v]	Mean Impact [vi]	Nearest Neighbor (Number of Neighbors)			Kernel (Bandwidth)		LLR (Bandwidth)		Impact Share [vii]
			Comparison Group [iii]	Trainees [iv]			1	5	10	0.1	0.2	0.05	0.1	
Adult Male	No Training	4,727	214,738											
	SENA	172	307,879	280,574	65,837	-27,304	-20,391	-68,562	-71,214	-3,328	48,638	-38,847	-37,424	-9%
		(187)		(285,453)			(47,292)	(54,023)	(50,071)	(29,501)	(26,958)	(35,306)	(34,640)	
Father's education	Public	287	306,032	356,909	142,171	50,877	76,039	44,450	36,992	60,983	96,183	19,196	22,298	17%
		(302)		(360,913)			(40,423)	(41,910)	(41,585)	(36,493)	(34,234)	(38,313)	(37,686)	
	Private	628	419,648	708,643	493,906	288,995	275,525	309,147	295,726	285,788	296,954	279,726	280,100	69%
		(655)		(743,263)			(73,248)	(68,979)	(69,898)	(71,629)	(69,858)	(62,981)	(64,219)	
	Ever	1,985	350,605	471,386	256,649	120,782	128,097	121,732	116,682	117,161	129,752	117,886	114,162	34%
		(2,068)		(514,354)			(36,542)	(35,427)	(31,453)	(30,736)	(30,989)	(27,530)	(28,219)	
Adult Female	No Training	5,237	77,178											
	SENA	183	136,867	173,453	96,276	36,586	39,508	34,968	31,745	38,679	67,213	19,872	24,117	27%
		(204)		(174,541)			(29,509)	(27,526)	(25,819)	(20,892)	(17,748)	(29,861)	(27,265)	
	Public	357	138,763	216,037	138,860	77,274	98,111	76,283	69,846	74,698	97,463	62,375	62,143	56%
		(374)		(225,228)			(30,363)	(25,575)	(26,501)	(26,045)	(22,607)	(24,762)	(25,628)	
	Private	728	194,094	474,796	397,618	280,702	310,758	292,029	282,560	271,973	287,433	262,544	257,614	145%
		(759)		(496,451)			(53,590)	(50,702)	(53,291)	(57,225)	(56,350)	(68,381)	(68,586)	
	Ever	2,229	154,637	259,002	181,824	104,365	126,757	108,339	103,553	96,775	111,161	91,916	92,052	67%
		(2,322)		(279,562)			(23,134)	(28,264)	(27,499)	(30,240)	(27,674)	(29,701)	(30,285)	
Male Youth	No Training	2,907	57,368											
	SENA	60	66,180	106,978	49,610	40,798	50,501	47,455	43,775	36,394	46,092	29,481	31,889	62%
		(62)		(109,599)			(26,211)	(26,987)	(24,052)	(25,491)	(25,527)	(27,655)	(26,094)	
	Public	73	94,988	119,136	61,768	24,148	25,748	17,968	20,298	23,059	28,189	26,787	26,990	25%
		(79)		(116,038)			(36,585)	(26,087)	(28,889)	(30,425)	(36,156)	(30,750)	(29,930)	
	Private	88	92,682	146,519	89,151	53,838	48,118	42,278	47,101	66,384	79,590	42,974	50,417	58%
		(93)		(145,454)			(55,136)	(49,887)	(52,111)	(27,785)	(24,582)	(36,744)	(29,810)	
	Ever	243	99,457	124,554	67,186	25,097	15,391	22,186	23,428	28,491	35,989	23,793	26,403	25%
		(257)		(128,056)			(33,388)	(18,864)	(16,836)	(15,318)	(14,741)	(14,636)	(12,731)	
Female Youth	No Training	2,823	32,842											
	SENA	34	58,440	53,958	21,116	-4,482	-11,225	-19,499	-19,406	5,052	17,405	-2,385	-1,315	-8%
		(43)		(49,806)			(28,693)	(24,628)	(23,876)	(18,647)	(15,668)	(16,625)	(16,243)	
	Public	67	52,420	53,438	20,597	1,018	11,098	-7,081	-7,250	7,007	17,316	-8,026	-5,935	2%
		(77)		(61,201)			(16,616)	(13,655)	(12,655)	(11,874)	(11,730)	(13,785)	(13,582)	
	Private	141	59,242	75,148	42,306	15,906	23,130	15,786	10,124	15,873	24,283	11,481	10,660	27%
		(151)		(87,957)			(16,560)	(14,869)	(13,958)	(12,631)	(12,449)	(14,609)	(13,861)	
	Ever	290	62,591	81,594	48,752	19,002	17,891	16,408	16,008	18,417	24,857	19,932	19,503	30%
		(308)		(86,846)			(22,030)	(17,316)	(14,418)	(13,138)	(12,100)	(12,024)	(11,327)	

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.
[i] Average Exchange Rate in 1997: $1,180.00/US$1
[ii] Trimmed number of observations after imposing common support, based on a specific replication of the data. Original number of observations are in parenthesis.
[iii] Mean income of comparison group over all estimates.
[iv] Mean Income of trainees after trimming. Mean income of trainees before trimming in parenthesis.
[v] Difference between mean income of trainees and mean income of all non trainees in the demographic group.
[vi] Treatmen on the treated
[vii] Mean Impact (Simple average impact over the seven estimates) as a percentage of mean income of the comparison group.
Bootstrapped standard errors appear in parentheses. They are based on 50 replications of the data with 100% sampling.

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Table 17. Simple Average Nearest Neighbor, Kernel and Local Linear Regression Estimators of the Impact on Monthly Labor Income or SENA Graduates according to Course Length

Colombian Pesos(i)

Period of Training (Sample)	Demographic Group	Length of Course	N[ii]	Mean Income		Mean Difference (T-NT)[v]	Mean Impact [vi]	Nearest Neighbor (Number of Neighbors)			Kernel (Bandwidth)	
				Comparison Group[iii]	Trainees[iv]			1	5	10	0.1	0.2
Only Last Year (Sample 1)	Male	No Training		152,289								
		Short	78	193,564	181,426	29,137	-12,137	-15,774	-17,421	-22,266	-1,816	-1,921
			(86)					(42,726)	(43,354)	(47,163)	(25,416)	(25,484)
		Long	38	155,485	121,597	-30,692	-33,888	-66,245	-44,463	-36,068	-7,184	-7,152
Father´s education (1-5 years)			(44)					(75,130)	(67,828)	(62,172)	(40,236)	(40,436)
	Female	No Training		61,208								
		Short	63	77,943	103,579	42,371	25,636	30,475	24,991	13,202	41,095	45,300
			(74)					(55,658)	(52,117)	(52,037)	(41,592)	(42,768)
		Long	33	90,450	147,061	85,853	56,611	62,756	41,036	35,329	89,974	90,311
			(35)					(121,055)	(166,617)	(150,805)	(71,929)	(72,044)
Last Year or Ever Before (Sample 2)	Male	No Training		152,289								
		Short	171	225,240	255,367	103,078	30,126	29,944	30,530	30,604	53,252	98,764
			(180)					(87,987)	(68,495)	(54,228)	(47,568)	(46,332)
		Long	59	183,031	173,047	20,758	-9,983	-34,157	-6,591	-12,676	8,190	9,301
			(69)					(213,620)	(72,736)	(70,429)	(43,388)	(43,454)
	Female	No Training		61,208								
		Short	134	117,355	151,793	90,585	34,438	53,765	30,147	16,430	46,506	78,699
			(181)					(48,377)	(49,482)	(48,717)	(35,867)	(32,754)
		Long	45	96,226	138,310	77,102	42,084	24,486	23,911	29,448	67,265	75,590
			(66)					(73,640)	(63,353)	(52,833)	(53,714)	(56,082)

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.

(i) Average Exchange Rate in 1997: $1,180.00/U$1

(ii) Trimmed number of observations after imposing common support, based on a specific replication of the data. Original number of observations are in parenthesis.

(iii) Mean income of comparison group over all estimates.

(iv) Mean Income of trainees after trimming. Mean income of trainees before trimming in parenthesis.

(v) Difference between mean income of trainees and mean income of all non trainees in the demographic group.

(vi) Treatmen on the treated

(vii) Mean Impact (Simple average impact over the seven estimates) as a percentage of mean income of the comparison group.

Bootstrapped standard errors appear in parentheses. They are based on 50 replications of the data with 100% sampling.

Table 18. Benefit Minus Cost Estimates for Trainees Who Took Courses Only Last Year, by Institution under Alternative Assumptions of Benefit Persistence and Discounting

Thousands of 1997 Pesos(i)

Demographic Group			Adult Male			Adult Female			Male Youth			Female Youth		
Institution			*SENA*	Public	Private	*SENA*	Public	Private	*SENA*	Public	Private	*SENA*	Public	Private
Average Hours of Training			153	134	85	217	163	91	506	463	186	533	333	152
Mean Monthly Y0c[ii]			252	247	363	140	98	143	63	64	67	34	39	52
Mean Opportunity Cost[iii]			192	165	154	152	80	65	159	148	63	91	65	40
Mean Direct Cost[iv]			193	169	107	275	207	115	639	585	235	673	420	192
Mean Impact[v]			-40	-20	64	7	27	135	-8	-7	48	13	6	-7
Benefit Duration	Annual Real Interest Rate	Direct Cost												
1	0.0%	No	(671)	(404)	619	(73)	240	1,556	(255)	(234)	511	71	3	(126)
1	0.0%	Yes	(864)	(572)	512	(348)	33	1,441	(894)	(819)	276	(602)	(418)	(318)
1	3.0%	No	(664)	(400)	607	(74)	235	1,530	(254)	(233)	502	68	1	(125)
1	3.0%	Yes	(856)	(569)	500	(349)	28	1,415	(892)	(818)	267	(605)	(419)	(317)
1	6.0%	No	(656)	(396)	595	(76)	230	1,506	(252)	(231)	494	66	0	(124)
1	6.0%	Yes	(849)	(565)	488	(350)	23	1,391	(891)	(816)	258	(607)	(420)	(316)
2	0.0%	No	(1,150)	(642)	1,393	6	559	3,176	(352)	(319)	1,085	232	70	(213)
2	0.0%	Yes	(1,343)	(811)	1,285	(269)	353	3,061	(990)	(905)	850	(441)	(350)	(405)
2	3.0%	No	(1,121)	(628)	1,346	1	540	3,078	(346)	(314)	1,051	222	66	(208)
2	3.0%	Yes	(1,314)	(796)	1,239	(274)	334	2,964	(984)	(899)	815	(451)	(354)	(400)
2	6.0%	No	(1,094)	(614)	1,303	(3)	522	2,987	(340)	(309)	1,018	213	63	(203)
2	6.0%	Yes	(1,287)	(783)	1,195	(278)	316	2,872	(979)	(895)	783	(460)	(358)	(395)
3	0.0%	No	(1,629)	(880)	2,167	85	879	4,797	(448)	(405)	1,659	393	138	(299)
3	0.0%	Yes	(1,822)	(1,049)	2,059	(190)	673	4,682	(1,087)	(990)	1,424	(280)	(282)	(491)
3	3.0%	No	(1,565)	(849)	2,064	74	837	4,582	(435)	(393)	1,583	372	129	(288)
3	3.0%	Yes	(1,758)	(1,017)	1,957	(200)	630	4,467	(1,074)	(979)	1,348	(301)	(291)	(480)
3	6.0%	No	(1,507)	(820)	1,970	65	798	4,385	(423)	(383)	1,513	352	121	(277)
3	6.0%	Yes	(1,700)	(988)	1,862	(210)	591	4,270	(1,062)	(968)	1,278	(321)	(299)	(469)
6	0.0%	No	(3,066)	(1,595)	4,488	321	1,839	9,658	(737)	(661)	3,381	877	342	(559)
6	0.0%	Yes	(3,258)	(1,764)	4,380	47	1,632	9,543	(1,376)	(1,247)	3,145	204	(78)	(751)
6	3.0%	No	(2,822)	(1,474)	4,094	281	1,676	8,834	(688)	(618)	3,089	795	308	(515)
6	3.0%	Yes	(3,015)	(1,643)	3,987	7	1,470	8,719	(1,327)	(1,203)	2,853	122	(113)	(707)
6	6.0%	No	(2,611)	(1,369)	3,754	246	1,535	8,121	(646)	(580)	2,836	724	278	(477)
6	6.0%	Yes	(2,804)	(1,538)	3,646	(28)	1,329	8,006	(1,284)	(1,165)	2,601	51	(142)	(669)
10	0.0%	No	(4,981)	(2,548)	7,582	637	3,118	16,140	(1,122)	(1,003)	5,676	1,521	614	(905)
10	0.0%	Yes	(5,174)	(2,717)	7,475	362	2,912	16,025	(1,761)	(1,588)	5,441	848	194	(1,097)
10	3.0%	No	(4,333)	(2,226)	6,535	530	2,685	13,947	(992)	(887)	4,900	1,303	522	(788)
10	3.0%	Yes	(4,526)	(2,395)	6,428	256	2,479	13,833	(1,631)	(1,473)	4,664	630	102	(980)
10	6.0%	No	(3,813)	(1,967)	5,695	444	2,338	12,187	(887)	(795)	4,276	1,128	448	(694)
10	6.0%	Yes	(4,006)	(2,136)	5,587	170	2,131	12,072	(1,526)	(1,380)	4,041	455	28	(886)

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.
[i] Average Exchange Rate in 1997: $1,180.00/US$1
[ii] Mean monthly income of the comparison group.
[iii] Calculated assuming that individuals work an average of 200 hours per month.
[iv] Based on an average cost per hour per student of $1,263.00
[v] Treatment on the treated.

Table 19. Benefit Minus Cost Estimates for Trainees Who Took Courses Last Year Regardless of Whether They Ever Did Before, by Institution under Alternative Assumptions of Benefit Persistence and Discounting

Thousands of 1997 Pesos(i)

Demographic Group			Adult Male			Adult Female			Male Youth			Female Youth		
Institution			*SENA*	Public	Private	*SENA*	Public	Private	*SENA*	Public	Private	*SENA*	Public	Private
Average Hours of Training			136	115	75	217	146	76	117	360	202	538	370	127
Mean Monthly Y0c[ii]			308	306	420	137	139	194	66	95	93	58	52	59
Mean Opportunity Cost[iii]			209	176	158	149	102	74	39	171	93	157	97	38
Mean Direct Cost[iv]			171	146	95	274	185	96	148	455	255	680	468	160
Mean Impact[v]			-27	51	289	37	77	281	41	24	54	-4	1	16
Benefit Duration	Annual Interest Rate	Direct Cost												
1	0.0%	No	(537)	434	3,310	291	826	3,294	451	119	553	(211)	(85)	153
1	0.0%	Yes	(708)	289	3,215	16	641	3,198	303	(336)	298	(891)	(552)	(7)
1	3.0%	No	(531)	425	3,255	284	811	3,241	443	114	542	(210)	(85)	150
1	3.0%	Yes	(703)	279	3,160	9	626	3,145	295	(340)	288	(890)	(553)	(10)
1	6.0%	No	(526)	415	3,203	277	797	3,190	436	110	533	(209)	(85)	147
1	6.0%	Yes	(698)	270	3,108	3	612	3,094	288	(345)	278	(889)	(553)	(13)
2	0.0%	No	(864)	1,045	6,778	730	1,753	6,663	940	409	1,199	(265)	(73)	344
2	0.0%	Yes	(1,036)	899	6,683	455	1,568	6,567	793	(46)	944	(945)	(540)	184
2	3.0%	No	(844)	1,008	6,569	703	1,697	6,460	911	391	1,160	(262)	(73)	333
2	3.0%	Yes	(1,016)	862	6,474	429	1,512	6,363	763	(63)	905	(942)	(541)	172
2	6.0%	No	(826)	974	6,373	678	1,645	6,270	883	375	1,123	(259)	(74)	322
2	6.0%	Yes	(997)	828	6,279	404	1,460	6,174	735	(80)	869	(939)	(542)	161
3	0.0%	No	(1,192)	1,655	10,246	1,169	2,680	10,031	1,430	698	1,845	(319)	(60)	535
3	0.0%	Yes	(1,363)	1,510	10,151	894	2,495	9,935	1,282	244	1,590	(999)	(528)	374
3	3.0%	No	(1,148)	1,574	9,786	1,110	2,557	9,584	1,365	660	1,759	(311)	(62)	510
3	3.0%	Yes	(1,320)	1,429	9,691	836	2,372	9,488	1,217	205	1,504	(991)	(530)	349
3	6.0%	No	(1,109)	1,500	9,364	1,057	2,445	9,175	1,306	625	1,680	(305)	(63)	486
3	6.0%	Yes	(1,280)	1,355	9,270	783	2,260	9,079	1,158	170	1,426	(985)	(531)	326
6	0.0%	No	(2,175)	3,487	20,650	2,486	5,462	20,137	2,899	1,568	3,783	(480)	(24)	1,108
6	0.0%	Yes	(2,346)	3,341	20,555	2,211	5,277	20,040	2,751	1,113	3,528	(1,160)	(491)	947
6	3.0%	No	(2,008)	3,176	18,886	2,262	4,990	18,423	2,650	1,420	3,454	(453)	(30)	1,010
6	3.0%	Yes	(2,180)	3,031	18,791	1,988	4,806	18,327	2,502	966	3,200	(1,133)	(498)	850
6	6.0%	No	(1,864)	2,908	17,359	2,069	4,582	16,940	2,434	1,293	3,170	(429)	(35)	926
6	6.0%	Yes	(2,035)	2,762	17,264	1,795	4,397	16,844	2,286	838	2,915	(1,109)	(503)	766
10	0.0%	No	(3,485)	5,929	34,522	4,242	9,171	33,610	4,857	2,727	6,367	(695)	25	1,871
10	0.0%	Yes	(3,657)	5,783	34,427	3,968	8,986	33,514	4,709	2,272	6,112	(1,375)	(442)	1,711
10	3.0%	No	(3,042)	5,103	29,829	3,648	7,917	29,052	4,195	2,335	5,493	(622)	9	1,613
10	3.0%	Yes	(3,214)	4,957	29,734	3,374	7,732	28,956	4,047	1,880	5,238	(1,302)	(459)	1,452
10	6.0%	No	(2,686)	4,440	26,061	3,171	6,909	25,393	3,663	2,020	4,791	(564)	(5)	1,405
10	6.0%	Yes	(2,858)	4,294	25,966	2,897	6,724	25,296	3,515	1,565	4,536	(1,244)	(472)	1,245

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.
[i] Average Exchange Rate in 1997: $1,180.00/US$1
[ii] Mean monthly income of the comparison group.
[iii] Calculated assuming that individuals work an average of 200 hours per month.
[iv] Based on an average cost per hour per student of $1,263.00
[v] Treatment on the treated.

Table 20. Benefit Minus Cost Estimates for SENA Trainees according to Course Length under Alternative Assumptions of Benefit Persistence and Discounting
Thousands of 1997 Pesos(i)

Sample			Only Last Year				Last Year or Ever Before			
Demographic Group			Male		Female		Male		Female	
Length of Course			Short	Long	Short	Long	Short	Long	Short	Long
Average Hours of Training			76	533	89	778	70	659	75	770
Mean Monthly Y0c(ii)			194	155	78	90	225	183	117	96
Mean Opportunity Cost(iii)			73	415	35	352	79	603	44	371
Mean Direct Cost(iv)			96	674	112	983	89	832	95	973
Mean Impact(v)			-12	-34	26	57	30	-10	34	42
Benefit Duration	Annual Real Interest Rate	Direct Cost								
1	0.0%	No	(219)	(821)	273	327	282	(723)	369	134
1	0.0%	Yes	(315)	(1,495)	161	(656)	194	(1,555)	274	(839)
1	3.0%	No	(217)	(815)	268	317	277	(721)	363	126
1	3.0%	Yes	(312)	(1,489)	156	(666)	188	(1,553)	268	(847)
1	6.0%	No	(214)	(809)	264	306	271	(719)	356	119
1	6.0%	Yes	(310)	(1,483)	151	(677)	183	(1,551)	262	(855)
2	0.0%	No	(365)	(1,228)	581	1,007	644	(842)	782	639
2	0.0%	Yes	(460)	(1,902)	469	24	555	(1,675)	688	(334)
2	3.0%	No	(356)	(1,203)	562	966	622	(835)	758	609
2	3.0%	Yes	(451)	(1,877)	450	(17)	533	(1,667)	663	(364)
2	6.0%	No	(348)	(1,181)	545	927	602	(828)	734	580
2	6.0%	Yes	(443)	(1,854)	433	(56)	513	(1,661)	639	(393)
3	0.0%	No	(510)	(1,635)	888	1,686	1,005	(962)	1,196	1,144
3	0.0%	Yes	(606)	(2,308)	776	703	917	(1,794)	1,101	171
3	3.0%	No	(491)	(1,581)	847	1,596	958	(946)	1,141	1,077
3	3.0%	Yes	(587)	(2,255)	735	613	869	(1,778)	1,046	104
3	6.0%	No	(473)	(1,531)	810	1,513	914	(932)	1,091	1,016
3	6.0%	Yes	(569)	(2,205)	698	530	825	(1,764)	996	43
6	0.0%	No	(947)	(2,855)	1,811	3,724	2,090	(1,322)	2,435	2,659
6	0.0%	Yes	(1,043)	(3,528)	1,699	2,741	2,001	(2,154)	2,341	1,686
6	3.0%	No	(873)	(2,648)	1,655	3,378	1,906	(1,261)	2,225	2,402
6	3.0%	Yes	(969)	(3,322)	1,543	2,395	1,817	(2,093)	2,130	1,429
6	6.0%	No	(809)	(2,469)	1,519	3,079	1,747	(1,208)	2,043	2,180
6	6.0%	Yes	(905)	(3,143)	1,407	2,096	1,658	(2,040)	1,949	1,207
10	0.0%	No	(1,530)	(4,481)	3,042	6,441	3,536	(1,801)	4,089	4,679
10	0.0%	Yes	(1,625)	(5,155)	2,930	5,458	3,447	(2,633)	3,994	3,706
10	3.0%	No	(1,333)	(3,931)	2,625	5,522	3,047	(1,639)	3,529	3,996
10	3.0%	Yes	(1,428)	(4,605)	2,513	4,539	2,958	(2,471)	3,434	3,023
10	6.0%	No	(1,174)	(3,489)	2,291	4,784	2,654	(1,509)	3,080	3,447
10	6.0%	Yes	(1,270)	(4,163)	2,179	3,801	2,565	(2,341)	2,985	2,474

Source: Encuesta Nacional de Calidad de Vida 1997 (DANE). All variables are measured at the time of the interview.
[i] Average Exchange Rate in 1997: $1,180.00/US$1
[ii] Mean monthly income of the comparison group.
[iii] Calculated assuming that individuals work an average of 200 hours per month.
[iv] Based on an average cost per hour per student of $1,263.00
[v] Treatment on the treated.

Figure 2. Density of Estimated Propensity Scores

Adult Male   **Male Youth**   **Adult Female**   **Female Youth**

Ever
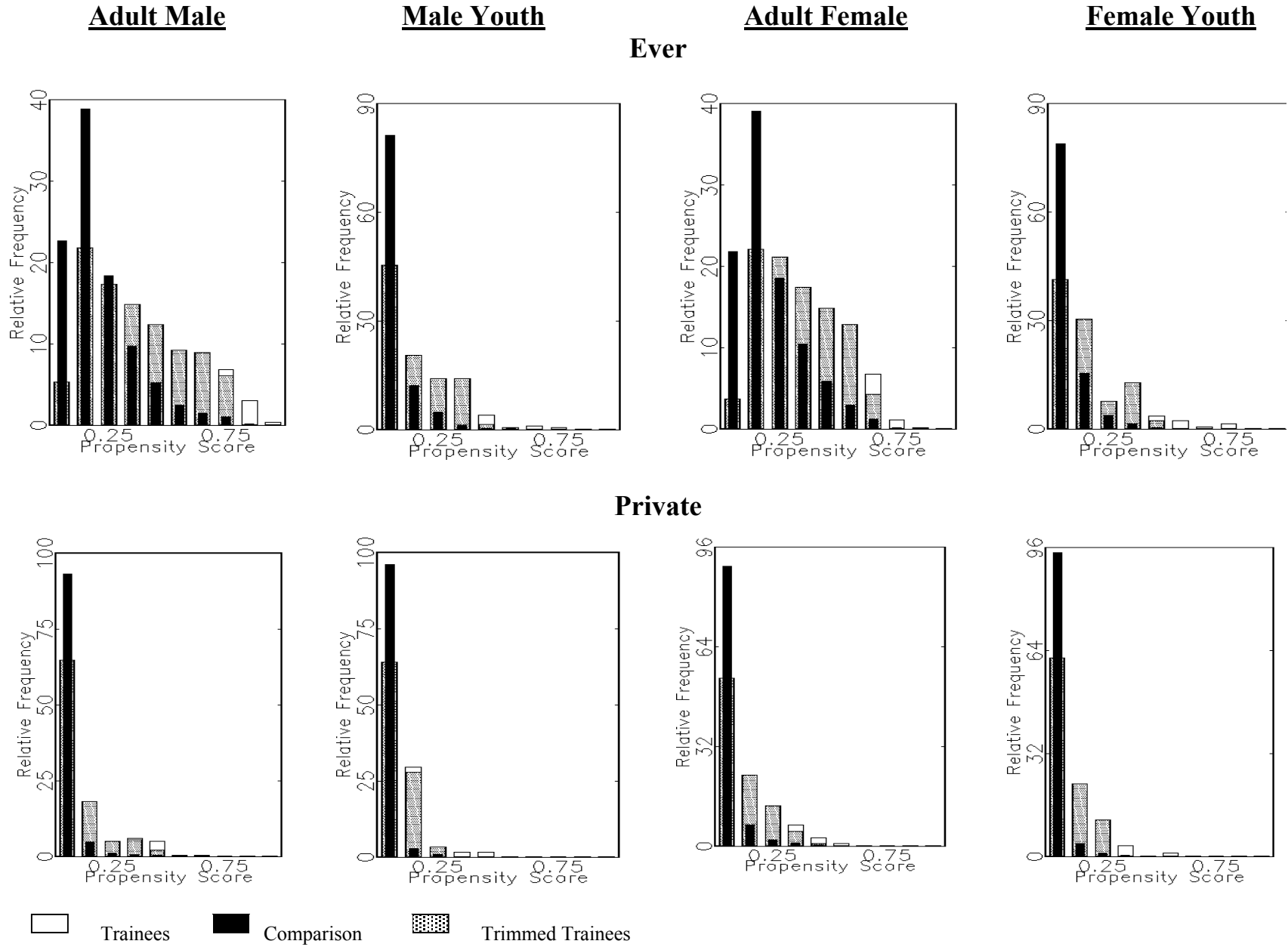
Private

□ Trainees   ■ Comparison   ▨ Trimmed Trainees

Figure 2. Density of Estimated Propensity Scores (Continuation)

Adult Male **Male Youth** **Adult Female** **Female Youth**

Public

SENA

☐ Trainees   ■ Comparison   ▨ Trimmed Trainees