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1. Introduction

Public training institutions have played a key role in the provision of general training to workers in most Latin American countries. These institutions were created four decades ago, based on two main premises: Training was seen as (i) a key element for firm competitiveness and economic growth, and (ii) as the only alternative for young individuals who did not have access to tertiary education and did not want to enter the labor market immediately. The *Servicio Nacional de Aprendizaje* (SENA) in Colombia was one of such institutions. Yet despite its strategic role, SENA has been a source of controversy in recent years. While many analysts (and almost all politicians) highlight its importance, other analysts question its efficiency and its social impact. This paper evaluates the impact of SENA on earnings and employment in an attempt to contribute some plain facts to a debate often plagued with ideological arguments.

The stated purpose of SENA is to contribute to the technical education and skill upgrade of Colombian workers. SENA's funds, consisting of an annual budget of about US\$ 200 million, come mainly from a payroll tax levy on private employees. Of this, 75% is devoted to finance training activities. These activities are of two types: professional training of young individuals who aspire to enter the labor market (long courses) and skill upgrading for workers (short courses). Currently, 100 thousand students are enrolled in long courses and 900 thousand in short courses.¹

¹ In a sense, SENA can be seen as two institutions merged into one: it is a public university financed with earmarked resources and it is a public training institute. Although the latter type is quite common in Latin America, the former is not.

The goal of this paper is to shed light on the impact of public training programs in Colombia. To this effect, we use various data sets and put into practice various methodologies. We use data from both a living standard survey and a survey of SENA trainees to evaluate the impact of SENA courses. In addition, we use public opinion polls to evaluate the perception of managers and workers as well as that of the public at large about the role of SENA and the quality of the training provided.

Opinion polls show that managers are roughly satisfied with the quality of SENA programs and that the public at large perceives SENA as an honest, reliable institution. At the same time, however, the results show that SENA training programs do not have a discernable impact on earnings and employment. The conflict between perception and reality indicates that reforming SENA is both a policy priority and a political snag. Without a doubt, closing the gap between perception and reality is paramount to advancing reform in this area. This paper constitutes one step in that direction.

2. Public Opinion about SENA

This section presents the results of three opinion polls that query business representatives, managers, as well as lay men and women about the probity of SENA and the quality of its services. This evidence not only complements the formal substantiation about the impact of SENA programs on individual earnings and employment presented in the following sections, but also sheds some light on the general support (or the lack thereof) that any attempt to drastically reform SENA will have. Perceptions about SENA do not have to coincide with the measured impact of the programs. Oftentimes, ineffectual institutions enjoy good reputations, and vice versa.

Three different polls were used to gauge public opinions about SENA. The first is a survey conducted by the Colombian vice-presidency on the perceptions about corruption of Colombian public institutions. The second is a private sector survey conducted by Fedesarrollo--an independent, nonprofit institution and think tank located in Bogotá-- on the perceptions of firm managers about the quality of services provided by SENA. The

third is a survey on social conditions and public perceptions (Colombian Social Survey) also conducted by Fedesarrollo.²

In 2001, the Colombian vice-presidency, jointly with the World Bank, conducted a comprehensive survey on government quality and, particularly, corruption. The survey included questions about the prevalence of corruption, its mechanisms, and its effects on the functioning of business, as well as questions on the perceived honesty (or dishonesty, for that matter) of several public institutions. The survey has three independent segments, each focusing on a different population group. The first was answered by 1343 firm managers, the second by 3943 individual users of government services and the third by 4567 public sector employees. The samples can be taken as representative of urban Colombia.³

All three segments included questions about the perceived honesty (or dishonesty) of 30 public institutions, from the ministries and the Central Bank to SENA and the local governments. Respondents were asked to rate each institutions in a scale from one to seven, one meaning completely dishonest and seven completely honest. Figure 1 shows the mean answers of firm managers and individual users for all 30 institutions. As shown, Congress and the Colombian Social Security Institute (ISS) are the most dishonest public institutions in the eyes of both firm managers and individual users. For their part, SENA and the Colombian Institute for Family Welfare (ICBF) are perceived as the most honest institutions. Largely, firm managers and individual users have similar opinions about the honesty (or the lack thereof) of Colombian public institutions. Both regard SENA as one of the most, if not the most, honest public institution in the country.

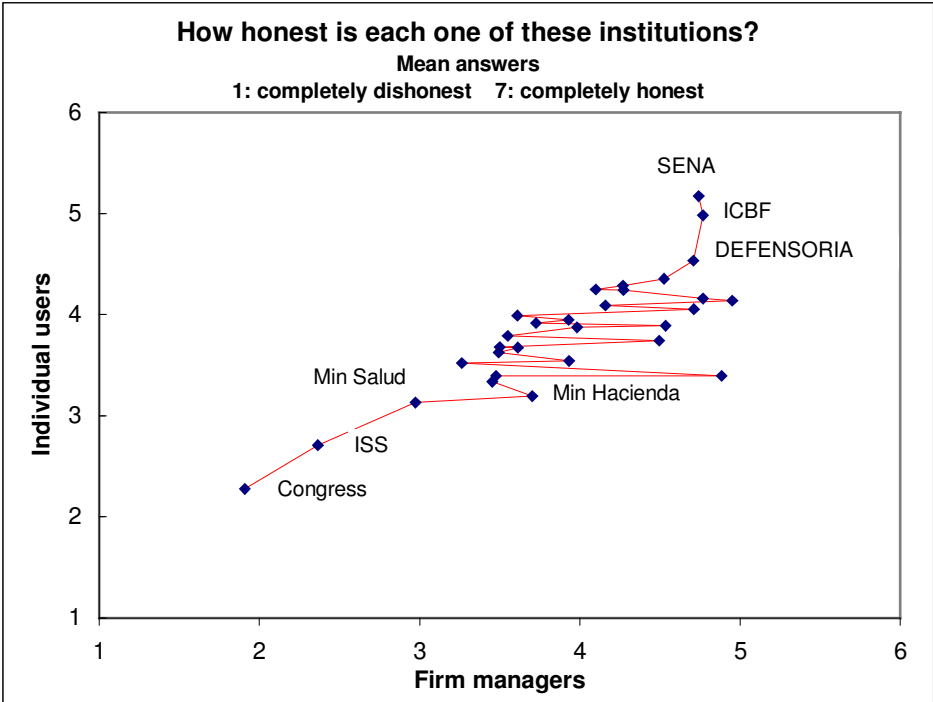
Opinions about the honesty of SENA independent of the respondent's gender or age. Mean answers are smaller (reflecting less perceived honesty) in Bogotá, but the differences are

² The Social Survey of Fedesarrollo is similar in emphasis and design to the General Social Survey of the United States.

³ The sample was applied in the cities of Bogotá, Cali, Cúcuta, Cartagena, Yopal, Ibagué, Medellín, Buenaventura y Armenia. Individual users were selected randomly among those who were present in public institutions for any reason: getting a license, filing a complaint, visiting a friend, and so on. The idea was to query individuals with some type of interaction with public employees and government officials.

neither substantial in economic terms nor significant in statistical terms. Overall, agreement about the honesty of SENA is widespread both demographically and geographically. While one may argue that these results only reflect that SENA is a well-known institution that has never been involved in a highly publicized corruption scandal--something which cannot be said about many other public institutions in Colombia-- the fact of the matter is that SENA has a reputation for probity that must be taken into account in the discussion of any potential reform. Although the existence of corrupt and clientelist practices cannot be ruled out based on the evidence at hand, it must be recognized that these problems, if they do exist, do not resonate with the public as loudly as do similar problems in other institutions.

Figure 1



The previous evidence can be complemented with evidence from a similar dataset that has also collected qualitative evidence about SENA: the private sector survey of Fedesarrollo. This survey has been conducted uninterruptedly every month since 1975. Although its main objective is to collect data on both industrial performance and managers' expectations about the state of the economy and ultimately to compute leading indicators of the Colombian business cycle, this survey often includes small chapters about other topics that

are of concern to the private sector. In 1997, the survey included a special chapter on training which explicitly asked firm managers about the demand and the perceived quality of the several programs provided by SENA.

The chapter on training was answered only by managers of industrial firms. The total sample comprises 413 firms that, taken together, account for nearly 40% of the value added of the Colombian manufacturing sector. The firms were classified into two groups according to the value of annual sales (size) and the type of goods produced (sector).⁴ Mean averages for each type of firm in each group were computed in order to examine how the probability of using SENA services, as well as the opinions about such services, vary with both firm size and sector. Three types of services were considered: training services (firm contracts SENA to train a fraction of its labor force), apprenticeship services (firm temporarily hires SENA trainees) and hiring of SENA trainees.

Figure 2 shows that 52% of the surveyed firms report using training services, 62% report using apprenticeship services and 35% report hiring SENA trainees on a regular basis. Panel A shows that the probability of using services increases with the size of the firms. Whereas almost 90% of firms with annual sales above US\$ 25 million report using apprenticeship services, only 40% of firms with annual sales below US\$10 million report using the same type of service. The corresponding figures are 54 and 27% for the hiring of SENA trainees, and 67 and 47% for the use of SENA training services. Panel B shows that firms producing consumer goods are less likely to use SENA services than firms producing either raw materials or capital goods. These differences are more apparent for the hiring of SENA trainees and less so for the use of training services.

⁴ Three types of firms were considered in each group (see Figure 2). 79 Firms had annual sales above US\$ 25 million, 157 had sales between US\$ 25 million and US\$ 10 million and 177 had sales below US\$ 10 million. 184 produced mainly consumer goods, 154 produced raw materials and 72 produced capital goods.

Figure 2

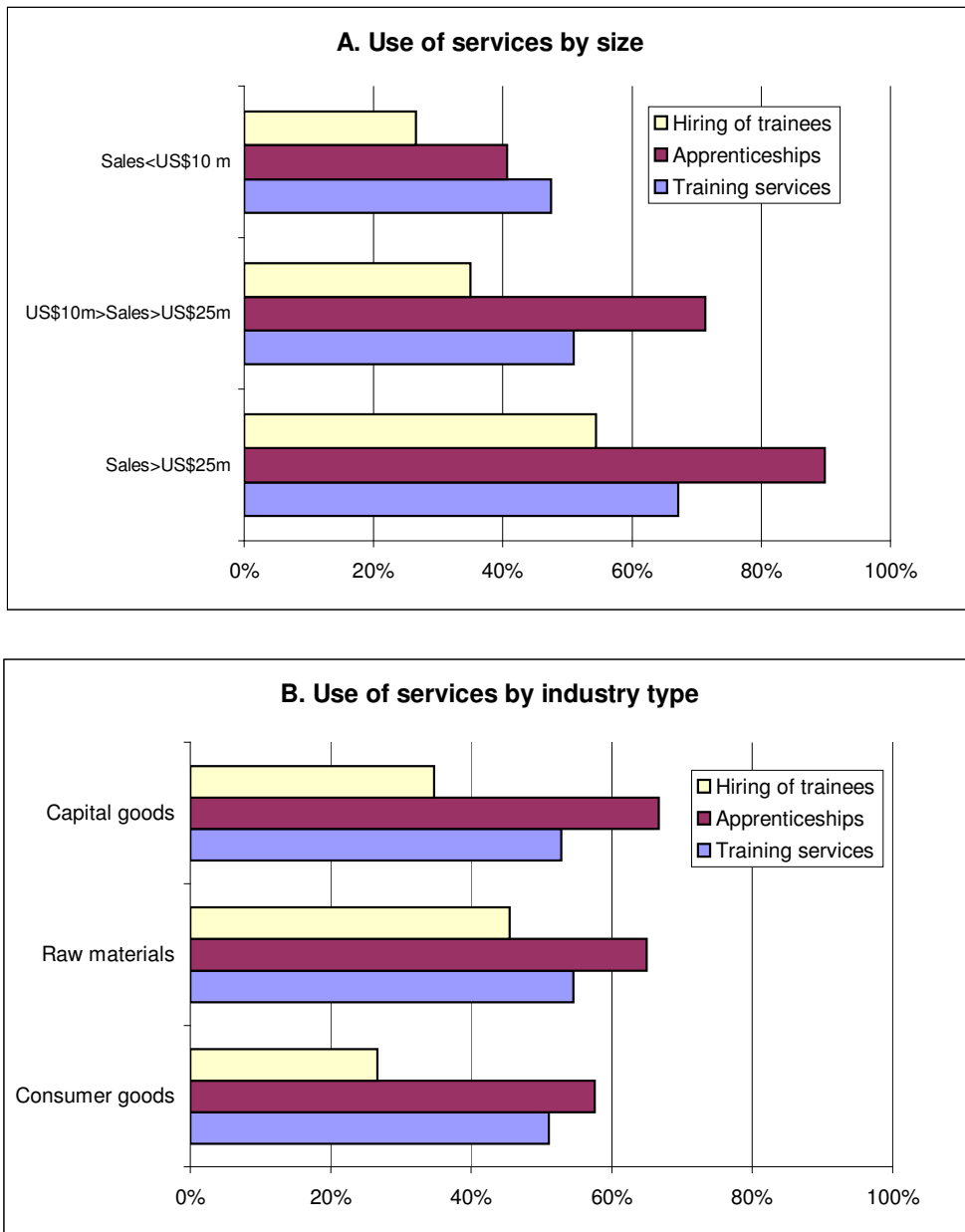
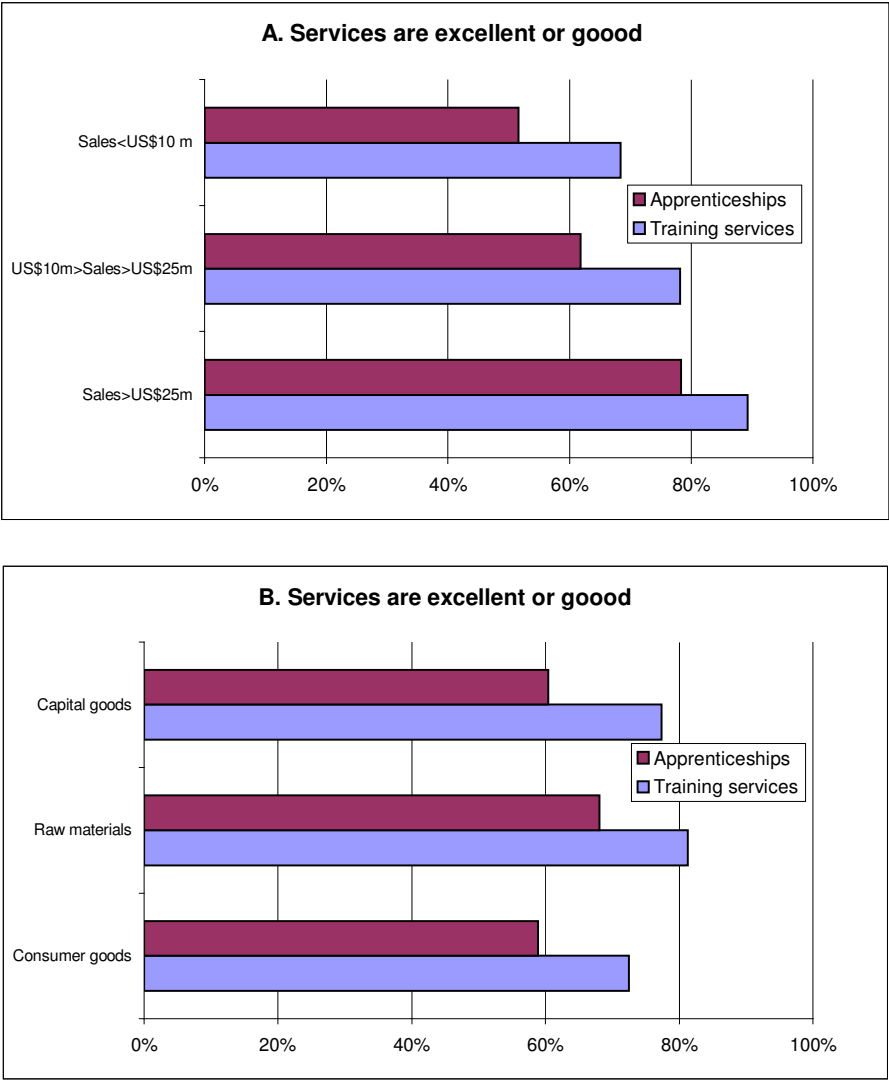


Figure 3 presents the perceptions about the quality of services for the same sample of firms. Managers were asked to rate the services provided by SENA as excellent, good, mediocre or poor. The figures display, for each type firm, the percentage of respondents that reported that the services are either excellent or good. The data show that perceptions about the quality of services are positive: 77% of the respondents report that apprenticeship services are either good or excellent and 62% report that training services deserve a similar rating.

Positive perceptions about the quality of services increase with firm size, and are more prevalent among producers of raw materials. Overall, the results indicate that perceptions about the quality of services provided by SENA are positive, which is consistent with the previous information.

Figure 3



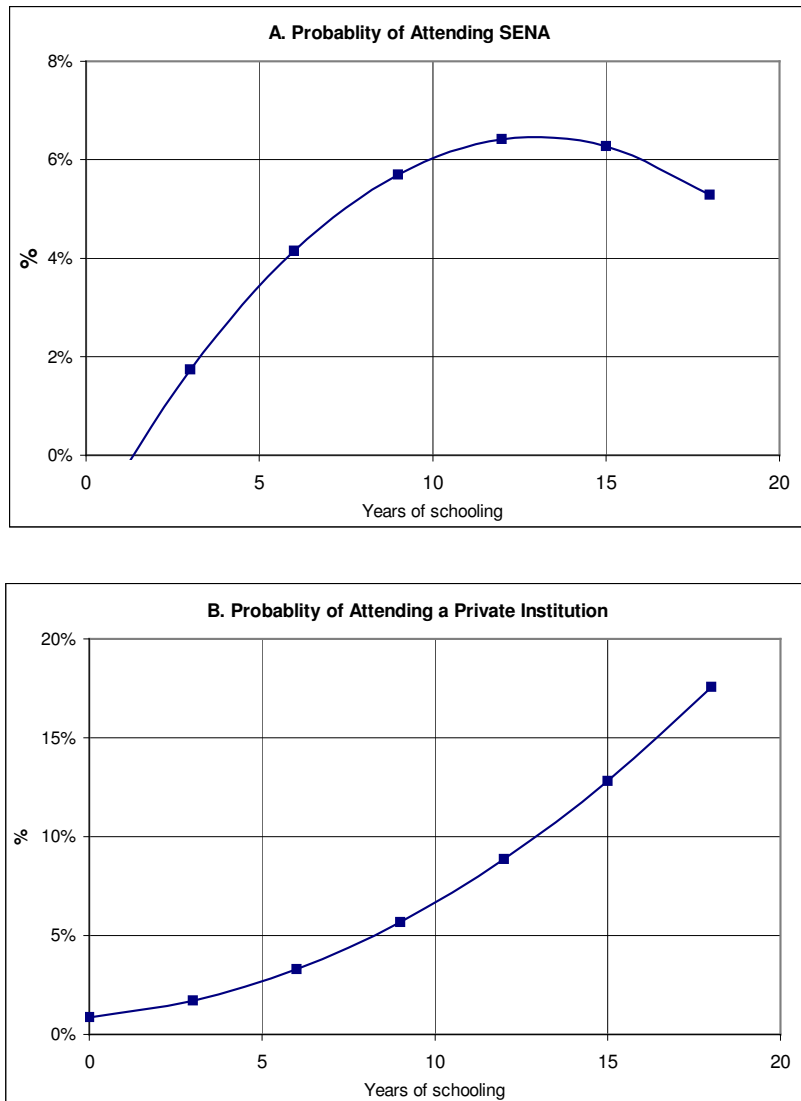
Finally, we use evidence taken from the Social Survey of Fedesarrollo to compare private and public training programs in two dimensions: duration and intensity of courses. The Social Survey began in September 1999 and has since been conducted every semester. The

survey is restricted to the four largest metropolitan areas of the country: Bogotá, Medellín, Cali and Barranquilla. While the survey's emphasis is on household finances, every round has included a special chapter on a topic of interest. The latest round includes a chapter on training. Individuals were asked whether they have ever attended training programs, as well as about the duration, the intensity and the perceived quality of the courses. The survey comprises approximately 2700 households and 10000 individuals.

The results show that 20% of the individuals sixteen and older report having received formal training. Of those, 22% attended SENA, 16% attended a different public institution and 33% any private institution. The rest received on-the-job training. Figure 4 shows that while the probability of attending SENA is the highest among those who finish high school but do not go into college (i.e., those who have 11 years of schooling), the probability of attending a private institution grows monotonically with schooling. In the sample, men are two percentage points more likely to receive training than women irrespective of whether they attend a private or public institution.

Finally, it is worth mentioning that no differences in course length are apparent between SENA and private institutions. Half of SENA trainees report having taken courses that lasted less than three months and an additional 20% reported taken courses that lasted between three and six months. The same is true for those who attended private institutions. Conversely, more than 80% of workers who received training at the workplace were enrolled in courses lasting less than three months. As for the intensity of the courses, 60% of trainees reported that they devoted less than 10 hours a week to formal instruction and 30% reported that they devoted between 10 and 20 hours. These percentages are the same regardless of whether the individual attend a public or a private institution. Surprisingly, all trainees reported that the instruction received was good. Such uniformity may reflect either lack of information or a reluctance to pass judgment in past decisions, or both. In any case, high satisfaction is somewhat at odds with the impact results shown in the next section.

Figure 4



3. Impact Evaluation

This section presents comparative estimates of the effect of SENA training on both wages and the probability of unemployment. Two different data sets are used: the *Encuesta Nacional de Calidad de Vida* conducted in 1997 and a survey conducted by SENA among graduates. Before showing the results, we present a description of the methodology and a review of previous studies dealing with the individual impact of SENA training programs.

Methodology

This paper attempts to evaluate the impact of training programs on the labor market outcomes of trainees. The problem with this type of evaluation (post-treatment) is that one cannot know what the labor market outcomes of a SENA trainee would have been had she opted for not getting any training (or for getting it at a different institution). It would not be enough to compare such an individual to those who have not opted for training or did attend a different institution due to selection bias; that is, it is possible that SENA trainees possess unobservable characteristics that differentiate them from non-SENA trainees and that also have an effect on labor market outcomes. To solve this problem, one must simulate the labor market outcomes corresponding to the hypothesized situation. In short, one must create a counterfactual for the unobserved state in order to estimate the impact of the program in question.

Ideally, an impact evaluation which controls for selection bias would consist of three steps. First, draw a random sample of individuals that wish to participate in the program. Second, randomly divide the sample between non-participants ($D=0$) and participants ($D=1$). The former will be part of the control group and the latter of the treatment group. And third, compare average earnings (or any other outcome of interest) between the two groups. The mean difference could be interpreted as the impact of the program.

But reality is much more complicated, as participation is often not randomly assigned by the researcher but willfully decided by the individual. For this reason, the researcher is forced to *construct* a control group for each participant using similar individuals that do not participate in the program. Simply stated, the earnings of each participant are compared to those of non-participants that have *similar* attributes (i.e., a similar probability to participate in the program in question).

Thus, the first step in impact evaluation is to set up a model that estimates the probability of participation. In theory, participation depends on socioeconomic characteristics of the individual and her household. Participation is a binary decision that can be written as:

$$\Pr.(D = 1 | X_i) = \pi_i = f(\beta X_i), \quad (1)$$

where X_i is a vector of socioeconomic characteristics and π_i is the estimated probability of participation for i . The coefficients β are estimated using maximum likelihood and measure the impact of socioeconomic characteristics on Pr.

To estimate the effect of the program, one needs to compute the difference between the actual earnings of the participants ($Y_1 | X, D = 1$) and the earnings they would have obtained had they not participated in the program ($Y_1 | X, D = 0$). Since the latter term is not observed, it has to be estimated using the information at hand. By using the β s, one can estimate the distribution of earnings for participants ($F(Y_1 | X, D = 1)$) and non-participants ($F(Y_0 | X, D = 0)$). The latter distribution can, in turn, be used in order to estimate $Y_1 | X, D = 0$.

According to Heckman, LaLonde, and Smith (1999), one must compare earnings of participants to earnings of non-participants with a similar probability of participation. An estimator of the impact of the program is, then, construed as the difference between the two. There are various ways to compute this estimator. Here we use the *average nearest neighbor estimator*. The procedure is as follows: By using the β s, we can, first, compute the probability of participation for each individual as well as the difference in the probabilities for a participant (i) and non-participant (j): $|\Pr(X_i) - \Pr(X_j)|$. Then, we can compute, for each participant, the average earnings of the closest M non-participants (Y_m). The difference, $Y_i - Y_m$, is an estimate of the impact of participation for i . The mean differences for all participants is the *average nearest neighbor estimator*. That is,

$$m = \sum_{i=1}^{N_t} (Y_i - Y_{m,i}) / N_t, \quad (2)$$

where N_t is the number of participants and m can be interpreted as the impact of the program under scrutiny.

Previous Work

Puryear (1977) was the first researcher to seriously study the impact of job training programs in Colombia. He focused on the effect of training on wages for a sample of industrial workers.⁵ His goals were: (i) to compare the socioeconomic characteristics between SENA trainees and other workers, (ii) to estimate the impact of SENA programs on wages, and (iii) to calculate the private and social benefits of the SENA programs. Puryear collected information about two different groups of people: males who graduated from SENA programs in Bogotá between 1965 and 1967 and a random sample of individuals between 20 and 29 years old, residents of Bogotá who had completed primary education and did not have tertiary education. Members of each group answered an identical questionnaire during the first semester of 1972.

Labor market conditions by the time of Puryear's study were different from current conditions, as were the socioeconomic characteristics of the objective populations. In 1964, 27% of individuals 15 and older had no formal education, only 12% had completed primary, and less than 2% had finished secondary. Because of the low levels of educational attainment, SENA's admission policy only required that potential candidates have finished primary education. SENA's programs were an appealing alternative for individuals who had completed primary education and were considering continuing their studies; not only did they provide a free option to acquire skills, but the skills imparted were competitive vis-à-vis most available alternatives.

In Puryear's model, earnings are a linear function of a set of covariates (X) and a dummy variable set to unity if the individual in question received training at SENA. That is,

$$Y_i = c + \beta X_i + \alpha D_i + u_i$$

where Y_i is the log of hourly wages of individual i , X_i is a vector of socioeconomic characteristics (education squared, log of experience, and log of socioeconomic status) and u_i is an error term. Only individuals who were working at the time of the interview were

⁵ Puryear's book is based on his doctoral dissertation presented to the Department of Education of the University of Chicago in 1974.

included in the regression. The results show that individuals who did attend industrial courses at SENA had hourly wages around 15% higher than those who did not. Puryear also found that the impact on earnings decreased as the trainee had more years of secondary education, implying that secondary education and SENA programs were to some extent, substitutes. In addition, Puryear examined the wage progression of SENA trainees after graduation in order to calculate private and social rates of return. Private rates of return for trainees with 10-11 (5-9) years of formal education were 82% (96%). Social rates of return for trainees with 10-11 (5-9) years of formal education were 32% (29%).

Gómez and Libreros (1984) also studied the impact of SENA programs on individual wages. They used data from the *Proyecto de Recursos Humanos*--an evaluation exercise sponsored by SENA and conducted between 1978 and 1982. Gómez and Libreros estimated a model similar to Puryear's, using information on SENA graduates and their coworkers. They controlled for various socioeconomic characteristics of workers, and estimated separate equations for different occupations. They found that SENA courses do not have a significant effect on 66% of the occupations assessed, and that they do on 30% of them. Differences in earnings were mostly lower than 17%.

Gómez and Libreros also studied the differential impact of SENA courses across educational categories. They found that SENA graduates earned 17% more than their coworkers when both had completed basic education, 6.7% more when both had completed primary, and 38% less when none had completed primary. These results are at odds with the evidence found by Puryear (1977). The disparity can be partly explained by differences in the datasets used by both studies. While Puryear's study uses a random sample of comparable individuals as a control group, Gómez and Libreros' uses a sample of individuals working under similar conditions to those of SENA graduates.

Jiménez and Kugler (1987) also studied the impact of SENA on labor outcomes. They used similar data to that of Gómez and Libreros (1984). They estimated separate *Mincerian* equations for individuals that did not take training at SENA, those that took short courses and those that took long courses, and corrected them for self-selection bias using a choice

model. In their analysis, the decision of whether or not to attend a SENA course (i.e., the choice model) depends on parental education, occupational status, spatial mobility and whether or not the individual attended a rural primary school. For its part, the value of earnings (i.e., the *Mincerian* equation) depends on education, experience, experience squared, and the cross product of education and experience.

They found that OLS estimation overestimates the impact of SENA on earnings, and that the impact increases with the level of education and experience of the graduates --a finding similar to that of Gómez and Liberos (1984). For short courses, the impact goes from –14.6% for individuals with 10 years of schooling and 19 years of experience to 16.4% for individuals when 12 years of schooling and 29 years of experience. For long courses, the impact ranges from –1.8% for individuals with 10 years of schooling and 12 year of experience to 3.5% for individuals with 12 years of schooling and 16 years of experience.

In a related study, Jiménez *et al.* (1989) set out to estimate the social and private rates of return of SENA programs. They used administrative information of direct costs per trainee for each type of course, and coupled this information with estimated earnings for SENA and non-SENA individuals in order to compute the estimates of the rates of return to each type of course. Even under the less favorable assumptions for SENA's programs, they found them to be socially profitable. Rates of return were systematically beyond 10%. Long courses were always socially more profitable than short ones, and in some cases more profitable than higher education. Private rates of return were found to be above social rates by at least 40%.

Many other applied studies have made explicit recommendations about how to improve SENA services.⁶ Some highlight the importance of stepping up the physical and human capital endowment of the SENA, others the importance of greater cooperation between private and public sectors in the provision of training, and still others the importance of greater competition in the provision of training services.

⁶ See, for example, López (1994a,b), Vélez (1994) and Ramírez and Reyes (1989), among others.

Impact estimates using data from the ENCV

This paper uses data from the *Encuesta Nacional de Calidad de Vida* (ENCV) to evaluate the impact of training programs, including SENA, on both the earnings and the probability of employment of a sample of Colombian workers. The ENCV was conducted in 1997 under the supervision of the National Department of Planning (DNP). More than 10000 households located in over 75 municipalities, big and small, were queried about social conditions in general and education and training in particular. The survey is representative of the country as a whole and of urban and rural areas taken separately.

The ENCV can be used to study the impact of training programs, as it includes a special chapter devoted to job training as well as profuse socioeconomic information on individuals and households. First, the survey asks whether respondents took any training course during the previous year. If they did, then the survey asks about the type of institution attended and whether the respondents took any other training courses at some other time. If respondents did not take any training courses during the previous year, the survey also asks whether they ever did so in the past, but does not inquire about the institution attended. Figure 5 summarizes the sequence of questions.

This sequence of questions provides information about whether: (i) respondents took courses at SENA during previous year, (ii) respondents took courses at any public institution (including SENA) during previous year, (iii) respondents took courses at any private institution during previous year, or (iv) respondents received any training before the year previous to the survey.

We compare individuals who receive formal training in the year before the survey to individuals who have never received any formal training, neither in the previous year nor in any other time in the past. We break down the analysis according to the type of institution attended. We use four different treatment groups: (i) individuals who attended SENA last

year⁷, (ii) individuals who attended any public institution (including SENA), (iii) individuals who attended any private institution and, (iv) individuals who received formal training prior to last year.

Figure 5: Training questions included in the *Encuesta de Calidad de Vida*, 1997

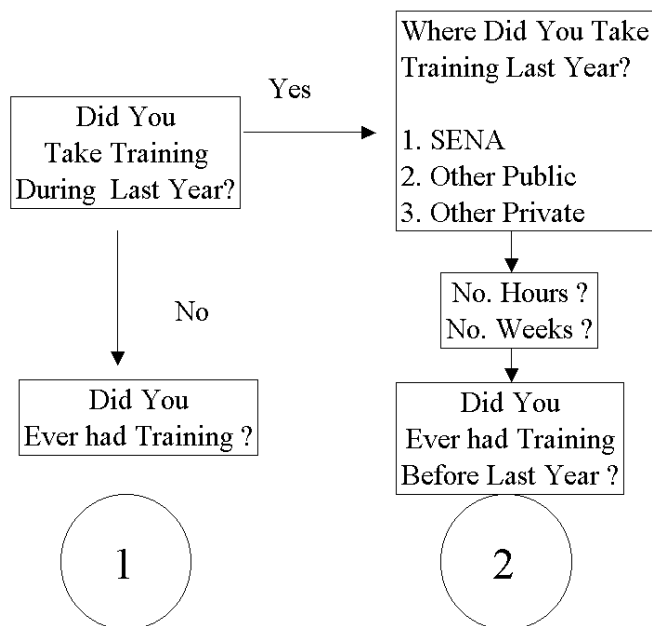


Table 1 compares mean individual characteristics for the four groups previously defined, as well as for the average individual in the sample. Individuals who received training are more likely to be currently employed and to earn higher wages than individuals who never received any formal training. For their part, individuals who attended private institutions earn higher wages and are more likely to be employed than individuals who attended public institutions. No differences are apparent, however, between individuals who attended SENA and individuals who attended any other public institution. Below we study whether the differences between private and public institutions are due to differences in the individual trainees or to institutional differences in the quality of services provided.

⁷ SENA trainees include those who were enrolled in either short or long courses.

Before moving ahead, it is worthwhile mentioning that 60% of those who receive training in a public institution do so at SENA. SENA trainees come from two different backgrounds: they are either disadvantaged individuals who undergo training in order to improve their labor market prospects (the young and the unemployed figure prominently in this group), or they are middle-income workers who undergo training in order to upgrade their skills (older workers in manufacturing are common in this group). Something similar can be said about individuals who receive training in other public institutions. The analysis that follows does not attempt to tease out the impact of training upon these two types of individuals.

Table 1. Descriptive Statistics

	SENA	Public	Private	Any training in the past	Full sample
Male (%)	47.5%	45.8%	45.1%	45.3%	48.1%
Age	31.24	31.94	32.78	32.50	30.85
Completed secondary education (%)	64.1%	56.5%	69.4%	65.1%	25.3%
Completed at least one year of tertiary (%)	24.1%	26.1%	45.4%	38.9%	11.5%
Father finished college education (%)	5.6%	3.5%	11.5%	7.8%	3.9%
Migrant (%)	53.4%	57.1%	33.5%	57.0%	65.5%
Urban dweller (%)	100.0%	72.6%	56.9%	79.5%	59.3%
Age at first job	15.9	16.0	17.1	16.7	13.1
Never had a formal job (%)	14.7%	16.8%	9.6%	12.0%	33.3%
Monthly income (col\$ of 1997)	231392	243865	463336	390003	151370
Currently employed	71.8%	74.6%	84.1%	81.0%	59.8%

Table 2 presents the estimated effects of training programs on both monthly earnings and the probability of being employed. We distinguish between the four different treatment groups mentioned earlier: (i) individuals who attended SENA last year, (ii) individuals who attended any public institution (including SENA) last year, (iii) individuals who attended any private institution last year and (iv) individuals who received formal training before last year. The control groups include individuals who have not received any formal training. We report simple average nearest neighbor matching estimators. We do so for various numbers of neighbors in order to check the robustness of the estimators to small adjustments in the methodology.

It should be kept in mind that whereas the estimates for the first three groups measure the short-run impact of the programs, the estimates for the last group measure the long-run impact of receiving some type of training regardless of the institution. Insofar as training is preceded by a sizable “pre-program dip in earnings”, short-run effects would differ

substantially from long-run effects.⁸ Unfortunately, the evidence at hand does not allow us to estimate long-run effects by type of institution.

Table 2 presents the impact estimates on both monthly earnings and the probability of employment. The impact on earnings is negative, as is the impact on the probability of employment. The negative impact on earnings is substantial: about 10% of average wages. In contrast, the negative impact on the probability of employment is small: about one fifth of a percentage point. When taken as a group, public courses also appear to have a negative impact on both earnings and the probability of employment. Overall, the results indicate that SENA courses do not appear to improve the labor market outcomes of trainees. If anything, the impact is negative.

By contrast, private courses appear to have a sizable impact on earnings: impact estimates are around 125,000 pesos or 25% of average wages. The impact on the probability of employment is about one percentage point. The impact estimates for individuals who report receiving formal training two or more years prior to the survey are more difficult to interpret, as they combine the effects of private and public courses. They do indicate that, *ceteris paribus*, training has a positive impact on earnings and a marginal impact on the probability of employment.

The direct cost per semester of a training course in SENA can be estimated in Col\$ 1,027,700 for short courses Col\$ 1,090,000 for long courses. Costs can be larger, however, as these figures include neither pension payments nor the administrative costs of SENA regional offices.⁹ The average cost of a comparable private course is less, at Col\$ 815,000 (see Castaño, 1999). In sum, not only are SENA courses ineffectual in terms of earnings, but are also more expensive than comparable private courses.

⁸ See Ashenfelter (1978) for evidence on the behavior of earnings prior to training enrollment.

⁹ These figures were reported by the Planning Office of SENA, and correspond to the year 2001.

Table 2. Impact of Training Programs

Type of Course	Size of Control Group	Wage Differentials	Employment Probability
		Col\$ of 1997	Percentage points
SENA	10	-36,004	-0.17%
SENA	20	-36,895	-0.08%
SENA	30	-38,580	-0.23%
SENA	40	-43,058	-0.27%
SENA	50	-40,497	-0.10%
Public Institution	10	-12,696	-0.44%
Public Institution	20	-10,447	-0.17%
Public Institution	30	-12,476	-0.17%
Public Institution	40	-15,840	-0.18%
Public Institution	50	-16,108	-0.18%
Private Institution	10	125,509	0.17%
Private Institution	20	127,708	0.15%
Private Institution	30	126,426	0.10%
Private Institution	40	125,717	0.15%
Private Institution	50	125,625	0.20%
Ever had before last year	10	93,296	0.95%
Ever had before last year	20	88,319	1.05%
Ever had before last year	30	82,887	0.97%
Ever had before last year	40	82,862	0.91%
Ever had before last year	50	82,734	0.87%

Impact estimates using data from the SENA Survey of Graduates

This section presents an alternative set of results about the impact of SENA training programs on the labor market outcomes of trainees. The results are based on a survey conducted by SENA on a sample of individuals who received technical training in 1997. This survey offers an alternative glimpse of the labor market performance of SENA trainees and allows for more precise impact estimates.

Since SENA's survey focuses exclusively on SENA graduates, the control group must be constructed using individuals from other data sources. Jalan and Ravallion (2000) proposed a methodology to circumvent this problem. The methodology comprises two main steps. First, a dataset is formed using the original survey and a sample of participants and non-participants drawn from a national representative survey. Finally, the new dataset is used in

order to compute the probability of participating in the program under analysis (i.e., propensity scores) and the impact estimates (i.e., the nearest neighbor estimates).

In this section we implement Jalan and Ravallion’s methodology using SENA’s survey of graduates along with the living standard survey (ENCV) described in the previous section. This methodology will yield unbiased estimators provided that both surveys have an equal distribution of observable characteristics (Jalan and Ravallion, 2000). Table 3 presents descriptive statistics for both the SENA survey and the ENCV’s. No substantial differences on mean characteristics are apparent, with the exception of the high proportion of SENA trainees living in the lowest denomination neighborhoods (*estrato* one).¹⁰ The regional distribution of individuals is also similar in both surveys. Education and age have a much lower dispersion in the SENA survey than in the ENCV even if only SENA participants are compared.

Table 3. Descriptive Statistics

Variable	SENA Data		Assistants ENCV		Full Sample ENCV	
	Mean	STD	Mean	STD	Mean	STD
Education	10.62	2.22	10.41	3.07	8.73	4.11
Gender	0.54	0.50	0.50	0.50	0.45	0.50
Age	30.94	7.78	30.85	9.15	30.90	11.47
Atlántica	0.20	0.40	0.20	0.40	0.21	0.41
Oriental	0.15	0.36	0.18	0.38	0.14	0.34
Pacífica	0.17	0.37	0.17	0.38	0.16	0.37
Central	0.13	0.34	0.10	0.30	0.11	0.32
Antioquia	0.20	0.40	0.14	0.35	0.13	0.34
Bogotá	0.13	0.34	0.17	0.38	0.23	0.42
Orinoquia	0.00	0.05	0.02	0.16	0.01	0.12
San Andrés	0.01	0.09	0.01	0.09	0.00	0.04
Stratum 0	0.02	0.12	0.01	0.09	0.03	0.16
Stratum 1	0.13	0.33	0.08	0.26	0.09	0.29
Stratum 2	0.41	0.49	0.43	0.50	0.35	0.48
Stratum 3	0.39	0.49	0.40	0.49	0.37	0.48
Stratum 4	0.04	0.20	0.07	0.25	0.09	0.28
Stratum 5 and 6	0.01	0.08	0.02	0.14	0.06	0.23
Observations	7003		496		12824	

Table 4 presents the results of a Logit model on the probability of participation. Only variables included in both surveys are used. The results show that schooling has an

¹⁰ Colombian urban areas are divided into six strata (*estratos*) according to living standards and dwelling characteristics, one being the poorest and six the richest. In the main metropolitan areas of the country, 8% of households live in *estrato* one, 36% in *estrato* two, 40% in *estrato* three, 8% in *estrato* four and the rest in *estratos* five and six.

inverted-U relationship with the probability of participating, with a peak at thirteen years.¹¹ The same applies to age, with a peak at 35. Men are eight percentage points more likely to participate than women. Participation is highest among individuals from *estratos* two and three and lowest among individuals from *estrato* five.

For the present methodology to work, one must be able to match each participant to a set of non-participants with a similar propensity score. In other words, the probability functions of participants and non-participants must share a common support. Otherwise, it would be impossible to gauge the impact of the program in question (Heckman, LaLonde and Smith, 1999). Figure 5 shows the probability functions for both participants and non-participants. A common support does exist for the majority of observations, but participants with propensity score above 0.15 have very small control groups. Since excluding these individuals from the analysis makes no difference on the results, we opt for using the whole sample.

We compute nearest neighbor estimators (m) for earnings using one, three and five neighbors. Results are reported in terms of minimum wages since the SENA survey does not have information on the absolute earnings of graduates. The results show that the impact is negative: participation lowers earnings by 0.13 times the minimum wage (or Col\$ 44,000). These results are consistent with the previous estimates, which also show a negative impact of SENA training services on trainees' post-graduation wages.

¹¹ These results are consistent with the evidence from the Social Survey of Fedesarrollo summarized in Figure 4.

Table 4. Probability of of Paticipating

Variable	Coefficient	t- stat	
Education	0,611	7,490	***
Education 2	-0,024	-6,132	***
Gender	0,087	0,813	
Age	0,227	6,313	***
Age 2	-0,003	-5,805	***
Atlántica	0,451	2,029	**
Oriental	0,764	3,452	***
Pacífica	0,403	1,795	*
Central	0,526	2,238	**
Antioquia	0,594	2,736	***
Orinoquia	0,876	3,360	***
San Andrés	1,969	8,413	***
Estrato 1	0,508	1,377	
Estrato 2	0,712	2,123	**
Estrato 3	0,543	1,601	*
Estrato 4	0,226	0,577	
Estrato 5 y 6	-0,636	-1,191	
Constant	-11,608	-14,932	***
Pseudo R2	0,088		

Overall, the results cast serious doubts on the social and private returns of SENA programs. At best, SENA training programs do not have a significant impact on the labor market outcomes of graduates. This result can be driven either by the mismatch between the skills taught and the skills rewarded by the market, or by the poor quality of the courses regardless of their relevance, or by a combination of both causes. On the whole, the results suggest that reforming SENA must be high in the agenda of Colombian policy makers.

Figure 5. Common Support

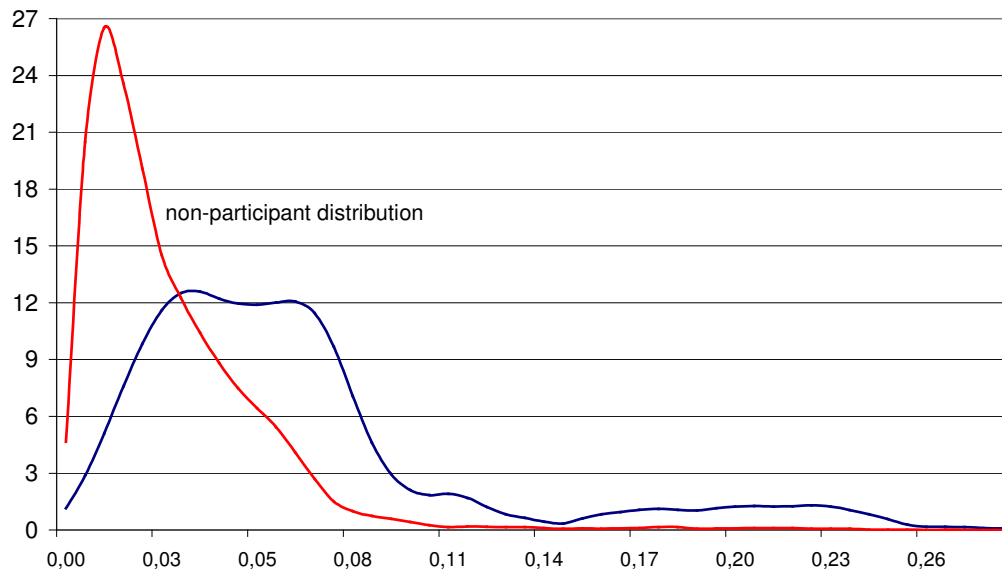


Table 5. Income Gap in Terms of Minimum Wages

No. of Neighbor	Minimum Wages Differences	\$ 1,997	\$ 2003
1	-0.1309	-22,515	-43,459
3	-0.1404	-24,150	-46,613
5	-0.1278	-21,982	-42,430

5. Concluding remarks

This paper presents qualitative evidence on the perceived value of public training programs in Colombia and quantitative evidence on their true impact upon earnings and employment. The results are contradictory. While the perceived value is high (public training providers are among the most reputed institutions in Colombia), the true impact is nil at best (average impact estimates show that trainees' post graduation earnings decrease by as much as ten%).

This conclusion indicates both the urgency of reforming public training providers in Colombia and the strong opposition that such an endeavor would elicit. In light of this, educating the public at large about the true impact of public training is paramount to pave the way to reform. If individual citizens (and voters in particular) are unaware of the private and social rate of return of public training programs, all attempts to reform will remain stuck in the ideological mud where they have been for years.

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