The Impact of Training Policies in Latin America and the Caribbean: The Case of "Programa Joven" [*]

Cristián Aedo and Sergio Nuñez [**]

Graduate Program in Economics
ILADES/Georgetown University

May 2001

[*] Financial support from the Interamerican Development Bank is gratefully acknowledged. This paper has been presented at the IADB research network seminars in Washington D.C. and Rio de Janeiro. I thank participants for helpful comments. I am particularly grateful to Jeffrey Smith, Petra Todd, James Heckman, and Gustavo Marquez for many helpful comments and suggestions. All remaining errors and omissions are my own. We acknowledged the cooperation of the Unidad de Estadísticas y Evaluación de Impacto, in providing the information used in this research. In particular, we are grateful to Mónica Muscolino, consultant of the Unidad de Estadística, and Sergio Diba, Coordinator of the Programa Joven.

[**] Correspondence to Cristian Aedo, Professor of Economics, Graduate Program in Economics ILADES/Georgetown University, Universidad Alberto Hurtado. Email: caedo@uahurtado.cl.

Abstract

This research evaluates the "Programa Joven", a training program conducted by the Ministerio del Trabajo of Argentina. We adapt and apply a non-experimental evaluation methodology to answer the following questions: Does "Programa Joven" increase the labor income of the trainees? Does "Programa Joven" increase the probability of being employed? And (3) what is the rate of return to dollars spent on the "Programa Joven"?

We used Propensity Scores Matching Estimators as our basic methodology to obtain a measure of the impact of the training program. Our choice of this methodological approach was based upon both the theoretical developments in the area of Program Evaluation and the availability of relevant information. We used three different set of data to estimate the Propensity Scores which allowed us to analyze the question on how sensitive Program impact estimates are to different propensity score specifications? This question has not been addressed by the previous literature.

Our results indicate first, that Program impact on earnings were statistically significant for young males and adult females. This result was not sensitive to the number of nearest neighbors. Second, the estimated Program impact on employment was statistically significant for adult females only. Again the result was not sensitive to the number of nearest neighbors. Third, impact estimates on earnings and employment for the groups with statistically significant results were not sensitive to the different sources of information used to estimate the propensity scores. This was a surprising result as we expected to observe greater variability in the impact results across different propensity score specifications. Fourth, the cost-benefit exercise conducted suggest that we required at least 9 years of duration of the earnings impact for the Program to have a positive net present value for the groups with statistically significant results.

Index

1. Introduction

Latin-American countries invest a significant amount of resources in training programs. An evaluation of these experiences is needed in order to learn from them and to design more effective programs. However, Program evaluation faces many difficulties (Heckman, LaLonde and Smith, 1999): first, due to the heterogeneity of impacts that Programs produce there are many parameters of interest in their evaluation. Second, there is no unique way of conducting Program evaluations. The choice of an appropriate Program impact estimate depends upon the question to be answered and data availability. Third, to produce "good" evaluations it is needed to have "good data". Usually econometric methods need to be used to correct for data problems. Fourth, to obtain Program impact estimates it is necessary to compare comparable individuals, which increases the complexities of Program evaluation. Thus, it is necessary to reduce the biases by comparing comparable individuals, by administering similar questionnaires to participant and non-participants, by using similar time frameworks, and by drawing the samples of participants and non-participants from similar labor markets. Fifth, non-experimental Program impact estimates solve the selection problem under different assumptions, which generates variability in their results. An experimental evaluation provides an important reference framework to analyze the performance of alternative non-experimental evaluation methodologies. Sixth, social Programs at the national or regional levels have an impact on both participants and non-participants. The usual approach to deal with this Program "contamination" is to assume that the impact on non-participants is not significant.

This research evaluates the "Programa Joven", a training program conducted by the Ministerio del Trabajo of Argentina. We adapt and apply a non-experimental evaluation methodology to answer the following questions: (1) Does "Programa Joven" increase the labor income of the trainees? (2) Does "Programa Joven" increase the probability of being employed? And (3) what is the rate of return to dollars spent on the "Programa Joven"?

To answer these questions we used the Matching Estimators approach as our basic methodology. This choice was based upon both the theoretical developments in the area of Program Evaluation (Heckman et al., 1995, 1997, 1998 & 1998) and the availability

and quality of relevant information. As described in Tood (1999) the application of this methodology requires two steps: first, the estimation of a model of program participation (Propensity Scores) and second, and conditional on the estimated propensity scores, the usage of matching estimators to obtain the impact of the Program.

To estimate the propensity scores we used three sources of information: first, the data for all the individuals who registered and qualified to take training programs in the period March 1996 to December 1997 (approximately 140,000 individuals). Second, the information contained in a sample of beneficiaries and controls used by the Ministerio del Trabajo of Argentina to evaluate the Program (3,340 individuals in total).[1] And third, the information contained in the first database but restricted to the 3,340 individuals contained in the second database. The access to these different sources of information allowed us to analyze the additional question on how sensitive Program impact estimates are to different propensity score specifications? This question has not been addressed by the previous literature and we face it here. Our hypothesis is that impact estimates are sensitive to different propensity score specifications.

We report and compare the Propensity Scores estimated from each one of these data sources and we estimate the program impact on earnings and employment based upon these propensity scores.

Finally, based upon cost information and the program impact estimates (benefits), we applied a cost benefit analysis of the Programa Joven. This analysis was conducted under different scenarios with regard to benefit duration, discount rate and the ratio of indirect to direct cost.

2. Description of "Programa Joven"

The "Programa Joven" offers training to facilitate the labor force participation of the beneficiaries in the formal labor market. To this purpose, the program provides intensive training for positions in the productive sector of the economy and training internships in firms.

The target population of the Program is young persons, males and females, coming from poor households, with a low educational level, without working experience, and

[1] These individuals were extracted from the universe of potential trainees (first data source).

who are unemployed, underemployed or inactive. The selection criteria for the program are: minimum 16 years of age; education level no greater than secondary education; to belong to a household considered poor and not to participate in the labor market.

The program comprehend the following benefits: an average of 200 hours of training, transportation expenses, a subsidy for females with young children, medical checkups, books, material and working clothing.

The duration of the training program varies from 14 to 20 weeks. The training is intensive and can be divided into two main activities:

a. Technical Knowledge phase: the beneficiaries receive knowledge and technical skills to undertake an occupation in classrooms. The duration of this activity varies from 6 to 12 weeks.

b. Internships phase: the beneficiaries complement their technical knowledge with an applied work in firms in the occupations they have been trained. The duration of this activity is of 8 weeks.

The criteria for selecting firms for internships are: general characteristics of the firm, tasks to be done by the trainees, personal involved in similar positions in the firm, equipment, supplies and infrastructure of the firm.

To carry out the training the Ministerio del Trabajo hires Instituciones de Capacitación (ICAP) using an international bidding process. The distribution of the training activities at the national level is determined in accordance to the quantity of inhabitants in the regions. The program executor is the Ministerio del Trabajo y Seguridad Social through the Secretaría de Empleo and Capacitación Laboral. The program will continue its operation until the year 2,000, being jointly funded by the Inter American Development Bank (IDB) and governmental funds.

The Programa Joven has been evaluated in terms of the impacts of the Program. The Unidad de Estadísticas y Evaluación de Impacto of the Programa Joven conducted studies for a sample of courses executed in 1993, for courses contained in the second and third bidding process (study conducted in 1996) and for courses from the fifth bidding process (study conducted in 1998 with a sample of 3,340 individuals). [2] These

[2] In Section 3, we describe this sample with more detail.

evaluations compared beneficiaries and comparisons assuming that they were random samples of the population. Although they attempt to do some matching on observables, they did not adjust properly for sample selection problems.

3. The Data: Description of the Different Information Available for the Evaluation

We use two sources of information. The first data set comprehends raw data on the 139,732 individuals who registered and qualified for training programs during the period March 1996 to December 1997. The second data set comprehends two samples, one for beneficiaries and one for controls of 1,670 individuals each, used by the Ministerio del Trabajo to evaluate the impact of the fifth wave of the training program. These samples were extracted from the universe of 139,732 individuals in the first data set.

For the Programa Joven the "Acreditación" correspond to the first contact of a person with the Program. This enables them to register and participate in a training class. Thus, the ***"Acreditado"*** category corresponds to individuals who are eligible for participation in the Program, but may or may not have taken any class. The ***"Beneficiary"*** category corresponds to individuals who have completed the Technical Knowledge phase.

a. Universe Information: Data on *"Acreditados"*

We obtained and processed raw information on 139,732 *"Acreditados"* who registered and qualified to take training programs in the period March 1996 to December 1997. We found that 80% of them presented complete records, but for the rest 20% we had to work case by case to complete their information.[3] Some of the individuals were excluded from the analysis because of missing information. The information was used to obtain the probability of program participation (Propensity Scores). Later in this article we will extend on the information we constructed and how it was used.

b. Sample Information: Data on *"Beneficiaries"* and *"Comparisons"*

We have data on two samples, one for *Beneficiaries* (intervention group) and one for *Comparisons* (comparison group) of 1,670 individuals each, used by the Ministerio del Trabajo to evaluate the impact of the fifth wave of the training program. Both groups

[3] We used other data available at the Programa Joven to complete these records.

come from individuals who meet the selection criteria to be considered as a potential participant of the program *("Acreditados"*). In addition, the *Beneficiaries* are the ones who actually completed the Technical knowledge phase.

Both samples comprehend 1,670 cases (3,340 cases in total). To make both samples comparable the sample design used by the Ministerio del Trabajo controlled for the following variables: age, sex, level of education, labor force participation, socioeconomic level, and to have a children with 5 years of age or less. Therefore, the comparison group is not selected at random. For both samples, there is information for the period covered by the first contact with the program to 12 months after the *Beneficiaries* finished the training (the follow-up information for the comparisons was obtained at the same time as the information for the beneficiaries). This information allows us to construct the individual labor history for both samples.

Beneficiaries Sample

The sample was designed by the Ministerio del Trabajo to have statistical representation by gender and region of residence. The first variable was introduced to study the program impact by gender, given the different labor market conditions for males and females. The regional variable was introduced to study the differential impact of socioeconomic characteristics and regional labor markets on program outcomes. In total, they considered 11 geographic units denominated "regions".

To define the sample size it was considered the observed variation in the values for variables such as proportion of employed/unemployed workers and average income received by employed workers. These variables present the greatest variation among the outcomes variables. It was considered a percentage of non-response of 5%. The determination of the sample sizes was estimated under the hypothesis that a proportion of P=0.35 of unemployed wants to be estimated with a precision of 10%, with a risk level of 1%. In other words, the interval (P-0.1, P+0.1) contains the estimated "p", of the population proportion P, with probability 0.95.

Comparison Sample

Once the *Beneficiaries* sample was obtained, a comparison sample was constructed. For each beneficiary a "twin" was selected among the people who have approached the Program, satisfied the selection criteria but did not take the training program ("certified" individuals). The "twin" was obtained at random from the universe of "certified" individuals, which presented similar socioeconomic characteristic as the person included in the *Beneficiaries* sample.

The Ministerio del Trabajo used the following variables to match the individuals: first, region, sex and age, and second, educational level, and presence of children. In the cases in which it was not possible to find an "identical" individual, a replacement was found to match as close as possible the socioeconomic and geographic characteristics. This procedure generated a sample, which is identical in terms of region and sex, presenting some differences in terms of level of education.

4. Program Participation

4.1 Determinants

The estimation of the probability of program participation is one of the main elements needed to apply a cross-sectional propensity score Matching Estimator methodology. We estimated three models of program participation: the first one, using the universe of *"Acreditados"* (139,732 individuals), that is, we estimated the conditional probability of program participation conditioning on eligibility. These estimated propensity scores are denoted by PSTOT. The second one, restricted to the sample of 3,340 individuals but using the information available at the "Acreditación". These are denoted as PSUN. Finally, a third one, using the sample of 3,340 individuals and using the information available at the sample. These are denoted as PSMU.

It is important to recall the requisites for eligibility. An individual is eligible if:

- *Housing:* they don't live in a house or if the house they live in does not have a bathroom or if the house they live in is "crowded" (more than 3 person per room).
- *Income:* Per capita household income below US$ 120 per month.

- *Labor Status:* The individual is searching for a job or she/he works for a wage under US$200 a month or she/he is head of the household and her/his labor income is below US$400 a month and she/he is looking for a new job or she/he neither is working or searching for a job but she/he wishes to work.
- *Capability of Living:* Ratio head of the household to number of dependent smaller than 0.25 and head of the household did not complete primary education.

We tried to obtain information related to the "pre-acreditación" labor history of program participants; unfortunately this information was not available in the data sets. According to the authorities in charge of the Program they did not include these types of questions because individuals did not have incentives (in fact, in some cases they have disincentives) to reveal the truth and there was no readily available mechanism to check this information. For this reason, the information gathered at first contact ("Acreditación") did not contained information on labor history.

The information on the universe of "acreditados" was useful because it allowed us to construct the "Program History" of any individual who has been *"Acreditado"*. As mentioned before, the Programa Joven is composed of a Technical Knowledge phase and an Internships phase. Therefore an *"Acreditado"* may be in different states: she/he may or may not have started a training program; she/he may have started the Technical Knowledge phase but she/he may or may not have finished it and she/he may have started the Internships phase but she/he may or may not have finished. In fact we have information to classify the universe of *"Acreditados"* in the following mutually exclusive categories:

- *"Acreditado" only:* Individuals who are eligible for training programs but have not started the Technical Knowledge phase.
- *Incomplete Technical Knowledge phase:* Individuals who did not finish the Technical Knowledge phase because of a justified reason (family problems, pregnancy, obtained a job, etc.).
- *Deserter of Technical Knowledge phase:* Individuals who did not finish the Technical Knowledge phase and did not have a justified reason.

- *Did not approve the Technical Knowledge phase:* Individuals who did not reach the minimum standards required for approval.
- *Incomplete Internships phase:* Individuals who did not finish the Internships phase because of a justified reason (family problems, pregnancy, obtained a job, etc.).
- *Deserter of Internships phase:* Individuals who did not finish the Internships phase and did not have a justified reason.
- *Did not approve the Internship phase:* Individuals who did not reach the minimum standards required for approval.
- *Completes:* Individuals who have successfully completed both phases

Empirically, around a 52% of the *"Acreditados"* are in the *"Acreditado" only* category, and 37% of the *"Acreditados"* are in the category *Completes*. Another useful piece of information obtained is the type of training program undertaken by the *Beneficiaries.*[4] This information will be used in future research to address the issues of multi-treatment and trainees' progression in the program.

Given that individuals can be in different program "states" an important question for the propensity score model is how to define when an individual has taken the program (value 1) and when the individual has not taken the program (value 0). The option we took was to consider an individual as a Beneficiary if she/he has successfully completed the Technical Knowledge phase and 0 otherwise. This choice allowed us to use most of the *"Acreditado"* (around a 89% of them) and it is consistent with the way in which the Ministerio del Trabajo obtained its samples of *Beneficiaries* and *Controls.*

The following individual dimensions, which are measured at the time of accreditation, were used in the model of program participation:

[4] Tertiary Sector (educative services, administration and accounting), assistant of firms and services, dental assistant, old men services, computation, gastronomy, hotel and tourism, janitor and maintenance, media and publicity, photography, hairdressing, sales, telephony, surveillance); industrial sector (construction, quality control, electronics, textiles, chemical laboratories, auto mechanic, industrial painting, plastic, refrigeration, graphic industry); agricultural, forest and mining (gardening, cultivation, watering, mining exploitation, cattle production).

- *Labor Status Dimension:* This variable reflects the labor status of the individual (employed, unemployed with and without labor experience, and inactive).
- *Poverty Dimension:* We use an index of unmet basic needs (NBI). This index consider an individual as poor if the person lives in an special home (minors, or unmarried mothers) or if the house they live in does not have a bathroom or if the house they live in is "crowded" (more than 3 person per room) or if the ratio head of the household to number of dependent smaller than 0.25 and the level of education of head of the household at most incomplete primary.

  We considered also the Poverty Line criteria, using as reference the income level of the individuals at the moment of "Acreditación" and as poverty line $120 per month.
- *Sociodemographic Dimension:* We use gender and age.
- *Education and Marital Status Dimension:* We use several indicators of years of education completed, as well as school attendance at the moment of "Acreditación". The Marital dimension was considered by measuring whether the individual was married or single, whether he/she had children (specially young children) and whether the individual was or not the head of the household.
- *Geographical Dimension:* We worked with the same 11 regions, which were used by the evaluation samples considered by the Ministerio del Trabajo.

Table 4.1

Regions	**Participation (%)**
GBA	36.2
Sur	6.0
Nea	1.4
Centro	8.7
Litoral	5.4
Cuyo	4.1
Noa	7.1
Córdoba	9.3
Mendoza	9.9
Sta.Fe	8.0
Tucumán	3.9
Total	***100***

Finally, we considered four groups in our estimations based upon gender and age. The groups were:

1. Adult Males – ages 21 to 35.[5]
2. Young Males – ages less than 21.
3. Adult Females – ages 21 to 35.
4. Young Females – ages less than 21.

4.2 Strategic Behavior

According to the authorities in charge of the Program they suspected that individuals followed strategic behavior in order to became eligible for the Program. However, the authorities did not have a readily available mechanism to check the information provided by the individuals at the "acreditación". To address this issue we compared information available at the "acreditación" with some information revealed at the survey by the 3,340 individuals in the beneficiaries and comparisons groups twelve months after the Program. The questions refer to their labor status at the "acreditación".[6]

The Tables 4.2 to 4.4 present cross-information about unemployment status (1 unemployed and 0 otherwise) at both "acreditación" and survey, for all the individuals, for beneficiaries only and for comparisons only. The information related to "acreditación" is presented in the rows while the information related to the survey is presented in the columns.

We could consider that the individuals who declare to be unemployed at the "acreditación" but revealed not to be unemployed at the survey were the ones who behaved strategically at the "acreditación". Using this as an indicator we have in Table 4.2 that 542 individuals out of 3,160 (17.2% of this individuals) who declared to be unemployed at the "acreditación" were "misbehaving". Separating between beneficiaries

[5] We had some cases of beneficiaries older than 35 years of age. They were included with the adult males and females.

[6] The "acreditación" information that was asked was rather limited and refers mainly to their labor status previous to the Program.

and comparisons (Tables 4.3 and 4.4), we have that the percentages of "misbehaviors" are 18.0% and 16.5% respectively.

Table 4.2

(All individuals)

		Survey		
		0	**1**	
"Acreditación"	**0**	37 (20.7%)	142 (79.3%)	179 (100%)
	1	545 (17.2%)	2,616 (82.8%)	3,160 (100%)
		582 (17.4%)	2,758 (82.6%)	3,339 (100%)

*Row percentages are presented.

Table 4.3

(Beneficiaries)

		Survey		
		0	**1**	
"Acreditación"	**0**	26 (29.5%)	62 (70.5%)	87 (100%)
	1	285 (18.0%)	1,299 (82.0%)	1,583 (100%)
		310 (18.6%)	1,360 (81.4%)	1,670 (100%)

*Row percentages are presented.

Table 4.4

(Comparisons)

		Survey		
		0	**1**	
"Acreditación"	**0**	11 (12.1%)	80 (87.9%)	91 (100%)
	1	260 (16.5%)	1,317 (83.5%)	1,578 (100%)
		272 (16.2%)	1,397 (83.8%)	1,669 (100%)

*Row percentages are presented.

However, this evidence is inconclusive because it could just indicate measurement error. What might suggest strategic behavior is asymmetric measurement error, so that one type of disagreement between the two values is more common than the other type. In particular, one would want to find the difference going in the direction consistent with the strategic incentives facing the agent. This was not the case: 79.3% of the people who declared to be employed at the "acreditación" revealed to be unemployed at the survey (the percentages being 70.5% and 87.9% for beneficiaries and comparisons, respectively). Moreover, one might also expect the asymmetry to be stronger for beneficiaries than for comparisons, which was not the case.

Based upon these (rather limited) indicators we do not have evidence of strategic behavior at "acreditación".

5. Estimation of Program Participation (Propensity Scores)

We estimated different logit models for each of the four subgroups: Young Males, Young Females, Adult Males and Adult Females. A description of the main variables is presented in Appendix 1. The variables related to an individual's eligibility for the Program were always controlled for in these estimations (regardless of their statistical significance).[7] Statistical significance was used to determine if the other explanatory variables remained in the logit estimations.

As previously mentioned, we conducted three estimations for the Propensity Scores. The first one uses the individuals and the information available at "acreditación" (139,732 cases). The second uses the information available at "acreditación" but only considers the individuals in the survey (3,340 cases). The third uses both the individuals and the information available at the survey (3,340 cases).

In the second and third cases we have to re-weight the sample previous to the econometric work. This is because the sample by design contains equal percentages of beneficiaries and comparisons.[8]

[7] These variables are: Pobrelp, Desocupa, Inactivo, Jefe and the educational dummies.
[8] To re-weight we followed Manski and Lerman (1977).

5.1 Universe Information (PSTOT)

The main econometric results for the binary Logits and their prediction tables, for the four groups can be seen in Tables 5.1 and 5.2.

Table 5.1
Propensity Scores*

	Young Males	Adult Males	Young Females	Adult Females
Constant	1.6333 (0.2307)	0.1951 (0.1639)	1.2739 (0.3658)	0.0338 (0.1806)
Pobrelp**	0.0190 (0.0239)	0.0791 (0.0290)	-0.0599 (0.0326)	-0.0553 (0.0297)
Desocupa**	-0.1827 (0.1662)	-0.2250 (0.1506)	-0.5210 (0.2997)	0.0857 (0.1730)
Inactivo**	0.0745 (0.1727)	0.3597 (0.1681)	-0.3000 (0.3052)	0.2299 (0.1797)
Jefe**	-0.0673 (0.0710)	-0.0182 (0.0460)	0.0709 (0.0883)	-0.0845 (0.0353)
Prinocom**	0.0866 (0.0701)	0.2087 (0.0646)	0.0051 (0.0848)	0.0432 (0.0576)
Pricom**	0.1545 (0.0551)	0.1516 (0.0465)	-0.0541 (0.0516)	0.1146 (0.0399)
Senocom**	0.1799 (0.0548)	0.1585 (0.0467)	0.0219 (0.0500)	0.0614 (0.0396)
Edad	-0.0701 (0.0078)	0.0045 (0.0019)	-0.0493 (0.0106)	-0.0031 (0.0015)
Enpareja	-0.1890 (0.0652)	-0.1976 (0.0441)	-0.1623 (0.0495)	
Hijos		-0.3264 (0.0483)	0.3937 (0.0376)	0.2536 (0.0261)
Desoexp				-0.2031 (0.0377)
Vaescu			-0.1542 (0.0479)	
Gba	-0.6834 (0.0284)	-0.7433 (0.0317)	-0.5546 (0.0359)	-0.7666 (0.0335)
Cordoba	-0.3667 (0.0404)	-0.0495 (0.0469)	-0.5767 (0.0538)	-0.5579 (0.0464)
Stafe	-0.0992 (0.0385)	-0.1145 (0.0554)	-0.2702 (0.0511)	-0.2863 (0.0596)
Tucuman	0.2581 (0.0535)		0.2708 (0.0699)	0.2314 (0.0755)
Mendoza	0.1826 (0.0393)		0.1499 (0.0485)	
Cuyo	0.6025 (0.0537)	0.4201 (0.0619)		0.1846 (0.0693)
Sur	-0.5519 (0.0488)	-0.6313 (0.0602)	-0.6070 (0.0644)	-0.9940 (0.0593)
Litoral		-0.1135 (0.0549)		-0.1473 (0.0566)
Centro				-0.1918 (0.0506)
Observations	39,119	27,215	23,758	30,278
Log Likelihood	-26,202.45	-18,151.11	-15,630.66	-19,776.20
Restr. Log Lik.	-27,004.27	-18.786.79	-15,984.04	-20,387.66

* Standard Errors in parenthesis.
** Variables related to eligibility criteria.

We will not discuss the estimated coefficients of the variables included in the regressions because of eligibility considerations. With regard to the others, it seems that age and the presence of a spouse or companion are, in general, related to a lower likelihood of Program participation. The presence of children was positively related to Program participation for females. However, for males this variable was not significant (young males) or it was positively related to Program participation (adult males). The variables related to unemployed with working experience and school attendance were significant and negatively related to Program participation only in the cases of young females and adult females respectively. The regional dummies for Gba, Cordoba, Santa Fe, Sur, Litoral (significant only in the cases of adult males and females) and Centro (significant only for adult females) were negatively related to propensity scores. Tucuman, Mendoza and Cuyo dummies were positively related to propensity scores (although they were not significant in all the sub samples).

To analyze the fit of the model we used the MacFadden R-Squared and the prediction evaluation of the estimated equation (using a success cutoff of 50%) versus a constant probability model. The following Table presents this evaluation for the four sub samples:

Table 5.2

Group	R-squared	Prediction Evaluation
Young Males	0.0299	% Correct goes from 53.76 to 59.06
Adult Males	0.0338	% Correct goes from 53.76 to 59.57
Young Females	0.0221	% Correct goes from 60.06 to 61.64
Adult Females	0.0300	% Correct goes from 59.91 to 62.41

The predicted Propensity Scores go from a minimum value of 0.2298 to a maximum value of 0.7880, showing a wide range of dispersion.

5.2 Individuals in the Sample with Universe Information (PSUN)

In this case we considered the 3,340 cases in the survey but we used the information available for them at the "Acreditación".[9] As mentioned before the sample was re-

[9] Given that the information at "Acreditación" was taken around two years before the survey, the distribution of the individuals by gender in the group's young and adult do not match with the classification

weighted prior to estimation to correct for Choice-Based Sampling. Following Manski and Lerman (1977) we reweighed each observation by the ratio of the proportion of beneficiaries in a random population divided by the proportion of beneficiaries in our sample. The sample proportion of beneficiaries was used to estimate the latter, while for the former we used the universe information to estimate the proportion of beneficiaries in the universe.

The main econometric results for the binary Logits and their prediction tables, for the four groups can be seen in Tables 5.3 and 5.4.

Table 5.3
Propensity Scores*

	Young Males	Adult Males	Young Females	Adult Females
Constant	11.3384 (1.2763)	0.4506 (0.2403)	6.4998 (1.4969)	0.0578 (0.2292)
Pobrelp**	-0.0126 (0.1427)	-0.0991 (0.1484)	0.0866 (0.1781)	-0.0176 (0.1374)
Desocupa**	-0.1654 (0.2098)	-0.3939 (0.1848)	-0.5446 (0.3622)	0.0199 (0.1977)
Inactivo**	-0.2352 (0.3388)	-0.6296 (0.5545)	0.0173 (0.4385)	0.1221 (0.3060)
Jefe**	-0.0908 (0.1976)	0.1310 (0.1484)	0.5552 (0.2986)	0.1086 (0.1597)
Prinocom**	-0.4856 (0.4064)	-0.6572 (0.3447)	-0.5280 (0.5318)	0.0738 (0.2696)
Pricom**	-0.3008 (0.2668)	-0.1827 (0.2086)	-0.2845 (0.2987)	0.0700 (0.1779)
Senocom**	-0.1063 (0.2268)	-0.0769 (0.1890)	-0.0161 (0.1765)	-0.0113 (0.1571)
Edad	-0.5771 (0.0634)		-0.3138 (0.0768)	
Enpareja	0.7099 (0.3126)			
Hijos	-0.6201 (0.3455)			
Vaescu	-0.3995 (0.1679)		-0.3498 (0.2021)	
Nea		0.6099 (0.3010)	0.6320 (0.4096)	0.7889 (0.3082)
Gba			-0.5082 (0.2809)	-0.2215 (0.1908)
Observations	914	807	587	1031
Log Likelihood	-579.327	-550.585	-385.333	-707.496
Restr. Log Lik.	-630.744	-557.8036	-405.589	-712.633

* Standard Errors in parenthesis. ** Variables related to eligibility criteria.

in the sample. This explains the different sizes of the groups when we use this information and the survey information.

As before, we will not discuss the estimated coefficients of the variables included in the regressions because of eligibility considerations. With regard to the others, it seems that age, the presence of children and school attendances are, in general, related to a lower likelihood of Program participation (although these effects are not significant for all the subgroups). The presence of a spouse or companion was positively related to Program participation only for young males. The regional dummy for Nea and Gba were positively related and negatively related to Propensity Scores, respectively.

Table 5.4 presents the MacFadden R-Squared and the prediction evaluation of the estimated equation (using a success cutoff of 50%) versus a constant probability model:

Table 5.4

Group	R-squared	Prediction Evaluation
Young Males	0.0815	% Correct goes from 54.8 to 67.1
Adult Males	0.0129	% Correct goes from 51.1 to 54.4
Young Females	0.0499	% Correct goes from 53.7 to 61.7
Adult Females	0.0072	% Correct goes from 52.9 to 53.9

The predicted Propensity Scores go from a minimum value of 0.18 to a maximum value of 0.91, showing a wide range of dispersion as before.

5.3 Information in the Sample (PSMU)

Finally, we considered the 3,340 cases in the survey but we used the information available at the survey. Tables 5.5 and 5.6 present the main econometric results for the binary Logits and their prediction tables. As mentioned before the sample was re-weighted prior to estimation to correct for Choice-Based Sampling.

Besides the variables related to the eligibility criteria only years of age and school attendance are significant (for some subgroups) and negatively related to Program participation. Table 5.6 presents the MacFadden R-Squared and the prediction evaluation of the estimated equation (using a success cutoff of 50%) versus a constant probability model.

Table 5.5
Propensity Scores*

	Young Males	Adult Males	Young Females	Adult Females
Constant	6.911 (1.004)	0.420 (0.366)	4.240 (1.240)	-0.240 (0.236)
Pobrelp**	-0.064 (0.130)	0.177 (0.158)	0.178 (0.160)	0.011 (0.147)
Desocupa**	-0.236 (0.190)	-0.550 (0.329)	-0.529 (0.332)	-0.030 (0.202)
Inactivo**	-0.286 (0.314)	-0.058 (0.397)	-0.085 (0.401)	0.137 (0.322)
Jefe**	0.122 (0.163)	0.194 (0.253)	0.250 (0.256)	0.200 (0.165)
Prinocom**	-0.400 (0.363)	-0.372 (0.476)	-0.625 (0.485)	0.173 (0.275)
Pricom**	-0.229 (0.225)	-0.290 (0.233)	-0.586 (0.249)	0.119 (0.190)
Senocom**	-0.137 (0.198)	-0.150 (0.194)	-0.327 (0.202)	-0.003 (0.170)
Edad	-0.349 (0.049)		-0.187 (0.060)	
Vaescu			-0.443 (0.188)	
Observations	1026	695	709	909
Log Likelihood	-707.61	-473.597	-458.599	-626.293
Restr. Log Lik.	-718.24	-475.356	-465.587	-630.765

* Standard Errors in parenthesis.
** Variables related to eligibility criteria.

Table 5.6

Group	R-squared	Prediction Evaluation
Young Males	0.014	% Correct goes from 50.9 to 62.4
Adult Males	0.004	% Correct goes from 56.5 to 58.7
Young Females	0.015	% Correct goes from 51.8 to 58.1
Adult Females	0.007	% Correct goes from 54.1 to 54.9

The predicted Propensity Scores go from a minimum value of 0.15 to a maximum value of 0.88, showing a wide range of dispersion.

5.4 A comparison of the propensity score estimates

Table 5.7 present simple correlation coefficients among the estimated propensity scores for each of the four subgroups.

Table 5.7
Correlation Coefficients

Young Males	**PSTOT**	**PSUN**	**PSMU**
PSTOT	**1**	**0.6507**	**0.5937**
PSUN		**1**	**0.5669**
PSMU			**1**
Adult Males	**PSTOT**	**PSUN**	**PSMU**
PSTOT	**1**	**0.2229**	**0.2418**
PSUN		**1**	**0.2521**
PSMU			**1**
Young Females	**PSTOT**	**PSUN**	**PSMU**
PSTOT	**1**	**0.3940**	**0.4213**
PSUN		**1**	**0.3363**
PSMU			**1**
Adult-Female	**PSTOT**	**PSUN**	**PSMU**
PSTOT	**1**	**0.2471**	**0.2729**
PSUN		**1**	**0.2512**
PSMU			**1**

From this Table it can be seen that the Propensity Scores do not present, in general, high correlation coefficients among the different data sources used in estimation.

In Tables 5.8 to 5.11 we present the predicted Propensity Scores when we use the estimated functional forms obtained from each of the three sources of information to the average information for each of the variables included in the models arising from these sources. The functional form in the Tables is kept fixed along a row and the source of the information for the independent variables is kept fixed along the columns.

Table 5.8
Young Males

Functional Form\Source of Information	**Universe**	**Survey**	**Combined**
Universe Functional Form	0.5389	0.5571	0.5593
Survey Functional Form	0.5635	0.4921	0.5183
Combined Functional Form	0.6500	0.5112	0.5548

Table 5.9
Adult Males

Functional Form\Source of Information	Universe	Survey	Combined
Universe Functional Form	0.4598	0.5279	0.4794
Survey Functional Form	0.3936	0.4326	0.4276
Combined Functional Form	0.4689	0.5184	0.5143

Table 5.10
Young Females

Functional Form\Source of Information	Universe	Survey	Combined
Universe Functional Form	0.3890	0.4447	0.4436
Survey Functional Form	0.4821	0.4793	0.4973
Combined Functional Form	0.4986	0.5112	0.5391

Table 5.11
Adult Females

Functional Form\Source of Information	Universe	Survey	Combined
Universe Functional Form	0.4112	0.4801	0.4761
Survey Functional Form	0.4592	0.4589	0.4582
Combined Functional Form	0.5076	0.5367	0.5311

From these Tables a decomposition of the main differences among the average propensity scores into functional form ($\Delta\beta$) and independent variables (ΔX) can be attempted. Table 5.15 presents these decompositions for two alternative methods:[10]

Method 1: $PS(\beta_i,X_i) - PS(\beta_j,X_j) = [PS(\beta_i,X_i) - PS(\beta_i,X_j)] + [PS(\beta_i,X_j) - PS(\beta_j,X_j)]$

$= [\Delta X\ ] + [\Delta\beta\ ]$

Method 2: $PS(\beta_i,X_i) - PS(\beta_j,X_j) = [PS(\beta_i,X_i) - PS(\beta_j,X_i)] + [PS(\beta_j,X_i) - PS(\beta_j,X_j)]$

$= [\Delta\beta\ ] + [\Delta X\ ]$

where $PS(b_k,X_s)$ denotes the predicted Propensity Score using the functional form obtained by using the "*k*" data source (*k* = universe, survey, universe-survey combined); and "*s*" denotes the source of information for the independent variables

[10] There is no unique way of decomposing the total difference.

Table 5.15

Propensity Scores Decomposition

	Universe Survey	Versus Info	Universe Combined	Versus Info	Combined Survey	Versus Info
	Method 1	**Method 2**	**Method 1**	**Method 2**	**Method 1**	**Method 2**
Young Males						
ΔX	-0.0714	-0.0182	-0.0952	-0.0045	0.0436	0.0262
$\Delta\beta$	0.0246	-0.0650	0.1111	0.0204	0.0191	0.0365
Total	-0.0468	-0.0468	0.0159	0.0159	0.0627	0.0627
Adult Males						
ΔX	0.039	0.0681	0.0454	0.0196	-0.0041	-0.005
$\Delta\beta$	-0.0662	-0.0953	0.0091	0.0349	0.0858	0.0867
Total	-0.0272	-0.0272	0.0545	0.0545	0.0817	0.0817
Young Females						
ΔX	-0.0027	0.0557	0.0405	0.0546	0.0279	0.0279
$\Delta\beta$	0.0903	0.0346	0.1096	0.0955	0.0319	0.0418
Total	0.0903	0.0903	0.1501	0.1501	0.0598	0.0598
Adult Females						
ΔX	-0.0003	-0.0212	0.0235	0.0649	-0.006	-0.000
$\Delta\beta$	0.048	0.069	0.0964	0.055	0.077	0.073
Total	0.048	0.048	0.1199	0.1199	0.0722	0.0722

Although there are mixed results across methods, in general, it seems like the change in functional is more important than changes in average values of the independent variables, as determinants of the differences in Propensity scores across the data sources.

5.5 Determining a common support

The application of propensity scores matching estimators requires that exists propensity scores values for the *Comparisons* in the vicinity of each of the propensity scores for the *Beneficiaries*. In order to analyze whether this was a problem for some of the propensity scores values for the *Beneficiaries* sample we plotted the histograms of the propensity

scores for both groups for each of the three estimated propensity scores. The Appendix 2 presents these figures for each of the four subgroups.

Visually we do not observe values of propensity scores for *Beneficiaries* for which we cannot find in its vicinity propensity scores in the sample of *Comparisons* in the cases of young males, adult males and young females. In the case of adult females we found 20 beneficiaries adult females in the combined universe-survey data for which there were no close matches in the comparison sample. Appendix 2 presents histograms for the three sets of estimated scores showing their distribution for the Beneficiaries and Comparisons groups.

The results we report in the next section assume a common support. It is important to mention that in the Programa Joven they considered several criteria to select the Comparisons, controlling by some variables such that age, gender, labor status, marital status and existence of Children and controlling also by their distribution. This makes more likely that the two populations present similar propensity scores.

6. Impact estimates: labor earnings and employment

The parameter being estimated is the impact of treatment on the treated. The outcome variables considered were: earnings and probability of employment in the 12^{th} month after the Program.

We worked with a cross-sectional (CS) matching estimator, given that this methodology compares the results for the *Beneficiaries* and *Comparisons* at the same period after the program. The information available allows us to apply this methodology.

The specific cross-sectional matching estimator was the ***Nearest Neighbor Matching Estimator:***[11] This is the simplest method to implement and its specific formulas can be seen in Todd (1999). The number of neighbors to include from the *Comparisons* sample for each *Beneficiary* is taken as given. For each Beneficiary we included only income information of the specified number of Comparisons with the lowest Euclidean distance to the ith *Beneficiary* propensity scores.

[11] As in the case of any propensity score matching estimators, it is necessary to assume that $E[Y_0 \mid P(X),D=1]=E[Y_0 \mid P(X), D=0]$ and $0 < Pr(D=1 \mid X) <1$.

The technique of **bootstrapping** was used to obtain the sample variance of the impact estimates. The Appendix 3 presents the Matlab (version 5.3.1) codes, which were used in estimation.

Table 6.1 presents some descriptive statistics for the four subgroups, for beneficiaries and comparisons, on labor earnings and employment in the 12th month after the Program.

Table 6.1
Descriptive Statistics

Young-Males	**Mean**	**Std. Dev.**
Beneficiaries Income at 12 months	$138.38	$163.28
Beneficiaries Employment at 12 months	0.677	0.4681
Comparisons Income at 12 months	$127.51	$152.63
Comparisons Employment at 12 months	0.6499	0.4775
Adult-Males	**Mean**	**Std. Dev**
Beneficiaries Income at 12 months	$180.61	$192.07
Beneficiaries Employment at 12 months	0.7062	0.4559
Comparisons Income at 12 months	$161.68	$173.84
Comparisons Employment at 12 months	0.7234	0.4477
Young-Females	**Mean**	**Std. Dev.**
Beneficiaries Income at 12 months	$86.24	$141.41
Beneficiaries Employment at 12 months	0.4650	0.4993
Comparisons Income at 12 months	$76.47	$130.35
Comparisons Employment at 12 months	0.4333	0.49.60
Adult-Females	**Mean**	**Std. Dev.**
Beneficiaries Income at 12 months	$111.82	$115.46
Beneficiaries Employment at 12 months	0.57	0.49
Comparisons Income at 12 months	$87.18	$133.44
Comparisons Employment at 12 months	0.45	0.48

6.1 Labor Earnings Results

The main results for the program impact estimates on earnings are presented in Table 6.2. We present impact estimates for 5, 10, 20 and 30 neighbors, for the four sub-groups and for the whole sample.[12] We report program impact estimates using the three estimated Propensity Scores: 1) using the universe individuals and information; 2) using the universe information but the individuals in the survey; and 3) using the individuals and the information from the survey.

[12] The estimate for the whole sample is constructed by weighting the individual results by sample proportions in the beneficiary sample of 1,670 individuals.

Table 6.2
Impact Estimators on Earnings*

1. Universe Information					
Neighbors	**Young Male**	**Adult Male**	**Young Female**	**Adult Female**	**All**
5	$19.626 (10.555)	$7.102 (13.029)	$11.098 (11.395)	$31.075 (8.493)	$18.721
10	$19.755 (10.707)	$1.451 (12.574)	$4.955 (11.486)	$28.869 (8.830)	$15.673
20	$18.938 (10.669)	$4.522 (12.275)	$7.341 (11.639)	$29.128 (9.241)	$16.661
30	$22.176 (10.401)	$2.484 (12.278)	$8.020 (11.446)	$26.244 (8.989)	$16.332
2. Sample with Universe Information					
Neighbors	**Young Male**	**Adult Male**	**Young Female**	**Adult Female**	**All**
5	$23.748 (13.029)	-$0.545 (14.871)	$13.632 (12.546)	$25.494 (9.262)	$16.834
10	$17.508 (11.381)	$9.565 (13.967)	$20.693 (12.747)	$23.402 (8.777)	$18.047
20	$20.061 (11.469)	$7.908 (14.435)	$21.376 (11.690)	$32.396 (8.615)	$21.259
30	$17.771 (11.450)	$13.837 (13.077)	$16.803 (12.757)	$29.661 (8.727)	$20.343
3. Sample Information					
Neighbors	**Young Male**	**Adult Male**	**Young Female**	**Adult Female**	**All**
5	$22.993 (11.754)	-$9.652 (14.899)	$23.885 (10.430)	$30.696 (8.099)	$17.918
10	$17.167 (11.644)	-$5.2026 (13.670)	$19.653 (9.758)	$31.606 (8.194)	$16.841
20	$19.778 (12.314)	$0.301 (13.660)	$18.813 (9.948)	$29.563 (8.347)	$18.082
30	$21.717 (11.4318)	-$1.137 (13.548)	$17.998 (11.161)	$28.160 (8.379)	$17.717

* Bootstrapping estimated sample standard deviation of the estimators is presented between brackets.

From this Table we can see that Program results on earnings are statistically significant for young males and adult females. However, Program estimates on earnings were not statistically significant for adult males and young females. Given that all groups obtain the same type of training Programs and there is no other program aspect that differs among groups, probably this result is more related to labor market differences for the different groups. This is what it makes more valuable the training Program for young males and adult females than for adult males and young females.

Controlling for the source of information used and for the statistically significant groups, Program impact estimates on earnings were not very sensitive to the number of nearest

neighbors.[13] Also impact estimates for the different propensity score specifications were very similar, even though the low correlations among the different scores reported earlier.

6.2 Employment Results

In this section we report the main Program impact on the probability of being employed. The main results are presented in Table 6.3.

Table 6.3
Impact Estimators Employment

1. Universe Information					
Neighbors	**Young Male**	**Adult Male**	**Young Female**	**Adult Female**	**All**
5	0.0095 (0.034)	-0.0238 (0.039)	-0.0181 (0.049)	0.1318 (0.035)	0.0345
10	0.0034 (0.035)	-0.0257 (0.029)	-0.0410 (0.048)	0.1194 (0.034)	0.0274
20	0.0072 (0.033)	-0.0292 (0.027)	-0.0244 (0.045)	0.1202 (0.035)	0.0279
30	0.0087 (0.033)	-0.0238 (0.027)	-0.0171 (0.047)	0.1130 (0.035)	0.0287
2. Sample with Universe Information					
Neighbors	**Young Male**	**Adult Male**	**Young Female**	**Adult Female**	**All**
5	0.0487 (0.032)	-0.0280 (0.031)	0.0019 (0.053)	0.0987 (0.037)	0.0379
10	0.0303 (0.036)	-0.0198 (0.030)	0.0255 (0.050)	0.1035 (0.033)	0.0403
20	0.0226 (0.036)	-0.0181 (0.031)	0.0107 (0.049)	0.1341 (0.035)	0.0453
30	0.0198 (0.035)	-0.0122 (0.029)	0.0213 (0.047)	0.1222 (0.034)	0.0441
3. Sample Information					
Neighbors	**Young Male**	**Adult Male**	**Young Female**	**Adult Female**	**All**
5	0.0323 (0.048)	-0.0295 (0.028)	0.0023 (0.035)	0.1282 (0.039)	0.0421
10	0.0276 (0.093)	-0.0357 (0.027)	-0.0095 (0.048)	0.1346 (0.035)	0.0392
20	0.0251 (0.039)	-0.0293 (0.029)	-0.0153 (0.049)	0.1277 (0.032)	0.0368
30	0.0209 (0.037)	-0.0395 (0.029)	-0.0137 (0.052)	0.1252 (0.046)	0.0328

* Bootstrapping estimated sample standard deviation of the estimators is presented between brackets.

[13] For adult males results were sensitive to the number of nearest neighbors, however results were not statistically significant.

From this Table it can be observed that the estimated Program impact on employment was statistically significant for adult females only. For this group the estimated impact was not sensitive to the number of nearest neighbors. Also, the impact estimates for the different propensity score specifications were very similar. For the non-statistically significant groups we observed a greater sensitivity of the estimates to the number of nearest neighbors and to the different sources of information used to estimate the propensity scores.

7. Cost Benefit Analysis

Based on the identification and quantification of the outcome measures, it is possible to estimate the benefits of Programa Joven, for the time period considered. This information is used in this section, together with information on costs of the program, to conduct a cost-benefit analysis and to calculate a rate of return to dollars spent on the Program.

We have information on:[14]

- **Direct Cost of Training:** This includes the cost of the training services rendered by the ICAP, the insurance for short-term stays in firms, and the fellowships and subsidies to the program beneficiaries for children.
- **Indirect Costs:** This includes the costs of personal, infrastructure, inputs and operational expenses of the unit that carries out the Program. It also includes, among others, information on bidding costs, promotion, computer services and supervision. The problem with the information is that the unit that carries out the Program has also other projects, however the Programa Joven is the most important in terms of expenditure.[15] This means that we will have to distribute these costs among the different projects (components) to have a reliable estimate of administrative costs of the Programa Joven.

The accumulated total cost within the period second semester 1993 to December 1998 has the following composition:

[14] The Programa Joven provided this information.
[15] Other components include Proyecto Microempresas, Proyecto Imagen y Fortalecimiento Institucional.

Table 7.1

Cumulative Budget Execution at 12/31/1998

Category	Cumulative	%
Direct Costs	$152,504,951.33	75.34%
Administration	$31,407,058.68	15.52%
Concurrent Costs	$5,417,166.29	2.68%
Financial Costs	$13,083,500.00	6.46%
Total	**$202,412,676.30**	**100%**

We did not have access to the detailed costs information needed to separate and allocate the Administrative costs among its several components (Programa Joven, Proyecto Microempresas, Proyecto Imagen and Fortalecimiento Institucional). As a compromise we assumed that the administrative, concurrent and financial costs maintain a constant proportionality with the direct costs. Thus, we assume that the direct costs represent 3.055 times the indirect costs (3.055=Direct Costs/administration+concurrent+financial).

The Programa Joven has estimated the Direct Cost of the courses in the fifth bidding wave of the training program. They estimated in US$ 1,342 the direct cost per student graduated at least from the technical knowledge phase. Given the assumption of a constant proportionality between indirect to direct cost, this means that we have an indirect cost of US$ 483.83 per student graduated from at least the technical knowledge phase, which gives a total cost of US$ 1,780.83 per student.

In addition, we assumed that there is a zero opportunity cost while the trainee is being treated and that there is a constant impact of the treatment on labor income. We conducted the cost benefit analysis under different scenarios for the duration of benefits, discount rate and ratio direct to indirect costs.

The specific formula used to obtain the net present value (NPV) is as follows:

$$NPV = \sum_{t=0}^{T} \left(\frac{E_t - C_t}{(1+r)^t} \right)$$

where E_t denotes the mean earnings effect on the treated,[16] C_t denotes the costs of Programa Joven (we assume that they take place at time zero), T denotes the duration of benefits and r denotes the opportunity cost of capital.

The different values assumed for these variables are presented in the following Table. The yearly real discount rate was set at two values 5% and 10%, the latest corresponding to the social rate of discount. We considered two values for the ratio Indirect/Direct costs the above-mentioned figure of 0.327 and 0.15 a figure, which is consistent with a 13% participation of indirect cost on total cost.[17]

Table 7.2

Simulation Scenarios

Variable	Values
Duration of Benefits (years)	1, 3, 6, 9, 12, 15 and infinite
Discount Rate (%)	5 and 10
Ratio Indirect/Direct Costs	0.15 and 0.327

The main cost benefits results obtained are presented in Table 7.3. In the Table we present the Net Present Value (NPV) calculations for two benefit figures: (i) US$ 17.87 per month, which corresponds to the average impact estimator on earnings for all the groups and across the three sources of information (see Table 6.2); and (ii) US$ 24.67 per month, which corresponds to the average impact estimator on earnings for young males and adult females only. As Table 6.2 reports the young males and females present statistically significant Program impact on earnings. This is equivalent to perform a cost-benefit analysis for a Program (with similar costs) targeted to young males and adult females only.

[16] Opportunity cost while the individual is undertaking training is assumed to be zero.
[17] The Programa Joven officials suggested this figure informally.

Table 7.3
Cost Benefit Analysis
(in US$)

Duration of Benefits	Discount Rate	Ratio Indirect/ Direct Cost	Net Benefits (US$)	Net Present Value (US$)	Net Benefits (US$)	Net Present Value (US$)
1 year	5%	0.15	17.87	-1,339.1	24.67	-1,261.3
1 year	5%	0.327	17.87	-1,576.6	24.67	-1,498.9
1 year	10%	0.15	17.87	-1,348.4	24.67	-1,274.2
1 year	10%	0.327	17.87	-1,585.9	24.67	-1,511.7
3 years	5%	0.15	17.87	-959.4	24.67	-737.1
3 years	5%	0.327	17.87	-1,196.9	24.67	-974.6
3 years	10%	0.15	17.87	-1,010.1	24.67	-807.0
3 years	10%	0.327	17.87	-1,247.6	24.67	-1,044.6
6 years	5%	0.15	17.87	-454.9	24.67	-40.6
6 years	5%	0.327	17.87	-692.5	24.67	-278.1
6 years	10%	0.15	17.87	-609.4	24.67	-253.9
6 years	10%	0.327	17.87	-846.9	24.67	-491.4
9 years	5%	0.15	17.87	-19.2	24.67	561.0
9 years	5%	0.327	17.87	-256.7	24.67	323.5
9 years	10%	0.15	17.87	-308.4	24.67	161.7
9 years	10%	0.327	17.87	-545.9	24.67	-75.82
12 years	5%	0.15	17.87	357.2	24.67	1,080.8
12 years	5%	0.327	17.87	119.7	24.67	843.2
12 years	10%	0.15	17.87	-82.3	24.67	473.9
12 years	10%	0.327	17.87	-319.8	24.67	236.4
15 years	5%	0.15	17.87	682.4	24.67	1,529.7
15 years	5%	0.327	17.87	444.86	24.67	1,292.2
15 years	10%	0.15	17.87	87.7	24.67	708.6
15 years	10%	0.327	17.87	-149.9	24.67	471.0
Infinite	5%	0.15	17.87	2,744.3	24.67	4,377.9
Infinite	5%	0.327	17.87	2,507.7	24.67	4,140.4
Infinite	10%	0.15	17.87	600.9	24.67	1,417.3
Infinite	10%	0.327	17.87	363.5	24.67	1,179.8

As it can be seen the NPV can be positive or negative. Ceteris Paribus, the longer the time period for the benefits, the smaller the discount rate and the lower the ratio indirect to direct cost, the greater the Net Present Value of the Programa Joven.[18]

[18] The NPV reported in the Table assume a zero deadweight loss of the resources used to fund the Programa Joven. If we assume, for instance, a 50% deadweight loss we have to subtract US$ 890 to the figures reported in the Table.

8. Conclusions

This article was aimed at answering the following questions: (1) Does "Programa Joven" increase the labor income of the trainees? (2) Does "Programa Joven" increase the probability of being employed? (3) How sensitive Program impact estimates are to different propensity score specifications? And (4) what is the rate of return to dollars spent on the "Programa Joven"?

Our results indicate first, that Program impact on earnings were statistically significant for young males and adult females only. In our opinion this result, which makes more valuable the training Program for these specific groups, is more related to the different labor market conditions that they face than to Program specific components (all groups obtain the same type of programs and there is no other program aspect that differs among groups). Program impact estimates on earnings were not sensitive to the number of nearest neighbors.

Second, estimated Program impact on employment was statistically significant for adult females only. For this group the estimated impact was not sensitive to the number of nearest neighbors. A greater sensitivity of the estimates to the number of nearest neighbors was observed for the other groups.

Third, impact estimates on earnings and employment for the different propensity score specifications and for the statistically significant groups were very similar, even though the low correlations among the different scores reported in the article. For the non-statistically significant groups we observed a greater sensitivity of the estimates to the different sources of information used to estimate the propensity scores. This was a surprising result as we expected to observe greater variability in the impact results across different propensity score specifications.

Finally, the cost-benefit exercise conducted suggest that, Ceteris Paribus, the longer the time period for the benefits, the smaller the discount rate and the lower the ratio indirect to direct cost, the greater the Net Present Value of the Programa Joven. For the all the beneficiaries we required 12 years of duration of benefits for the Program to have a positive NPV. For young males and adult females, which present higher and statistically significant earning impacts, we required a duration of benefits around 9 years for the Program to have a positive NPV.

References

Hardle, W. 1992. “Applied Nonparametric Regression”.

Heckman, J., Ichimura, H., Smith, J., and Todd, P. 1998. “Characterizing Selection Bias Using Experimental Data”. *Econometrica*. 66 (5).

Heckman, J., Ichimura, H., and Todd, P. 1997. “Matching As an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme”. *Review of Economic Studies*. 64 (4).

Heckman, J., Ichimura, and Todd, P. 1998. “Matching As an Econometric Evaluation Estimator”. *Review of Economic Studies*. 65 (2): 605-654.

Heckman, J., LaLonde, R., and Smith, J. 1999. “The Economics and Econometrics of Active Labor Market Programs”. In: O. Ashenfelter and D. Card, editors. *Handbook of Labor Economics, Volume IIIA: 1865-2097*. Amsterdam: North-Holland.

Heckman, J. and Smith, J. 1998. “Evaluating the Welfare State”. In: Steiner Strom, editor. *Econometrics and Economic Theory in the 20 th Century: The Ragnar Frisch Centennial*. Cambridge, United Kingdom: Cambridge University Press for Econometric Society.

Heckman, J. and Smith, J. 1999. “The Pre-Program Dip and the Determinants of Participation in a Social Program: Implications for Simple Program Evaluation Strategies”. *Economic Journal*. 109 (143): 1-37.

Heckman, J., Smith, J., and Clements, N. 1997. “Making the Most Out of Programme Evaluations and Social Experiments: Accounting for Heterogeneity in Program Impacts”. *Review of Economic Studies*. 64 (4): 487-536.

Jones, Marron & Sheather. 1996. “A Brief Survey of Bandwidth Selection for Density Estimation”, JASA.

LaLonde, Robert. 1986. “Evaluating the Econometric Evaluations of Training Programs with Experimental Data”. *American Economic Review*. 76 (4): 604-620.

Manski Charles F. 1995. “Learning about Social Programs from Experiments with Random Assignment of Treatments”. *Journal of Human Resources*. 31(4): 707-733.

Manski, C. F. and S.R. Lerman, 1977. “The Estimation of the Choice Probabilities from Choice-Based Samples”. *Econometrica* 45: 1977-1988.

Todd, P. 1999. “A Practical Guide to Implementing Matching Estimators”, *mimeo* presented at the IADB meeting in Santiago Chile, October.

Silverman, B.W. 1986. “Density Estimation for Statistics and Data Analysis”. (London: Chapman and Hall).

Ministerio de Trabajo y Seguridad Social de la República Argentina. “Base de datos e información del Programa Joven”. Secretaría de Empleo y formación Profesional. Gerencia de Evaluación de Impacto y Estudios Especiales.

Appendix 1: Variable Description

Variable	Description
EDAD	Age
ESTADO	1=Beneficiary, 0=Comparison
SEXO	1=Male, 0=Female
EDAD35	Dummy Age between 16 and 35 years of age
HIJOS	Children, 1=Yes, 0=No
HMENOR	Children younger than 5 years of age, 1=Yes, 0=No
VAESCU	School Attendance, 1=Yes, 0=No
JEFE	Head of the Household, 1=Yes, 0=No
ENPAREJA	Married, 1=Yes, 0=No
PRINOCOM	Primary Education Incomplete, 1=Yes, 0=No
PRICOM	Primary Education Completed, 1=Yes, 0=No
SENOCOM	Secondary Education Incomplete, 1=Yes, 0=No
SECOM	Secondary Education Completed, 1=Yes, 0=No
DESOCUPA	Unemployed, 1=Yes, 0=No
OCUPADO	Employed, 1=Yes, 0=No
DESOEXP	Unemployed with labor experience, 1=Yes, 0=No
DESONEXP	Unemployed without labor experience, 1=Yes, 0=No
INACTIVO	Out of the Labor Force, 1=Yes, 0=No
POBRELP	Poor by Income line, 1=Yes, 0=No
GBA	Reside in GBA, 1=Yes, 0=No
SUR	Reside in the South, 1=Yes, 0=No
NEA	Reside in the North East (NEA), 1=Yes, 0=No
CENTRO	Reside in the Center, 1=Yes, 0=No
LITORAL	Reside in the Coast, 1=Yes, 0=No
CUYO	Reside in Cuyo, 1=Yes, 0=No
NOA	Reside in the North West (NOA), 1=Yes, 0=No
CORDOBA	Reside in Córdoba, 1=Yes, 0=No
MENDOZA	Reside in Mendoza, 1=Yes, 0=No
STAFE	Reside in Santa Fe, 1=Yes, 0=No
TUCUMAN	Reside in Tucumán, 1=Yes, 0=No
MUESTRA	Internal Control Variable
GRUPO	Internal Control Variable

Appendix 2: Common Support

Figure A.2.1

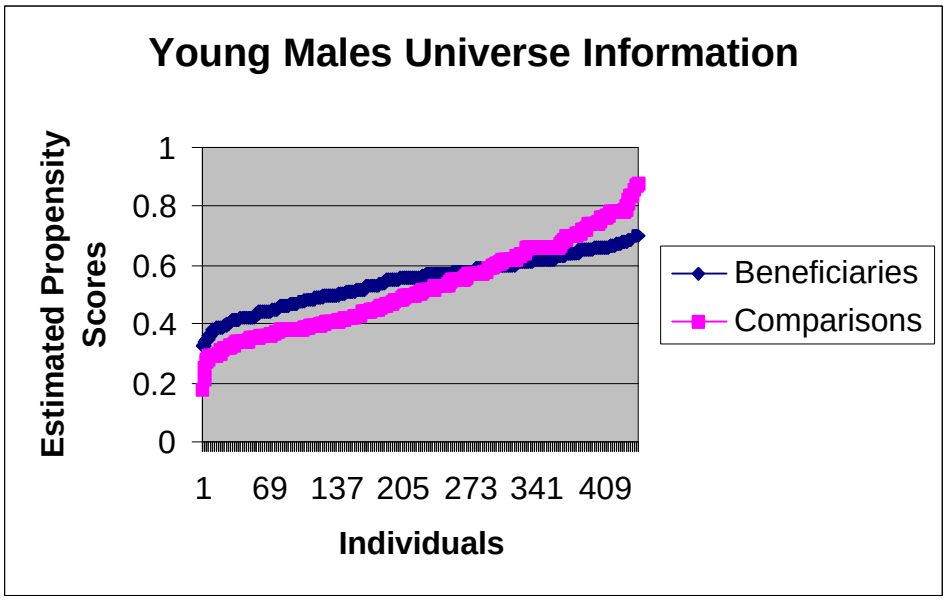


Figure A.2.2

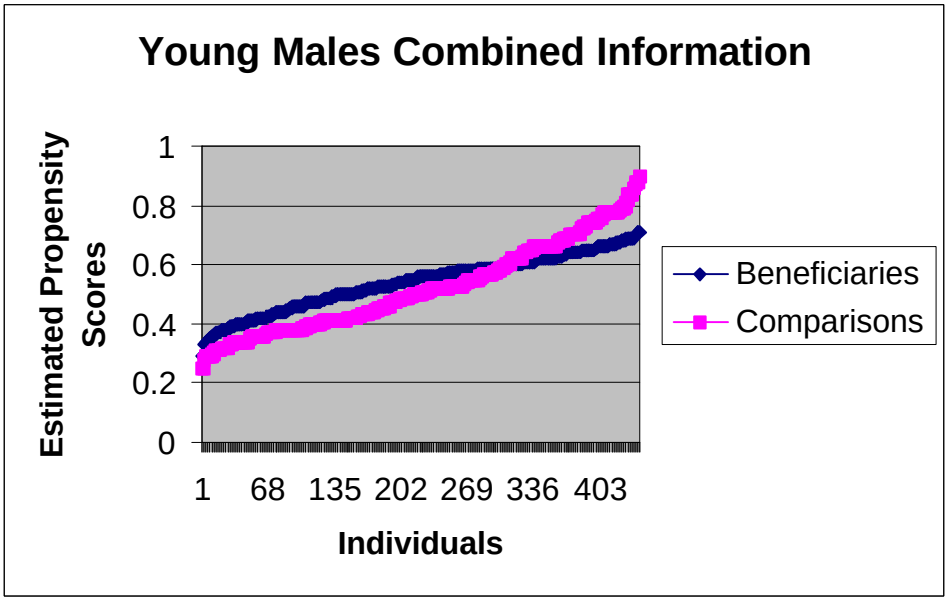


Figure A.2.3

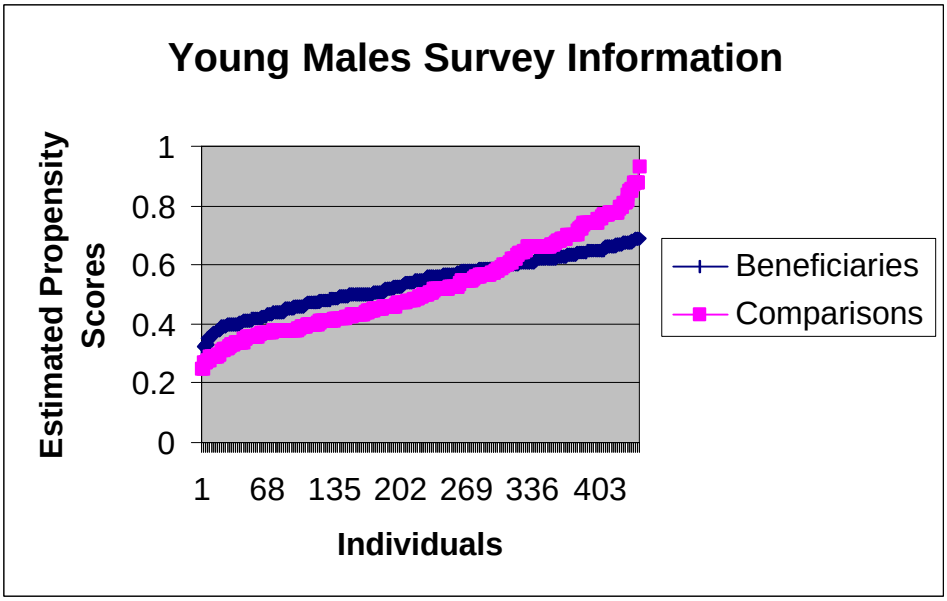


Figure A.2.4

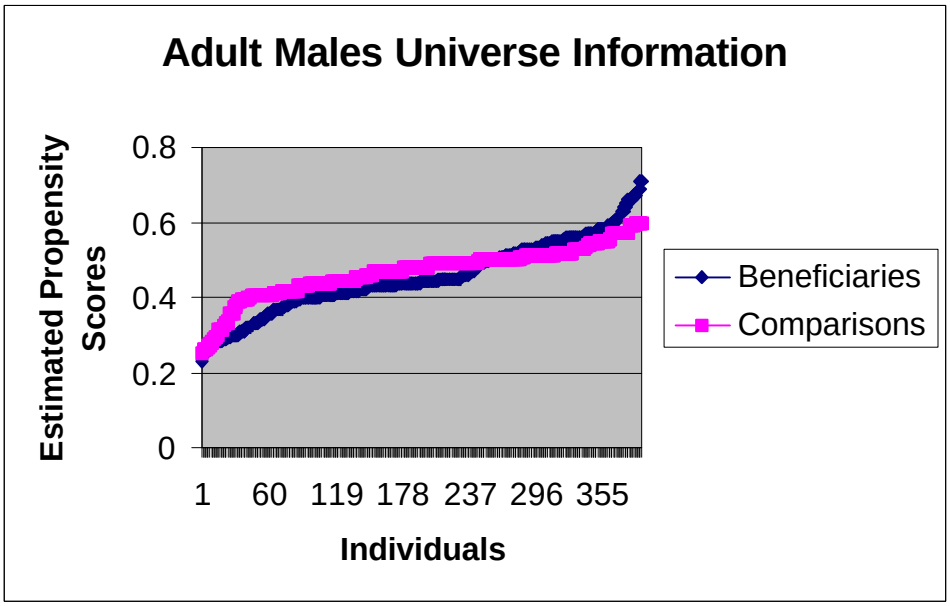


Figure A.2.5

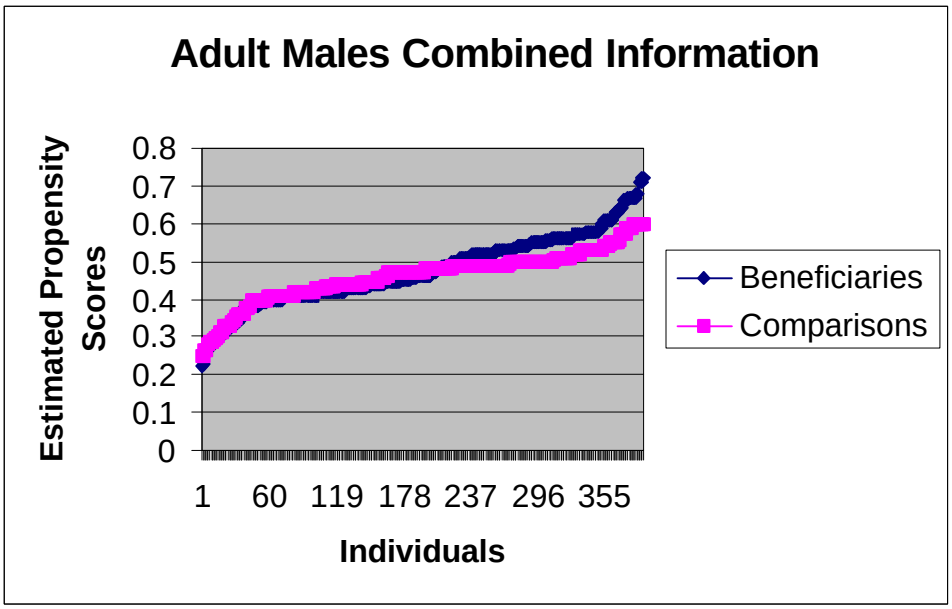


Figure A.2.6

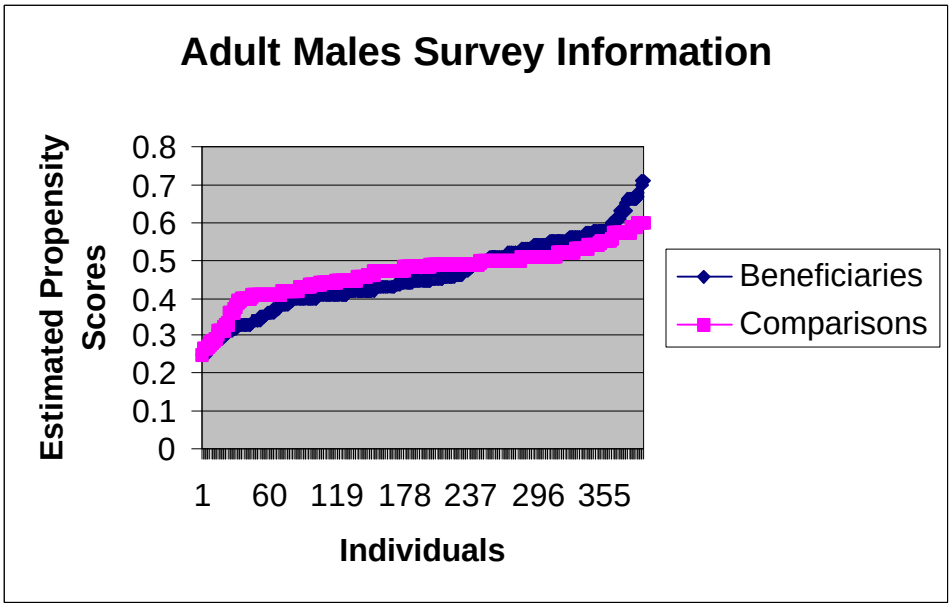


Figure A.2.7

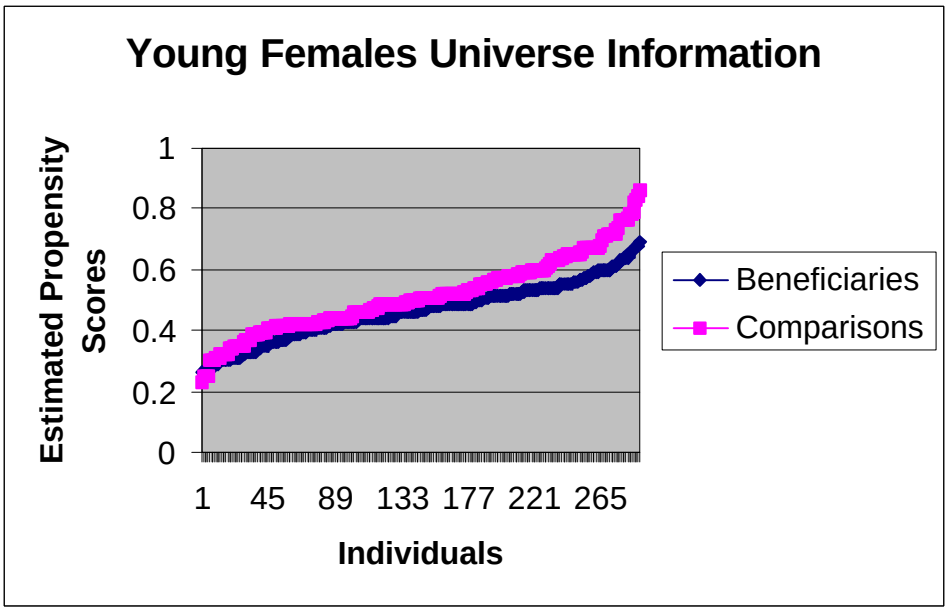


Figure A.2.8

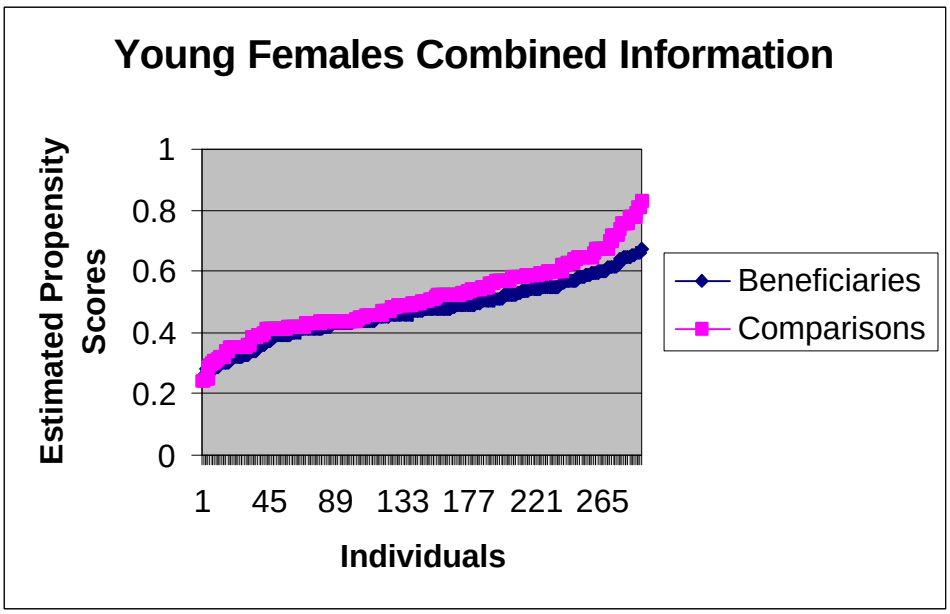


Figure A.2.9

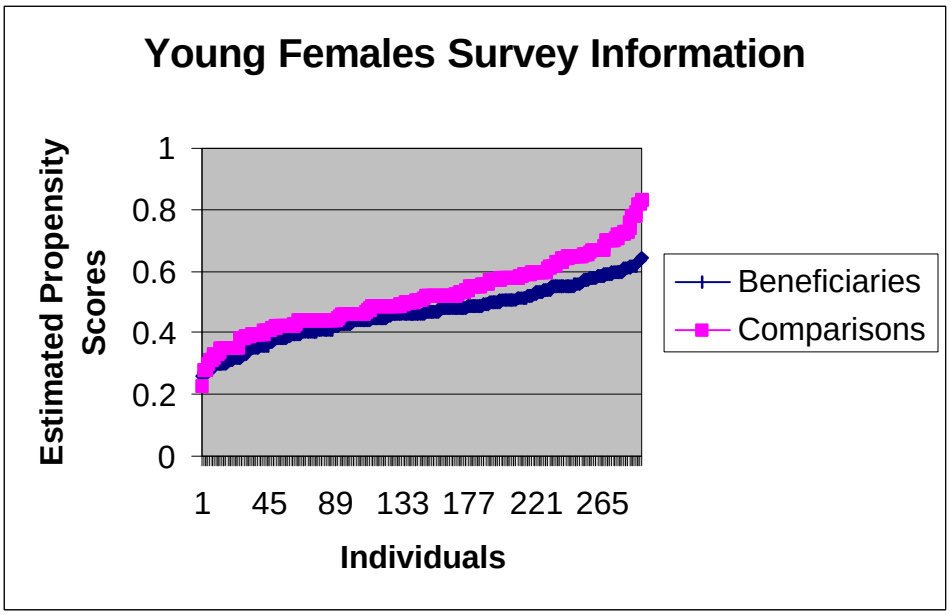


Figure A.2.10

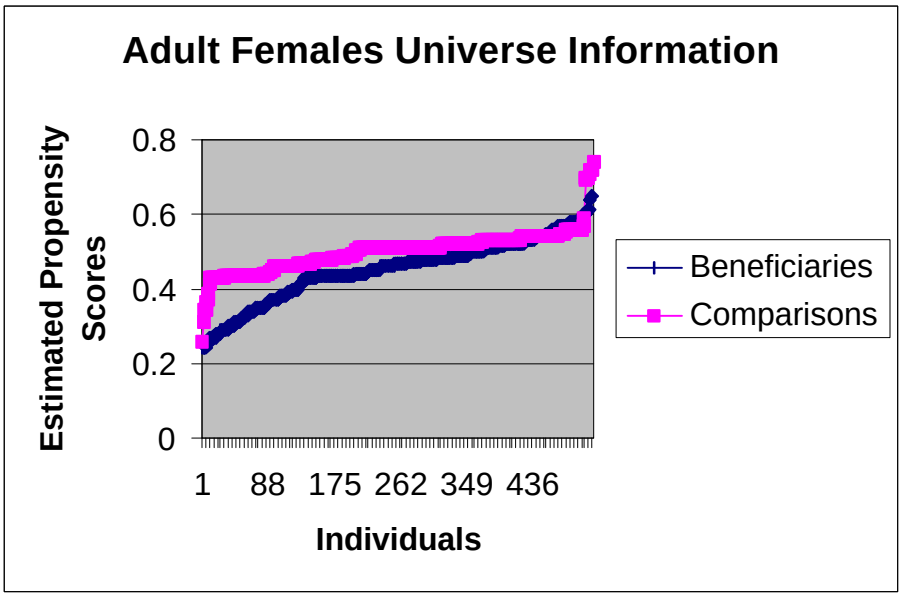


Figure A.2.11

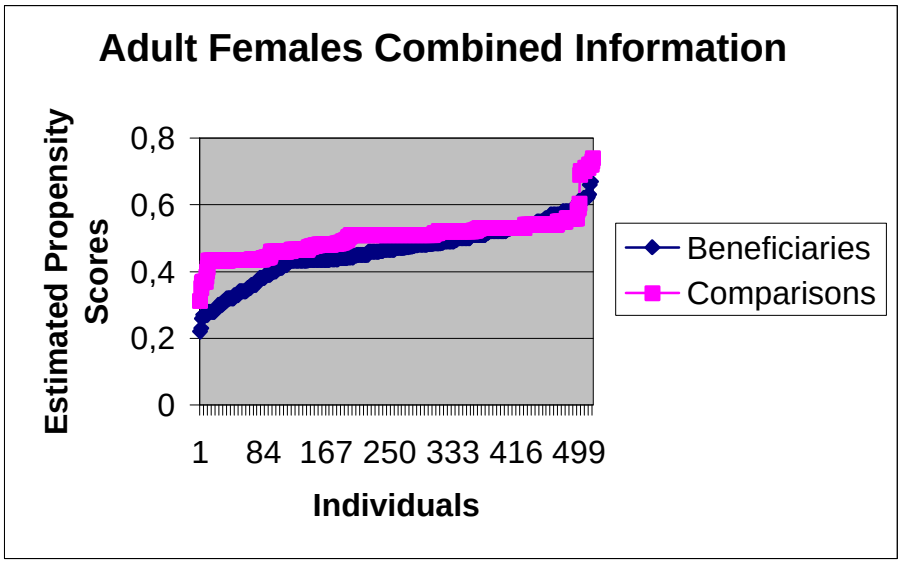
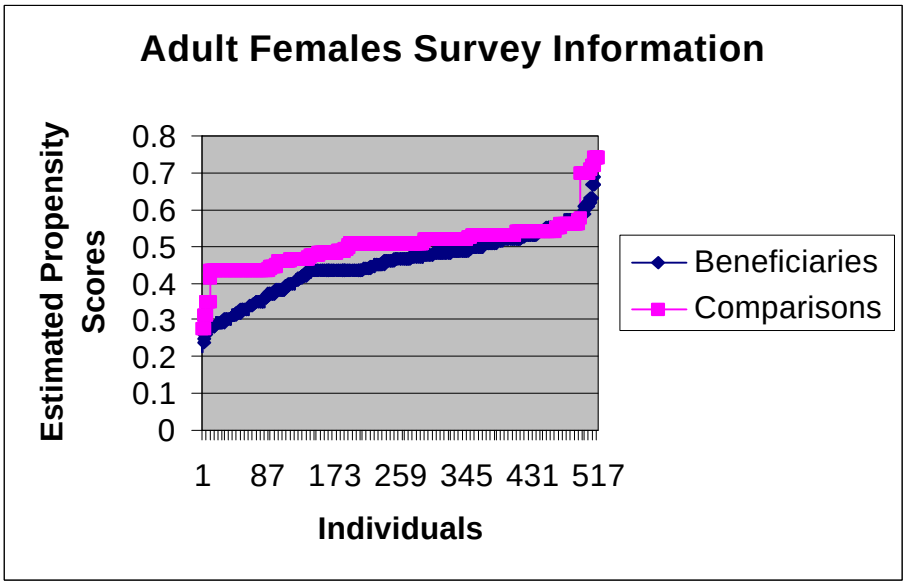


Figure A.2.12



Appendix 3: MATLAB Codes

a) Nearest Matching Estimators

```
%PROGRAM NEAREST MATCHING
%
%Developed by: Cristian Aedo (caedo@uahurtado.cl)
%
%Date: August 1, 2000
%Last Update: August 10, 2000
%
%Purpose: To estimate program impact using the Nearest
%Matching Estimator Approach.
%Subjects: Whole sample
%

%
%Loading and defining information matrix
%

clear;
load tresps2.dat;
m=tresps2;

%
%Defining Number of observations and location of
%beneficiaries and comparisons in the
%sample. Data set is ordered: first the beneficiaries and
%then the comparisons
%

n=3339;
n1=1670;
n2=1671;

%
%Transferring information matrix data into column vectors
%

dniclave=m(1:n,1);
grupos=m(1:n,2);
sexo=m(1:n,3);
subgrupo=m(1:n,4);
ing0=m(1:n,5);
ing1=m(1:n,6);
```

```
ing2=m(1:n,7);
ing3=m(1:n,8);
ing4=m(1:n,9);
ing5=m(1:n,10);
ing6=m(1:n,11);
ing7=m(1:n,12);
ing8=m(1:n,13);
ing9=m(1:n,14);
ocupa5=m(1:n,15);
desocu5=m(1:n,16);
inact5=m(1:n,17);
ocupa9=m(1:n,18);
desocu9=m(1:n,19);
inact9=m(1:n,20);
ocupa0=m(1:n,21);
desocu0=m(1:n,22);
inact0=m(1:n,23);
joven=m(1:n,24);
pstot=m(1:n,25);
psun=m(1:n,26);
psmu=m(1:n,27);

%
%Defining income data and propensity scores
%

yb=m(1:n1,5);
yc=m(n2:n,5);
pstotb=m(1:n1,25)/10000;
pstotc=m(n2:n,25)/10000;
psunb=m(1:n1,26)/10000;
psunc=m(n2:n,26)/10000;
psmub=m(1:n1,27)/10000;
psmuc=m(n2:n,27)/10000;

%
%Defining number of neighbors
%

neighbor=50;

%
%The following loop defines the comparisons which are
%going to be used for each beneficiaries. Then it
%calculates the average earnings for the number of
%neighbors considered.
%
```

```
for i=1:length(yb);

  difp=abs(pstotb(i)-pstotc);
  sortdifp=sort(difp);
  dist=sortdifp(neighbor);

  r=0;
  ycc=0;

  for j=1:length(yc);

     if difp(j) <= dist;

        r=r+1;
        ycc=ycc+yc(j);

     end;

  end;

     ycp(i)=ycc/r;
     ybb(i)=yb(i);

 end;

%
%Finally, we calculate the mean Program impact
%

imp=mean(ybb-ycp);
imp
```

b) Nearest Matching Estimator: Bootstrapping

```
%
%PROGRAM BOOTSTRAPPING FOR THE NEAREST MATCHING ESTIMATOR
%
%Developed by: Cristian Aedo (caedo@uahurtado.cl)
%
%Date: August 10, 2000
%Last Update: August 18, 2000
%
%Purpose: The Program will generate 100-paired samples of
beneficiaries and of comparisons (each of the samples will
%be of equal size as the original samples). For each of
%these 100 paired samples a Program Impact estimate will be
```

```
%obtained. The variance of the Mean Impact estimates will
%be computed as the sample analog using as a mean the
%original estimate of the Program Impact.
%
%Subjects: Whole sample
%

%
%Loading and defining information matrix
%

load madulta.dat;
m=madulta;

%
%Defining Number of observations and location of
beneficiaries and comparisons in the sample. Data set
%is ordered: first the beneficiaries and then the
%comparisons
%

n=3339;
n1=1670;
n2=1671;
nn1=1670;
nn2=1669;

%
%Transferring information matrix data into column vectors
%

dniclave=m(1:n,1);
grupos=m(1:n,2);
sexo=m(1:n,3);
subgrupo=m(1:n,4);
ing0=m(1:n,5);
ing1=m(1:n,6);
ing2=m(1:n,7);
ing3=m(1:n,8);
ing4=m(1:n,9);
ing5=m(1:n,10);
ing6=m(1:n,11);
ing7=m(1:n,12);
ing8=m(1:n,13);
ing9=m(1:n,14);
ocupa5=m(1:n,15);
desocu5=m(1:n,16);
```

```
inact5=m(1:n,17);
ocupa9=m(1:n,18);
desocu9=m(1:n,19);
inact9=m(1:n,20);
ocupa0=m(1:n,21);
desocu0=m(1:n,22);
inact0=m(1:n,23);
joven=m(1:n,24);
pstot=m(1:n,25);
psun=m(1:n,26);
psmu=m(1:n,27);

%
%Define some constant terms for the Random Number Generator
%

p=2147483647.0;
q=2147483655.0;
r=16807.0;

%
%Obtain 200 seeds to initialize each random sample
%

nseeds = 200;
seed=20;

for i=1:nseeds;

   seed=MOD(r*seed,p);
   x(i,1)=seed/q;

end;

%
%Now iterate over each of these paired samples to obtain
the Program Estimate for each
%

for i=1:100;

   seed1=x(i,1);
   seed2=x(100+i,1);

   for j=1:nn1;

      seed1=MOD(r*seed1,p);
```

```
      x1=seed1/q;
      rut=round(x1*nn1+0.5);
      yb(j)=m(rut,21);
      pstotb(j)=m(rut,25)/10000;
      psunb(j)=m(rut,26)/10000;
      psmub(j)=m(rut,27)/10000;

   end;

   for j=1:nn2;

      seed2=MOD(r*seed2,p);
      x2=seed2/q;
      rut=n1+round(x2*nn2+0.5);
      yc(j)=m(rut,21);
      pstotc(j)=m(rut,25)/10000;
      psunc(j)=m(rut,26)/10000;
      psmuc(j)=m(rut,27)/10000;

   end;

%
%Define the number of neighbors
%

neighbor=30;

%
%The following loop defines the comparisons that are
%going to be used for each beneficiaries. Then it
%calculates the average earnings for the
%neighbors considered.
%

for k=1:length(yb);

  difp=abs(psmub(k)-psmuc);
  sortdifp=sort(difp);
  dist=sortdifp(neighbor);

  s=0;
  ycc=0;

  for j=1:length(yc);

    if difp(j) <= dist;
```

```
      s=s+1;
      ycc=ycc+yc(j);

     end;

  end;

      ycp(k)=ycc/s;
      ybb(k)=yb(k);

 end;

 %
 %Calculate the mean Program impact
 %

 imp(i)=mean(ybb-ycp);

 end;

%
%Now we calculate the variance and the standard deviation
%of the mean Program Impact
%

 meaneffe=mean(imp);
 boot=sqrt(var(imp));
 meaneffe, boot
```