Topics

Mauricio Reis*

Vocational Training and Labor Market Outcomes in Brazil

Abstract: This paper examines the effect of vocational training on labor market outcomes in Brazilian metropolitan areas. Estimates based on difference-in-differences matching indicate that vocational training increases monthly and hourly labor earnings, as well as the probability of getting a job. However, evidence does not indicate that this kind of training improves access to jobs in the formal sector. Also according to the results, vocational training in Brazil seems to be more effective for workers with more labor market experience and for those with a higher level of formal education than for individuals in disadvantaged groups.

Keywords: vocational training, labor earnings, employment

DOI 10.1515/bejeap-2013-0023

1 Introduction

Vocational training is advocated as a way of increasing workers' skills and productivity in the labor market. This kind of human capital accumulation may be particularly important in a developing country, where the labor force comprises a high share of unskilled workers with low levels of formal education. In spite of improvements verified over time, the level of formal education is still low and very unequally distributed among Brazilian workers. Mean years of schooling increased from 9.1 in 2003 to 10.3 in 2011, but almost 25% of the Brazilian labor force in metropolitan areas had less than 8 years of schooling in this last period. In this setting, vocational training may have an important role, providing skills in specific occupations, in particular for unskilled workers who

*Corresponding author: **Mauricio Reis**, Instituto de Pesquisa Economica Aplicada, Av. Presidente Antonio Carlos, 51(1409), Rio de Janeiro RJ 20020-010, Brazil, E-mail: mauricio.reis@ipea.gov.br

are less likely to get back to school to acquire more formal education, improving their labor market perspectives. This paper attempts to estimate the effect of vocational training on labor market outcomes, represented by employment, monthly labor earnings, formal employment and hourly labor earnings, for Brazilian workers.

Vocational training programs were introduced in Brazil in 1942, when the National Service for Industrial Training (SENAI) was founded. Following the foundation of SENAI, many National Training Institutions were introduced in Brazil and in other Latin American countries, representing the first phase of the development of vocational training in the region (Biavaschi et al. 2012). In the 1990s, many Latin American countries adopted models target at disadvantaged groups, following the *Chile Jóven* started in 1992. These programs usually provide a subsidized internship after classroom training and intend to offer more demand-driven training and to improve the participation of private firms (Ibarrarán and Rosas Schady 2009). However, National Training Institutions are still reference for training programs in Brazil. Despite the tradition of offering quality courses, the vocational training model in Brazil is usually characterized by classroom instructions and is classified as dated because it was not able to adapt to changes in the economic structure after the 1970s (Biavaschi et al. 2012; de Moura e Castro and Verdisco 1998). Nevertheless, evaluations of vocational training effects on labor market outcomes in Brazil are scarce.

There is a large body of evidence about the effectiveness of training programs in developed countries, and the estimated impacts on labor market outcomes are generally weak (see, for example, Heckman, Lalonde, and Smith 1999 and Kluve 2010 for surveys). Betcherman, Olivas, and Dar (2004) review a number of studies about training programs and suggest that the effects of these programs seem to be more pronounced in Latin America than in the US and in Europe. Even in the context of Latin America, evidence on vocational training effects is mixed and depends on the characteristics of participants. Attanasio, Kugler, and Meghir (2011), making use of experimental data, estimate the impact of vocational training on Colombian unemployed and poor youths and show that training has positive effects on many labor market outcomes for women, but more limited impacts on men. Nõpo, Robles, and Saavedra (2007) analyze gender differences in *ProJoven*, a Peruvian job training program for poor youths, and find higher effects for women. Nevertheless, Card et al. (2011) present an evaluation based on an experimental design for job training targeted at less educated and poor youths in the Dominican Republic, the *Juventud y Empleo*, and the estimated effects on employment and earnings are non-significant. In Brazil, PLANFOR (National Plan for Professional Qualification) was an initiative implemented in the 1990s to provide vocational training. Although the

program had an experimental design, it did not succeed in following individuals in treatment and control groups, as pointed out by Hermetto and Rios-Netto (2007). These authors investigate the impact of PLANFOR in the metropolitan area of Belo Horizonte and show that the length of unemployment decreased. Severnini and Orellano (2010), based on cross-sectional data from the Survey on Living Standards (*Pesquisa sobre Padrões de Vida – PPV*), present evidence that vocational training is associated with higher earnings and employment probability in the Brazilian Southeast and Northeast regions.

The empirical analysis in this paper uses data from the Monthly Employment Survey (*Pesquisa Mensal de Emprego – PME*), a longitudinal survey that collects information in the six main Brazilian metropolitan areas, to estimate the impact of vocational training on labor market outcomes. Thus, the empirical analysis in this paper represents a larger share of the Brazilian population than that investigated by Hermetto and Rios-Netto (2007),¹ in addition to providing estimates about training effects on labor market outcomes that can be compared to recent evidence from other Latin American countries. Hermetto and Rios-Netto (2007) and other evaluations using experimental data in Latin American countries address programs designed to disadvantaged groups, but the effects of training may be heterogeneous across demographic and skill groups. The analysis in this paper takes advantage from the large PME sample to exploit different impacts of vocational training on groups defined by schooling, gender and age. Also, the panel data structure of the PME allows taking into account the bias due to selection into training, while Severini and Orellano's (2010) dataset imposes a much more restrictive investigation of training program effects on labor market outcomes.

Estimates presented in this paper, based on Difference-in-Differences (DiD) matching, suggest that this kind of training increases employment by 1.1 percentage points, monthly labor earnings by 6.8% and hourly labor earnings by about 8%. However, there is no evidence of positive effects of training on the probability of getting a formal job. Also, the estimated impacts of vocational training programs seem to be heterogeneous among demographic and skill groups, suggesting that the effects are lower for disadvantaged workers.

The paper is organized as follows. Section 2 provides some information about vocational training programs in Brazil. Section 3 describes the dataset and presents some summary statistics. Section 4 describes the empirical strategy, and Section 5 reports and comments on the estimated results. Section 6 contains the main conclusions of the paper.

¹ Belo Horizonte represents less than 10% of the population in all six Brazilian metropolitan areas in the PME.

2 Vocational training in Brazil

Vocational training, as defined by the Brazilian Census Bureau (*Instituto Brasileiro de Geografia e Estatística* – IBGE) in the PME, is an activity dedicated to providing skills for a specific occupation. This kind of training usually has a low duration² and could be provided by schools or other institutions (e.g. churches, unions and NGOs). The programs focus on practical applications of skills learned through classroom instruction³ and a certification is granted upon completion of the course. The educational level required to attend vocational training is very heterogeneous. Computer literacy, language, seamstress, cook, massage therapist, secretary, manicurist, pedicurist, hairdresser, waiter, chef, tour guide, bricklayer, cake decorator, makeup artist and surgical technologist courses are a few examples of vocational training programs.

Table 1 presents information about vocational training in Brazil from the 2007 PNAD (*Pesquisa Nacional por Amostra de Domicílios*).⁴ Summary statistics are reported separately for individuals who have completed a vocational training program, those who have attended but did not completed a course of this type and those who had never attended a vocational training program.⁵ About 20% of the individuals aged between 21 and 54 years have attended a program of this type before, and more than 90% of those who have attended vocational training actually completed the program. According to Table 1, more than half of the programs are privately provided; but national training institutes (SENAI, SENAC, SEBRAE and others) and government programs also have important contributions, with shares corresponding to 28% and 16% of the total in column (1). Almost all training programs require class attendance and two-thirds of the training is done during the day. Computer literacy represents almost 30% of the courses for those who have completed a vocational training program before, while programs that focus on commerce and manufacturing activities account for 14.1% and 16.9%, respectively.

² Courses in SENAI (www.senai.br) usually have 160 hours, while a large share of those provided by SENAC (www.senac.br) last between 160 and 240 hours.

³ The National Training Institutes offer online information about their programs, such as descriptions of detailed types of courses, the number of hours required to complete each course, and the address of the unit offering the course in each Brazilian state.

⁴ PNAD, the Brazilian National Household Survey, is a nationally representative survey, which provided a supplement related to vocational training in 2007.

⁵ For those who have attended two or more training programs before, information refers to the one considered to be the most important by the individual.

Table 1: Summary statistics about vocational training in Brazil from the 2007 PNAD

	Individuals who have completed a vocational training	Individuals who have attended but did not completed a vocational training	Individuals who had never attended a vocational training
<i>Institute that provided the training (%)</i>			
National training Institutes (SENAL, SENAC, SEBRAE,...)	28.23	14.28	—
Government programs	15.5	20.56	
Private programs	51.56	60.68	
Others	4.7	4.48	
<i>Required attendance at classes (%)*</i>	98.02	89.71	
<i>Day Course (%)</i>	65.23	65.75	
<i>Course type (%)</i>			
Health and welfare services	8.32	7.32	
Computer literacy	28.81	42.22	
Construction techniques	2.81	2.39	
Manufacturing activities	16.85	14.05	
Hairdresser and beauty	6.63	6.67	
Commerce activities	14.07	7.46	
Others	22.51	19.89	
<i>Work in a job related to the course (%)</i>	60.33		
<i>Reasons for working in a job related to the course (%)</i>			
Skills learned in training	65.34		
Recognition of the course by the employer	15.38		
Others	19.28		
<i>Reason for not having completed the course (%)</i>			
Financial constraints		26.82	
Poor quality of the course		15.77	
Difficult to follow the lessons		10.68	
Others		46.73	
<i>Reasons for not having attended a vocational training (%)</i>			
Lack of vocational training in the region			8.39
Lack of places in the program			0.43
The desired course was not available			1.59
Financial constraints			15.38
Lack of interest			67.53
Others			6.69
Observations	32,976	3,003	135,368
Weighted share (%)	18.65	1.74	79.61

Source: The 2007 PNAD.

Sample: Individuals aged 21–54 years, who attended one or more vocational training programs in September 2007.

Table 1 also shows that 60% of the individuals who completed a vocational training work in a job related to the course, and about 80% attributed this fact to skills learned in the training program or to the recognition of the course by the employer. This suggests that training programs are effective in terms of increasing the skills of workers. However, the high completion rate and the fact that only 11% of those who did not complete a course of this type were not able to do it because it was difficult to follow the lessons indicate that the completion of the course does not require much effort or that selection into the programs depends on individuals' characteristics.

Table 1 shows that 68% of the individuals who had never attended a vocational training program did so for lack of interest. Only 8% of those who had never attended training mentioned that limited access to courses in their region was a problem, while financial constraints were considered a problem for 15% of the individuals. Also according to Table 1, less than 1% of the individuals who had never attended a vocational training did so because lack of vacancies in the courses.

3 Data

The empirical analysis in this paper uses data from the PME, which is conducted by the Brazilian Census Bureau (IBGE). Every month, information about 100,000 individuals aged 10 years or more is collected by the survey in the six main metropolitan areas of the country.⁶ Each household that enters the survey is interviewed for four consecutive months, not interviewed for the next 8 months, and interviewed once again for the next 4 months. Therefore, it is possible to follow the same individual for 16 months. The PME contains information about individual characteristics, such as schooling, age, gender, race and region of residence. The survey also provides many labor market variables, such as labor earnings, employment status and job duration. In each interview, the PME also collects some variables related to attendance and completion of vocational training.

It should be mentioned that the PME follows a physical residence. Therefore, the survey doesn't necessarily follow the same members of a household over time. As shown in Table 9 in the appendix, attrition rates are very high

⁶ Belo Horizonte, Porto Alegre, Recife, Rio de Janeiro, São Paulo and Salvador. About 25% of the Brazilian individuals aged between 21 and 54 years live in one of these six metropolitan areas.

in the PME. More than half of the individuals surveyed in the first interview are not matched 1 year later, in the fifth interviews. Differences regarding mean characteristics of movers and non-movers are significant for all variables, except the dummy indicating the presence of children in the household, although the magnitudes of the differences between these two groups of individuals seem to be small. This attrition can affect estimates if the impact of vocational training on labor market indicators is different for movers and non-movers.

The analysis in this paper uses data from January 2006 to December 2012, for individuals aged 21–54 years and participating in the labor force during their first PME interview. At the time of the first interview, the sample is restricted to those who have never completed a vocational training program before, in order to identify courses completed between the first and fifth interviews.⁷ In the fifth interview, the individuals could be divided into two groups, those who did a vocational training program (treatment group) and those who did not (control group). There are 14,166 individuals in the former group and 75,155 individuals in the latter. The basic idea of the empirical analysis, as will be explained in Section 4, is to compare labor market outcomes between these two groups 1 year after their first interview.

About 15% of the individuals in the sample completed a vocational training program between the first and fifth interviews. Table 2 displays the descriptive statistics based on information from the first PME interview for sampled individuals separately for those in treatment and control groups. As shown in Table 2, workers with vocational training in column (2) have higher average educational level (11.3 years) than those who did not complete training (8.9 years). Proportions of women, blacks and individuals in households with children are greater in column (1), and mean age is also higher among those without training.

At the time of the first interview, mean monthly labor earnings were higher for individuals with vocational training (R\$1,696) compared to those without training (R\$ 1,174). Mean hourly labor earnings was also higher in column 2 (R\$ 10.6) than in column 1 (R\$ 7.2). Working hours and the proportions of those in part-time jobs and temporary jobs were quite similar between individuals in the two groups reported in Table 2.

Table 2 shows that individuals who completed a vocational training program were more concentrated in manufacture and service sectors at the time of the first

⁷ The PME does not ask about the number of programs the individual completed and the date at which the last training program was completed. Thus, it is not possible to know whether an individual who had vocational training at the time of the first interview completed or not another program of this type during the next year.

Table 2: Descriptive statistics (Based on information at the time of the first PME interview – before vocational training)

	(1)	(2)
	Individuals who did not complete a vocational training between the first and fifth PME interviews	Individuals who did complete a vocational training between the first and fifth PME interviews
Age (years)	37.41	36.33
Years of schooling	8.85	11.25
Black (%)	46.16	37.76
Woman (%)	47.18	45.11
Monthly labor earnings (R\$)	1,174	1,696
Hourly labour earnings (R\$)	7.17	10.57
Employed (%)	93.55	93.73
Industry (%)		
Agriculture	0.71	0.51
Manufacture	16.13	18.14
Construction	8.64	4.20
Commerce	20.15	16.51
Services	54.38	60.64
Employment status (%)		
Employer	4.42	5.09
Formal employee	55.10	65.22
Informal employee	19.34	14.03
Self-employed	21.13	15.66
Working hours (per week)	38.08	37.34
Presence of children aged 0–10 years (%)	36.32	33.53
Part-time job (%)	17.23	17.42
Temporary job (%)	2.22	2.80
Job duration (months)	73.45	73.95
Observations	75,155	14,166

Source: PME.

Sample: Individuals aged 21–54 years, participating in the labor force.

The sample contains only individuals who have never completed a vocational training program at the time of the first PME interview.

interview, especially in the latter one, while those without training were more strongly represented in construction and commerce. The proportion of those who were employed and mean job duration were fairly similar for workers in both columns, and informal employees and self-employed workers in the first interview were more concentrated among individuals without training in column (1).

Table 3 presents a few summary statistics at the time of the fifth PME interviews. It is possible to notice that mean labor earnings remained constant for workers without training and increased 5% for those with vocational training between the first and fifth interviews. Mean hourly labor earnings dropped 6% in the former group and 1% among those in the latter one during the period of 1 year.⁸ The employment rate is 1 percentage point higher for those in the treatment group. In addition, 65% of the workers with vocational training were

Table 3: Labor market outcomes and information about vocational training at the time of the fifth PME interview

	(1)	(2)
	Individuals who did not complete a vocational training	Individuals who did complete a vocational training
Monthly labor earnings (R\$)	1,179	1,779
Changes in monthly earnings between the first and fifth interviews (%)	0.41	4.88
Hourly labor earnings (R\$)	6.77	10.48
Changes in hourly earnings between the first and fifth interviews (%)	−5.58	−0.86
Employed (%)	87.83	89.09
Employed in the formal sector (%) [*]	54.92	65.10
Educational level required to attend the vocational training (%)		
One year of schooling	—	22.86
Four years of schooling	—	11.70
Primary degree	—	23.48
Secondary degree	—	30.46
University degree	—	11.50
Observations	75,155	14,166

Source: PME.

Sample: Individuals aged 21–54 years, participating in the labor force at the time of the first PME interview.

The sample contains only individuals who have never completed a vocational training program at the time of the first interview.

Note: ^{*}Formal employees, public workers or employers.

⁸ Labor earnings is represented in November 2011 Reais, using the INPC (National Consumer Price Index) calculated by the IBGE to adjust for inflation.

occupied in the formal sector in the fifth interview, which is about 10 percentage points higher compared to those without training. This difference is similar to that found in the first PME interview. In this paper, formal employees, public workers and employers are classified as formal workers, while informal employees and self-employed workers are classified into the informal sector.

Table 3 also reports the educational level required to attend vocational training for those who completed a program of this type. In one-third of the cases, training required only less than the primary degree, that is, less than 8 years of schooling. However, the secondary or University degrees were necessary for 40% of the individuals who completed a vocational training, which illustrates the heterogeneity of training programs in Brazil.

4 Empirical strategy

This section briefly describes difference-in-differences extension of the method of matching suggested by Heckman, Ichimura, and Todd (1997), which is applied in this paper to the PME data.⁹ Let Y_1 be a labor market outcome for those who participated in vocational training, while Y_0 represents the outcome conditional on non-participation. Because only Y_1 or Y_0 is available for each individual, the impact of participating in the training, $\delta = Y_1 - Y_0$, is not observed.

The average treatment effect on the treated (ATT), the most common parameter of interest in evaluations, is given by:

$$ATT = E(Y_1 - Y_0 | T = 1) = E(Y_1 | T = 1) - E(Y_0 | T = 1), \quad [1]$$

where $T=1$ for those who did the training and $T=0$ for those who did not do vocational training. The term $E(Y_0 | T = 1)$ is not observable, and further hypotheses are necessary to estimate the ATT. In most experimental analyses, for example, the randomly defined control group provides an estimate of $E(Y_0 | T = 1)$.¹⁰ According to matching estimators, each training participant is compared with a non-participant with similar observable attributes.

Matching estimators assume that, conditional on observable characteristics Z , the outcome Y_0 is independent of T

$$Y_0 \perp T | Z \quad [2]$$

⁹ See, for example, Smith & Todd (2005) for more details about matching estimators.

¹⁰ Note that the bias in estimating ATT is given by $E(Y_0 | T = 1) - E(Y_0 | T = 0)$.

If the parameter of interest is the average treatment effect, a weaker assumption, named mean conditional independence, is sufficient. Then, eq. [2] could be replaced with the following hypotheses:

$$E(Y_0|Z, T = 1) = E(Y_0|Z, T = 0) \quad [3]$$

Matching estimators also require that there be a non-participant analogue, given the attributes in Z , for each participant. That is

$$\Pr(T = 1|Z) < 1 \quad [4]$$

Then, under assumptions [3] and [4], $E(Y_0|T = 1)$ could be estimated by $E_{Z|T=1}[E_Y(Y_0|T = 1, Z)] = E_{Z|T=1}[E_Y(Y_0|T = 0, Z)]$, and the ATT can be written as:

$$ATT = E(Y_1 - Y_0|T = 1) = E(Y_1|T = 1) - E_{Z|T=1}[E_Y(Y_0|T = 0, Z)], \quad [5]$$

where the second term on the right-hand side of eq. [5] represents the mean outcome of the matched comparison group that can be obtained using characteristics in Z .

Rosenbaum and Rubin (1983) show that

$$E(T|Y, \Pr(T = 1|Z)) = E(E(T|Y, Z)|Y, \Pr(T = 1|Z)) \quad [6]$$

Then, $E(T|Y, Z) = E(T|Z) = \Pr(T = 1|Z)$ implies $E(T|Y, \Pr(T = 1|Z)) = E(T|\Pr(T = 1|Z))$. According to this result, when Y_0 is independent of training participation conditional on Z , it is also independent of participation conditional on the propensity score, $\Pr(T = 1|Z)$, and the dimension of the conditioning problem is diminished by matching on the propensity score. Therefore, individuals with different values of Z but the same value of $\Pr(T = 1|Z)$ are combined in the propensity score matching.

A matching estimator can be written as

$$m = \frac{1}{N_1} \sum_{i \in I_1 \cap S_p} [Y_{1i} - \hat{E}(Y_{0i}|T_i = 1, \Pr(T = 1|Z_i))], \quad [7]$$

where $\hat{E}(Y_{0i}|T_i = 1, \Pr(T = 1|Z_i)) = \sum_{j \in I_0} w(i, j) Y_{0j}$, I_1 represents the set of individuals who did the training and I_0 is the set of non-participants in training, S_p is the region of common support and N_1 is the number of individuals in the set $I_1 \cap S_p$. The labor market outcome for an individual i who did training is given by Y_{1i} , while Y_{0j} represents the outcome for an individual j who did not complete a training program. According to eq. [7], the match for each individual in the set $I_1 \cap S_p$ is given by a weighted average over the values of non-participants. The weights $w(i, j)$ depend on the distance between $P_i = \Pr(T = 1|Z_i)$ and $P_j = \Pr(T = 1|Z_j)$ and can be calculated using different methods.

There is intense debate in the literature about whether propensity score matching and other non-experimental methods help to solve the selection bias problem present in program evaluation.¹¹ Matching estimators as those in eq. [7] assume that selection is based on observables characteristics in Z . However, there may be differences between participants and non-participants due to unobservable variables, which may cause bias in matching estimates of vocational training effects on labor market outcomes. The difference-in-differences matching estimator proposed by Heckman, Ichimura, and Todd (1997) controls for unobservable characteristics of individuals in these two groups that are time-invariant.

The difference-in-differences matching estimator requires the condition stated in eq. [4] and that

$$E(Y_{0t} - Y_{0t'} | Z, T = 1) = E(Y_{0t} - Y_{0t'} | Z, T = 0), \quad [8]$$

where t' and t are periods of time before and after the training. Assumption in eq. [8] is weaker than that stated in eq. [3].

The (DiD) matching estimator is given by

$$\text{ddm} = \frac{1}{N_1} \sum_{i \in I_1 \cap S^p} \left[(Y_{1ti} - Y_{1t'i}) - \sum_{j \in I_0 \cap S^p} w(i, j) (Y_{0tj} - Y_{0t'j}) \right], \quad [9]$$

where weights $w(i, j)$ are given by a kernel function.

5 Results

5.1 Propensity score

Table 4 presents the estimates of the propensity score. The probability that an individual has completed vocational training 1 year after his/her first PME interview, $\Pr(T = 1|Z)$, is estimated using the probit model. Column (1) reports the estimated coefficients and t -statistics for the total sample, and columns (2) to (7) show the results for subsamples defined by education, gender and age.

In all regressions in Table 4, the following variables are included in Z : age, age squared, an interaction between age and schooling, dummies for years of schooling, a dummy for black individuals, year dummies, dummy variables

¹¹ See Ashenfelter & Card (1985), Ashenfelter (1987), LaLonde (1986), Dehejia & Wabba (1999), Heckman, Ichimura, and Todd (1997), Heckman et al. (1998), Smith & Todd (2005), among many others.

Table 4: Propensity score (Estimated coefficients for probit regressions using conclusion of vocational training as dependent variable)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total		Schooling		Gender		Age
		0–10	11 or more	Women	Men	21–35	36–54
Age	0.010 (1.87)*	0.018 (1.72)*	0.000 (0.02)	0.002 (0.25)	0.020 (2.62)***	–0.008 (0.27)	–0.039 (1.49)
Age squared	–0.0001 (1.65)*	–0.0002 (1.59)	–0.0002 (1.99)**	–0.0001 (0.75)	–0.0002 (2.31)**	0.0002 (0.38)	0.0003 (1.10)
Black	–0.137 (3.86)***	–0.033 (1.62)	–0.190 (1.87)*	0.009 (0.50)	–0.005 (0.29)	0.010 (0.54)	–0.078 (1.29)
Woman	–0.314 (4.43)***	–0.228 (9.13)***	–0.278 (0.95)			–0.033 (1.58)	–0.354 (7.99)***
Dummies for industry (Reference: Agriculture)							
Manufactory	0.166 (2.33)**	0.536 (4.39)***	–0.089 (0.95)	–0.319 (1.97)**	0.255 (3.09)***	0.103 (0.97)	0.212 (2.21)**
Commerce	0.055 (0.78)	0.406 (3.33)***	–0.188 (2.00)**	–0.303 (2.11)**	0.129 (1.57)	0.016 (0.15)	0.074 (–0.78)
Services	0.201 (2.87)***	0.548 (4.52)***	–0.029 (0.32)	–0.146 (1.02)	0.294 (3.61)***	0.131 (1.26)	0.254 (2.67)***
Construction	0.00 (0.04)	0.26 (2.09)**	–0.10 (0.99)	–0.06 (0.33)	0.07 (0.83)	–0.01 (0.12)	0.01 (0.13)
Dummies for employment status (Reference: Unemployed)							
Employer	–0.189 (2.28)**	–0.359 (2.56)***	–0.060 (0.55)	0.181 (1.15)	–0.270 (2.63)***	–0.115 (0.91)	–0.226 (2.01)**

(continued)

Table 4: (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Schooling		Women	Gender		Age
		0–10	11 or more		Men	21–35	
Formal employee	–0.120 (1.53)	–0.422 (3.16)***	0.070 (0.68)	0.168 (1.11)	–0.156 (1.60)	–0.068 (0.58)	–0.153 (1.41)
Informal employee	–0.255 (3.21)***	–0.561 (4.18)***	–0.046 (0.44)	0.058 (0.38)	–0.289 (2.91)***	–0.198 (1.69)*	–0.293 (2.67)***
Self-employed	–0.148 (1.88)	–0.383 (2.88)***	–0.002 (0.01)	0.662 (4.09)***	–0.264 (2.69)***	–0.100 (0.86)	–0.170 (1.56)
Job tenure (months)	–0.0001 (1.96)**	–0.0001 (1.11)	–0.0002 (1.98)**	0.0000 (0.29)	–0.0003 (2.63)***	–0.0002 (1.26)	–0.0001 (1.74)*
Presence of children	–0.050 (1.10)	–0.033 (0.57)	0.048 (2.25)**	–0.028 (1.57)	0.023 (1.41)	0.019 (0.30)	–0.140 (3.04)***
Woman x presence of children	–0.096 (1.32)	–0.047 (1.27)	–0.205 (1.34)			–0.143 (4.40)***	0.000 (0.01)
Working hours	–0.002 (1.05)	–0.004 (1.20)	0.000 (0.11)	–0.002 (0.75)	–0.001 (0.37)	–0.001 (0.40)	–0.002 (0.81)
Working hours squared	0.00 (0.64)	0.00 (0.99)	0.00 (0.39)	0.00 (0.19)	0.00 (0.39)	0.00 (0.25)	0.00 (0.75)
Part-time status on the job	–0.013 (0.40)	–0.007 (0.12)	–0.013 (0.33)	–0.056 (1.37)	0.022 (0.41)	–0.043 (0.89)	0.015 (0.35)
Temporary job	0.245 (2.04)**	0.267 (1.44)	0.168 (0.54)	0.074 (1.54)	0.050 (0.96)	0.052 (1.20)	0.165 (2.54)**
Unemployment rate at the metropolitan area	0.003 (0.41)	–0.005 (0.39)	0.009 (0.90)	0.010 (0.83)	–0.002 (0.18)	0.006 (0.50)	0.000 (0.02)

Dummies for years of schooling (Reference: years of schooling=0, except in column 3)

Years of schooling=1	-0.111 (0.97)	-0.088 (0.77)	-0.241 (1.18)	0.014 (0.10)	-0.270 (1.11)	-0.101 (0.77)
Years of schooling=2	-0.098 (1.05)	-0.057 (0.57)	0.027 (0.19)	-0.086 (0.70)	-0.325 (1.65)*	-0.110 (1.01)
Years of schooling=3	0.003 (0.03)	0.054 (0.55)	-0.026 (0.21)	0.137 (1.36)	-0.037 (0.25)	-0.120 (1.22)
Years of schooling=4	0.078 (1.09)	0.145 (1.40)	0.128 (1.22)	0.212 (2.38)**	-0.135 (1.00)	-0.040 (0.43)
Years of schooling=5	0.128 (1.61)	0.222 (1.76)*	0.162 (1.38)	0.287 (2.91)**	-0.005 (0.03)	-0.048 (0.45)
Years of schooling=6	0.259 (3.03)**	0.365 (2.53)**	0.339 (2.75)**	0.422 (4.04)**	0.176 (1.18)	0.007 (0.06)
Years of schooling=7	0.301 (3.36)**	0.425 (2.63)**	0.359 (2.79)**	0.514 (4.74)**	0.215 (1.36)	0.013 (0.10)
Years of schooling=8	0.459 (5.03)**	0.597 (3.35)**	0.604 (4.76)**	0.657 (6.01)**	0.368 (2.25)**	0.129 (0.95)
Years of schooling=9	0.474 (4.67)**	0.645 (3.29)**	0.648 (4.55)**	0.687 (5.62)**	0.451 (2.52)**	0.051 (0.33)
Years of schooling=10	0.565 (5.35)**	0.751 (3.53)**	0.731 (4.97)**	0.833 (6.59)**	0.522 (2.77)**	0.129 (0.78)
Years of schooling=11	0.802 (7.52)**		1.085 (7.38)**	1.011 (7.98)**	0.802 (4.09)**	0.279 (1.62)
Years of schooling=12-14	0.856 (7.33)**		-0.074 (1.20)	1.088 (7.75)**	0.821 (3.75)**	0.295 (1.46)
University degree	0.934 (7.07)**		-0.044 (0.68)	1.132 (7.12)**	0.848 (3.39)**	0.121 (0.52)

(continued)

Table 4: (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total		Schooling		Gender		Age
		0–10	11 or more	Women	Men	21–35	36–54
Pseudo R-squared	0.116	0.097	0.057	0.125	0.113	0.104	0.126
Observations	89,345	46,396	42,949	41,739	47,606	39,981	49,364

Note: Regressions include dummies for metropolitan area, month of the interview, and dummies for year, and an interaction between age and schooling. In order to satisfy the balancing property, columns (1), (3) and (7) include interactions between schooling and the dummy for black, and between schooling and woman, columns (1), (3), (6) and (7) include an interaction between schooling and presence of children, while in columns (1) and (3) schooling is interacted with woman and presence of children. Column (1) adds interactions between schooling and Rio de Janeiro and part-time job, and between schooling squared and woman, and age is interacted with the dummy for University degree. Column (2) also includes interactions between temporary job and schooling and the dummy for Salvador, column (3) adds interactions between schooling categories and age, temporary job, woman and working hours, while column (4) contains interactions between schooling and self-employed and between manufacture and working hours. Column (5) has an interaction between schooling and Porto Alegre, and column (6) has an interactive term between schooling and the month of the interview. In column (7) the dummy for 2001 is interacted with schooling working hours and black. Regression in this last column also contains an interaction between black and working hours and another interaction between black, schooling and the dummy for 2001. Regressions are estimated by probit model and *t*-statistics are presented in parentheses.

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

indicating the month of the interviews, dummies for region of residence and variables referring to individuals' first interview, such as job duration and dummies for industry and employment status (formal employee or public worker, self-employed, informal employee and employer, while unemployed is the reference group). Regressions also contain the unemployment rate in the metropolitan area at the time of the individuals' first interview, a dummy for part-time job, a dummy indicating temporary job, working hours per week and working hours squared and a dummy indicating the presence of children aged between 0 and 10 years in the household.

A dummy for female and an interaction between this variable and the dummy for the presence of children are also included, except in regressions by gender in columns (4) and (5). Those variables are present in all equations, but the exact specification in each case depends on the balancing test, which is calculated in the following way (see Smith and Todd 2005). Observations are divided into strata, chosen such that the means of the propensity scores in groups with $T=1$ and $T=0$ are not different within strata. Then, differences in each variable in Z within each stratum are tested between individuals with $T=1$ and $T=0$ through t -tests. In the case of significant differences in one or more variables, high-order and interactive terms are added to Z . This procedure is repeated until differences are non-significant for each variable and stratum.

The results in column (1) show that more educated individuals are more likely to do a vocational training program, and that this relationship is nonlinear. Also according to estimates, women and black individuals seem to be less likely to do a vocational training program. As to the differences regarding the industrial sector of the job in the first interview, evidence in column (1) indicates that those who were occupied in the manufacture and service sectors have a higher probability of completing a vocational training program than individuals who were occupied in agriculture. Employers, informal employees and self-employed workers are less likely to complete a training program than an unemployed individual. Column (1) also shows that the probability of an individual having completed a training program is higher for those in a temporary job, and that job tenure at the time of the first interview is negatively related to training probability.

Figure 1 shows the distributions of the propensity scores for the total sample, that is, the predicted probabilities of completing a vocational training program, for individuals for whom $T=1$ and those for whom $T=0$. The distribution of propensity scores among those in the latter group lies to the left of the distribution for individuals in the former group. Sample size reduction, because of the common support condition, is very small and both groups are represented in a large part of the distributions. The number of individuals drops from 89,345 to 89,320 when imposing the common support restriction.

Figure 1: Distribution of the predicted probability of complete a vocational training

Note: The predicted probabilities are calculated using the probit regression in column (1) of Table 4.

5.2 Main results

Column (1) of Table 5 presents the (DiD) matching estimates using monthly labor earnings in the fifth interview to represent labor market outcome.¹² The

Table 5: Vocational training and labor market outcomes (Difference-in-Differences Matching estimator)

	(1)	(2)	(3)	(4)
	Dependent variable			
	Labor earnings	Hourly labor earnings	Employment	Formal employment
Mean	79.568	0.563	0.011	0.006
S.E.	(19.98)	(0.131)	(0.003)	(0.005)
As % of mean earnings in the control group	6.78	7.85	–	–
Observations				
Control	150,308	150,308	150,308	150,308
Treatment	28,328	28,328	28,328	28,328

Note: Estimated standard errors are presented in parentheses. Standard errors are calculated using a bootstrap procedure with 200 replications.

All estimates use the common support condition.

¹² Earnings are set to zero if a person is out of work.

estimated coefficient is positively significant, indicating that labor earnings increase R\$ 80 as a consequence of vocational training. This value represents an increase of 6.8% in the mean monthly labor earnings for individuals without training in the fifth interview.

Column (2) of Table 5 shows the results for hourly labor earnings. The estimated effect of vocational training is also significant and represents a change of 7.9% relative to the mean hourly labor earnings of individuals without training. The estimated coefficient in column (3) indicates that the probability of employment is 1.1 percentage points higher for individuals with training. However, according to column (4), vocational training does not have a significant impact on the probability of getting a formal job.

Training effects are also estimated using cross-sectional matching and regression-based estimators. The estimated coefficients in these cases are higher than those reported in Table 5. As shown in Table 10, in the appendix, the results using a cross-section matching estimator, for example, indicate that training increases monthly labor earnings by 19.2%, hourly labor earnings by 19.7% and the formal job probability by 2.6 percentage points. However, these higher effects of vocational training in Table 10 seem to be a consequence of the bias due to time-invariant differences in unobservable characteristics between participants and non-participants, a factor that is taken into account in the (DiD) matching estimator.¹³

The results in Table 5 show that training is positively associated with employment probability and labor earnings, but not with the probability of getting a formal job. This suggests that vocational training does not improve workers access to better paid jobs.¹⁴ Also, evidence indicates that vocational training effects in Brazil are lower than those obtained for Colombia, where Attanasio, Kugler, and Meghir (2011) show that training increases monthly labor earnings by 12%, and the probability of getting a formal job by about 6 percentage points. Conversely, Card et al. (2011) do not find positive and significant effects of training on labor market outcomes for the Dominican Republic.

¹³ Severini and Orellano (2010), using OLS, for example, find that training increases labor earnings by 39% in Brazil.

¹⁴ Individuals who work in the formal sector earn about 60% more than those in the informal sector in Brazil.

5.3 Demographic and skill groups

The literature usually presents evidence that the impacts of training programs on labor market outcomes are very different for demographic and skill groups (Heckman, Lalonde, and Smith 1999). In order to investigate this issue and to analyze vocational training effects on the Brazilian labor market in more details, this subsection reports estimates similar to those in Table 5 for subgroups defined by schooling, age and gender.

Table 6 presents estimates of vocational training effects on employment, labor earnings and formal employment by educational level. Workers are

Table 6: Vocational training and labor market outcomes by educational groups (Difference-in-Differences Matching estimator)

	(1)	(2)	(3)	(4)
	Dependent variable			
	Labor earnings	Hourly labor earnings	Employment	Formal employment
Panel A				
Years of schooling: < 11				
Mean	42.97	0.140	0.006	−0.012
S.E.	(11.692)	(0.083)	(0.004)	(0.007)
As % of mean earnings in the control group	5.70	3.33		
Panel B				
Years of schooling: ≥ 11				
Mean	91.48	0.708	0.013	0.012
S.E.	(32.897)	(0.214)	(0.004)	(0.006)
As % of mean earnings in the control group	5.48	7.27		
Observations				
Years of schooling: < 11				
Control	84,352	84,352	84,352	84,352
Treatment	7,928	7,928	7,928	7,928
Years of schooling: ≥ 11				
Control	65,490	65,490	65,490	65,490
Treatment	20,402	20,402	20,402	20,402

Note: Estimated standard errors are presented in parentheses. Standard errors are calculated using a bootstrap procedure with 200 replications.

All estimates use the common support condition.

classified into two groups: those with less than 11 years of schooling and those who finished secondary education, that is, with 11 or more years of schooling. Results in column (1) suggest that vocational training increases monthly labor earnings for less educated workers in R\$ 43, which corresponds to a change of 5.7%. Regarding the estimated coefficient for more educated individuals, it is equal to R\$ 92, which represents an increase of 5.5%.

According to column (2), which reports the results for hourly labor earnings, vocational training is positive and significant for both educational groups and estimates indicate a higher impact in relative terms for more educated individuals (7.3%) than for less educated ones (3.3%). Results in columns (3) and (4) show that training improves employment probability by 1.3 percentage points and the probability of getting a formal job by 1.2 percentage points among more educated workers. For less educated individuals, the estimated coefficient is non-significant in column (3) and negative in column (4).

The results in Table 6 suggest that vocational training improves labor market outcomes in a more accentuated way for more educated workers compared to less educated ones. Table 11 in the appendix reports estimates using 8 years of schooling instead of 11 years to classify workers by educational level, and the results for less educated individuals are non-significant or negative for all labor market indicators.

According to Heckman, Lalonde, and Smith (1999), evidence from developed countries does not show different impacts of training by education, while Card et al. (2011) estimate larger effects on earnings for better-educated workers in the Dominican Republic. More pronounced effects of vocational training among more educated workers estimated in this paper may be due in part to the higher level of formal education that is usually required to attending better training programs. In addition, as de Moura e Castro and Verdisco (1998) highlight, basic skills provide a foundation on which subsequent training improves workers' performance. Thus, it is possible that individuals with secondary education not only have access to better training programs but also their basic skills allow a more effective impact of training on productivity. However, evidence in Table 6 also suggests that vocational training effectiveness in Brazil seems to be limited by the lack of basic skills among less educated individuals, mainly those with less than 8 years of schooling.

Table 7 presents the estimated results by gender. According to column (1), vocational training increases labor earnings by 6% for women, while the estimated coefficient for men corresponds to an increase of 7.3%. The estimated effect of training on hourly labor earnings is positive and significant for women in column (2), where the coefficient represents an increase of 5.8%. The result for men also shows a significant coefficient, with estimate representing an

Table 7: Vocational training and labor market outcomes by gender (Difference-in-Differences Matching estimator)

	(1)	(2)	(3)	(4)
	Dependent variable			
	Labor earnings	Hourly labor earnings	Employment	Formal employment
Panel A				
Woman				
Mean	57.41	0.346	0.023	0.005
S.E.	(23.635)	(0.161)	(0.005)	(0.007)
As % of mean earnings in the control group	5.97	5.77		
Panel B				
Man				
Mean	99.37	0.743	0.003	0.007
S.E.	(30.969)	(0.200)	(0.003)	(0.006)
As % of mean earnings in the control group	7.28	9.98		
Observations				
Woman				
Control	70,422	70,422	70,422	70,422
Treatment	12,964	12,964	12,964	12,964
Man				
Control	78,634	78,634	78,634	78,634
Treatment	15,352	15,352	15,352	15,352

Note: Estimated standard errors are presented in parentheses. Standard errors are calculated using a bootstrap procedure with 200 replications.

All estimates use the common support condition.

increase of 10% in the mean hourly labor earnings. According to column (3), training increases the employment probability for women by 2.3 percentage points, but the coefficient is non-significant for men. For both women and men, the estimated effects of vocational training on formal employment are non-significant.

Evidence from other countries shows that vocational training seems to have a larger impact on women than on men. This is verified in developed (Heckman, Lalonde, and Smith 1999) and developing countries (Attanasio, Kugler, and Meghir 2011 and Ñopo, Robles, and Saavedra 2007), although Card et al. (2011) do not find differences by gender for the Dominican Republic. The results in

Table 7 also indicate that training program effects do not seem to be clearly different by gender groups in Brazil. When labor market outcome is represented by earnings, the estimated effects are more pronounced for men, but improvements are higher for women using employment as outcome.

Table 8 shows estimates by age groups. According to the results, monthly labor earnings increase R\$62 among workers aged between 21 and 35 years as a consequence of vocational training. Considering individuals aged between 36 and 54 years, evidence indicates that training increases monthly labor earnings by R\$ 99. These values correspond to changes of 6.4% for the former group and 7.4% for the latter group.

Table 8: Vocational training and labor market outcomes by age groups (Difference-in-Differences Matching estimator)

	(1)	(2)	(3)	(4)
	Dependent variable			
	Labor earnings	Hourly labor earnings	Employment	Formal employment
Panel A				
Age: 21–35				
Mean	61.569	0.401	0.014	0.010
S.E.	(19.508)	(0.129)	(0.005)	(0.007)
As % of mean earnings in the control group	6.36	7.13		
Panel B				
Age: 36–54				
Mean	99.221	0.725	0.009	0.001
S.E.	(33.290)	(0.217)	(0.003)	(0.006)
As % of mean earnings in the control group	7.44	9.49		
Observations				
Age: 21–35				
Control	65,586	65,586	65,586	65,586
Treatment	14,006	14,006	14,006	14,006
Age: 36–54				
Control	84,124	84,124	84,124	84,124
Treatment	14,320	14,320	14,320	14,320

Note: Estimated standard errors are presented in parentheses. Standard errors are calculated using a bootstrap procedure with 200 replications.

All estimates use the common support condition.

The estimated impact of vocational training on hourly labor earnings is also higher for older individuals (9.5%) compared to younger ones (7.1%). Results in column (3) indicate that training increases employment probability by 1.4 percentage points among younger individuals, while among those aged between 36 and 54 years the estimated coefficient corresponds to 0.9 percentage point. About the effect of training on the probability of getting a formal job, column (4) shows that it is non-significant for both younger and older workers.

Although evidence from developed countries shows that training for youths usually has close to zero or negative impacts (Heckman, Lalonde, and Smith 1999), Attanasio, Kugler, and Meghir (2011), analyzing a youth training program in a developing country, find positive effects on labor market outcomes. Estimates presented in Table 8 indicate that training impact on employment probability is higher for younger workers than for older ones,¹⁵ but employment is not a problem for most of those in the latter group. Also, training is more effective for individuals aged between 36 and 54 years compared to those aged between 21 and 35 years when labor market outcomes are represented by monthly labor earnings and hourly labor earnings. As shown in Table 12 in the appendix, about 70% of the older workers were in the same job for more than 2 years previous to the training, while among younger workers only 40% had more than 2 years in the same job. As many skills become obsolete over time, a possible interpretation for the results in Table 8 is that programs in Brazil give an opportunity to older workers retrain into jobs for which tasks performed experienced changes due to technological progress. In order to analyze this hypothesis in more details, it would be important to compare workers' occupation with courses fields of study, but this information is not available in the PME. Younger individuals may already have basic computer skills and knowledge in new technologies, for example, but they usually need practical experience in addition to classroom training.¹⁶ On-the-job training may be especially important for those attending courses with the aim of being introduced to a new job. Table 12 shows that more than 20% of the individuals aged between 21 and 35 years who completed a vocational training have changed job between the first and fifth PME interviews. Among older workers, only 9.7% were in a different job than that of the previous year.

¹⁵ Given the high turnover rate among younger individuals in Brazil, this result could be due to the fact that the attainment of training in a specific occupation may represent a signal of the commitment of young workers with a job in the same occupation.

¹⁶ The *Jóvenes en Acción* in Colombia, for example, consists of 3 months of in-classroom training and 3 months of on-the-job training.

6 Conclusions

This paper analyzes the effect of vocational training on employment, labor earnings and the probability of getting a formal job among workers in Brazilian metropolitan areas. Estimates based on (DiD) matching indicate that this kind of training improves employment probability and labor earnings for these individuals 1 year later, but estimated effects on formal employment are not significant. According to the results, vocational training increases employment probability in about 1 percentage point, and monthly labor earnings and hourly labor earnings by 6.8% and 7.9%, respectively.

Empirical evidence from developed countries usually provides non-significant effects of training on labor market outcomes. In Latin America, the impact of training is considered more effective (Betcherman, Olivas, and Dar 2004), although most of the studies do not take into account selection into the program on the basis of individuals' unobservable characteristics. Therefore, the results presented in this paper reinforce the argument in favor of vocational training as an instrument to improve workers' productivity, in particular in the context of Latin America.

In spite of the positive effects of vocational training on labor market outcomes, a few lessons can be drawn from the empirical analysis and may help to improve this kind of training effectiveness. Training programs in Brazil, mainly those provided by the National Training Institutions, seem to offer quality courses to more educated and more experienced workers. Nevertheless, evidence also indicates that vocational training effects on labor market outcomes are lower for those in disadvantaged groups. According to Attanasio, Kugler, and Meghir (2011), one aspect that may have contributed to the success of vocational training for vulnerable workers in Colombia is the provision of on-the-job training. In addition to offering practical experience, the internships allow firms to obtain information about workers without having to commit with an employment contract, while workers acquire more information on jobs. The provision of work experience combined with classroom instructions could be a way to enhance training effects in Brazil, in particular for younger workers.

According to the results, it seems that training effectiveness depends on an adequate level of basic education, indicating that vocational training should not be seen as a substitute for formal education. Furthermore, improvements in the education level may also allow workers' access to better-quality training. Thus, incentives for training programs should be accompanied by the expansion of formal education.

Biavaschi et al. (2012) suggest that training programs in developing countries should recognize the relevance of the informal sector, and that it is important to provide courses closer to the needs of the informal labor market.

The informal sector represents a significant share of the Brazilian labor market and estimates show that training does not increase the probability of getting better paid jobs in the formal sector, except for those with higher education level. Therefore, the recommendation of Biavaschi et al. (2012) could be a way to improve training effectiveness in terms of labor earnings for those in disadvantaged groups, who are less likely to get a job in the formal sector.

Acknowledgements: I would like to thank two anonymous referees and seminar participants at IPEA-Rio for many helpful comments and suggestions.

Appendix

Table 9: Individuals' characteristics by attrition status

	Always in	Ever out	Test for difference of sample means	
			Difference	(t-statistics)
Age (years)	37.45	36.10	-1.35	-30.53
Years of schooling	9.00	8.60	-0.40	-21.64
Black (%)	47.10	53.88	6.78	28.85
Woman (%)	45.72	44.42	-1.29	-5.53
Monthly labor earnings (R\$)	1,292.85	1,122.15	-170.70	-23.05
Industry (%)				
Agriculture	0.79	0.89	0.09	2.17
Manufacture	16.80	15.73	-1.07	-6.18
Construction	8.35	9.93	1.58	11.57
Commerce	20.02	20.74	0.72	3.82
Services	54.03	52.70	-1.33	-5.67
Employment status (%)				
Employer	4.26	3.65	-0.61	-6.69
Formal employee	57.10	57.50	0.40	1.72
Informal employee	18.18	19.93	1.75	9.46
Self-employed	20.45	18.91	-1.54	-8.27
Working hours in the first interview (per week)	40.90	41.08	0.18	3.99
Presence of children aged 0–10 years	36.40	36.17	-0.23	-0.99
Part-time job in the first interview	9.91	8.77	-1.14	-8.36
Temporary job in the first interview	2.50	2.31	-0.19	-2.69
Job duration in the first interview (months)	78.11	68.86	-9.25	-23.53
Observation	76,955	109,307	–	–
Share of the population (weighted)	44.59	55.41	–	–

Source: PME.

Sample: Individuals aged 21–54 years, occupied in the first PME interview.

Table 10: Vocational training and labor market outcomes (cross-sectional matching and regression-based estimators)

	(1)	(2)	(3)	(4)
	Dependent variable			
	Labor earnings	Hourly labor earnings	Employment	Formal employment
Panel A: OLS				
Mean	163.471	1.039	0.012	0.026
S.E.	(17.946)	(0.126)	(0.003)	(0.005)
As % of mean earnings in the control group	15.495	15.764		
Panel B: Cross-sectional Kernel matching estimator				
Mean	225.316	1.413	0.012	0.026
S.E.	(23.901)	(0.124)	(0.003)	(0.003)
As % of mean earnings in the control group	19.186	19.700		
Panel C: Difference-in-Differences				
Mean	77.926	0.593	0.014	−0.003
S.E.	(22.485)	(0.143)	(0.004)	(0.006)
As % of mean earnings in the control group	6.636	8.275		

Note: Estimated standard errors are presented in parentheses. Standard errors are calculated using a bootstrap procedure with 200 replications in Panel B. Estimates in Panel B use the common support condition.

Regressions in Panel A include: age, age squared, an interaction between age and schooling, dummies for black and woman, dummies for years of schooling, region of residence and the period of the interview.

The variables in the propensity score in Panel B are the same as those in column (1) of Table 4.

Table 11: Vocational training and labor market outcomes by educational groups (Difference-in-Differences Matching estimator)

	(1)	(2)	(3)	(4)
	Dependent variable			
	Labor earnings	Hourly labor earnings	Employment	Formal employment
Panel A				
Years of schooling: < 8				
Mean	16.31	0.036	0.008	−0.017
S.E.	(13.123)	(0.084)	(0.005)	(0.008)
As % of mean earnings in the control group	2.26	0.89		
Panel B				
Years of schooling: ≥ 8				
Mean	88.01	0.638	0.012	0.008
S.E.	(25.649)	(0.167)	(0.003)	(0.005)
As % of mean earnings in the control group	5.88	7.36		
Observations				
Years of schooling: < 8				
Control	53,656	53,656	53,656	53,656
Treatment	3,460	3,460	3,460	3,460
Years of schooling: ≥ 8				
Control	96,214	96,214	96,214	96,214
Treatment	24,868	24,868	24,868	24,868

Note: Estimated standard errors are presented in parentheses. Standard errors are calculated using a bootstrap procedure with 200 replications. All estimates use the common support condition.

Table 12: Job duration by age

	Age: 21–35	Age: 36–54
Workers who were in the same job for more than two years previous to the training (%)	39.68	70.63
Workers who have changed job between the first and fifth PME interviews (%)	21.00	9.67

Source: PME
Sample: Individuals who completed a vocational training program between the first and fifth PME interviews.

References

- Ashenfelter, O. 1987. "The Case for Evaluating Training Programs with Randomized Trials." *Economics of Education Review* 6(4):333–38.
- Ashenfelter, O., and D. Card. 1985. "Using the Longitudinal Structure of Earnings to Estimate the Effect of Training Programs." *Review of Economics and Statistics* 67:648–60.
- Attanasio, O., A. Kugler, and C. Meghir. 2011. "Subsidizing Vocational Training for Disadvantaged Youth in Developing Countries: Evidence from a Randomized Trial." *American Economic Journal: Applied Economics* 3(3):188–220.
- Betcherman, G., K. Olivas, and A. Dar. 2004. "Impacts of Active Labor Market Programs: New Evidence from Evaluations with Particular Attention to Developing and Transition Countries." Social Protection Discussion Paper 0402, World Bank, Washington, DC.
- Biavaschi, C., W. Eichhorst, C. Giulietti, M. Kendzia, A. Muravyev, J. Pieters, N. Rodríguez-Planas, R. Schmidl, and K. Zimmermann. 2012. "Youth Unemployment and Vocational Training." IZA Discussion Paper 6890.
- Card, D., P. Ibarrarán, F. Regalia, D. Rosas-Shady, and Y. Soares. 2011. "The Labor Market Impacts of Youth Training in the Dominican Republic." *Journal of Labor Economics* 29(2):267–300.
- Dehejia, R., and S. Wahba. 1999. "Causal Effects in No Experimental Studies: Reevaluating the Evaluation of Training Programs." *Journal of the American Statistical Association* 94 (448):1053–62.
- De Moura e Castro, C., and A. Verdisco. 1998. "Training Unemployed Youth in Latin America: Old Sad Story?" Inter-American Development Bank, Washington, DC.
- Heckman, J., H. Ichimura, J. Smith, and P. Todd. 1998. "Characterizing Selection Bias Using Experimental Data." *Econometrica* 66(5):1017–98.
- Heckman, J., H. Ichimura, and P. Todd. 1997. "Matching as an Econometric Evaluation Estimator: Evidence From Evaluating a Job Training Program." *Review of Economic Studies* 64(4):605–54.
- Heckman, J., R. Lalonde, and J. Smith. 1999. "The Economics and Econometrics of Active Labor Market Programs." In *Handbook of Labor Economics*, Vol. 3a, edited by O. Ashenfelter and D. Card, 1865–2097. North-Holland, Amsterdam: Elsevier.
- Hermetto, A., and E. Rios-Netto. 2007. "Uma Avaliação Experimental dos Impactos da Política de Qualificação Profissional no Brasil." *Revista Brasileira De Economia* 61(3):353–78.
- Ibarrarán, P., and D. Rosas Schady. 2009. "Evaluating the Impact of Job Training Programs in Latin America: Evidence from IDB Funded Operations." *Journal of Development Effectiveness* 1(2):195–216.
- Kluve, J. 2010. "The Effectiveness of European Active Labor Market Programs." *Labour Economics* 17(6):904–18.
- Lalonde, R. 1986. "Evaluating the Econometric Evaluations of Training Programs with Experimental Data." *American Economic Review* 76(4):604–20.
- Ñopo, H., M. Robles, and J. Saavedra. 2007. "Occupational Training to Reduce Gender Segregation: The Impacts of Projovent." Inter-American Development Bank, Working Paper 623.
- Rosenbaum, P., and D. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70:41–55.
- Severini, E., and V. O. Orellano. 2010. "Efeito do Ensino Profissionalizante sobre a Probabilidade de Inserção no Mercado de Trabalho e sobre a Renda no Período Pré-PLANFOR." *Economia* 11(1):155–74.
- Smith, J., and P. Todd. 2005. "Does Matching Overcome Lalonde's Critique of Nonexperimental Estimators?" *Journal of Econometrics* 125(1–2):305–53.