

Training Vouchers and Labour Market Outcomes in Chile

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Abstract. This paper evaluates the impact of a training voucher programme in Chile, called Bono Trabajador Activo, on two labour market outcomes: monthly earnings and employment probabilities. Using detailed administrative datasets of the National Employment Service and the unemployment insurance system, we combine matching and difference-in-difference estimators to measure these effects up to five years after the application to the programme. Our main results indicate that the voucher has an overall positive impact on earnings, on the order of 3.2 per cent, and a small negative impact on formal employment. We find that the programme particularly improves earnings for less educated workers.

1. Introduction

Vocational training programmes have been widely promoted in Latin America and the Caribbean (LAC) since the 1990s. Although their designs vary in terms of target populations, types of training, and duration, the programmes have generally consisted of classroom training in public or private institutions, targeted low-income youth, and involved about three months of training. In addition to training in vocational or basic skills, many programmes have included a period of on-the-job training through a short internship in a private firm, thereby increasing the duration to six months or one year. The empirical evidence on the effectiveness of training programmes in LAC is limited in comparison to the quantity of literature on developed economies. Also, most of the existing studies of LAC

The study used Chile's Unemployment Insurance database. We thank the Department of Employment of the Chilean Ministry of Labour and Pensions for dataset access. The authors are responsible for all results and views, which do not represent the Ministry of Labour and Pensions or the Inter-American Development Bank. All the information utilized in this paper was kept anonymous. We do not use any data with individual indicators. The data were stored and managed on a secure server. We thank Paulina Sepúlveda for her excellent work in preliminary versions of the paper. We also thank Mariano Bosch, Cristobal Huneus, Carmen Pages-Serra, seminar participants at the Inter-American Development, and conference participant at the 28th European Society for Population Economics (ESPE), the 26th European Association of Labour Economics (EALE), the 9th IZA/World Bank Conference 'Employment and Development,' the 19th Latin American and Caribbean Economic Association (LACEA), and Franco Peracchi and anonymous referees for helpful comments.

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LABOUR •• (••) ••–•• (2017)

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DOI: 10.1111/labr.12115

JEL J24, J68, H43

programmes evaluate only short-term effects (less than two years) and are based on follow-up surveys. Our study contributes to the literature by providing evidence of longer-term effects (up to five years) from administrative data of a Chilean vocational training voucher programme.

In Chile, the largest training programme is *Franquicia Tributaria* (FT), which allows workers to receive training paid for by their employers, and the employers are reimbursed through tax deductions.¹ FT was implemented in 1976. The programme budget in 2011 was USD 206.4 million, accounting for more than half the budget of the National Training and Employment Service (SENCE). Evaluations of FT indicated that the mechanism was almost exclusively reaching workers in medium- and large-sized companies as well as high-productivity workers (Rodríguez and Urzúa, 2012). Furthermore, previous internal analysis of the Chilean training system revealed the absence of public instruments allowing workers to express their preferences regarding labour training.

To correct for these shortcomings, Chile implemented a series of measures to strengthen its training system and increase coverage, including the introduction of a voucher scheme in 2011. The *Bono Trabajador Activo* (BTA) program had the objective of increasing workers' employability and job mobility through training. It consisted of a public grant allowing individuals to choose the subject of their vocational training from a list of courses predefined by SENCE. Beneficiaries had to be formally employed or recently unemployed from formal work (they had to have made six contributions to the social security system during the year prior to application) and have, on average, a monthly gross income lower than USD 1,200 (CLP 600,000).² With a budget of USD 33.3 million in 2011, BTA was SENCE's second-most important social programme in terms of public investment, accounting for 8.3 per cent of its total expenditure. The programme budget was reduced in subsequent years until it was definitively discontinued in 2015. This paper examines the first cohort of BTA beneficiaries, who applied to the programme during 2011.

The economics literature suggests different ways through which training vouchers may affect labour market outcomes. First, vouchers are expected to increase the set of individuals' choices, which should increase competition among training providers. More competition would reduce inefficiencies in the delivery of training, which would be expected to improve labour outcomes. Moreover, vouchers might allow workers to choose training providers according to their own preferences, which could lead to better matches between workers and training providers and increase the effectiveness of the training. However, a key underlying assumption behind the advantages of using vouchers is that individuals are well informed: when they are poorly informed about their own abilities, the quality of the training provider, or the expected wages and employment prospects in the occupation for which they are training, the efficiency gains of vouchers might be at risk (Barnow, 2009).

Our study uses administrative data from different sources to evaluate BTA's impact on formal employment and earnings. First, we use data from the unemployment insurance (UI) system, which contains employment and earning histories of formal workers. Second, we merge the UI dataset with administrative data from SENCE, which contains information on the 205,823 workers who applied to BTA in 2011. The use of administrative data allows us to estimate longer-term impacts (almost five years after application to the programme) while avoiding data loss from attrition, which is a serious problem for studies based on long-term surveys. However, using administrative data allows us to capture impacts on formal employment only, excluding potentially important impacts such as increased informal employment or increased wages in informal jobs.

Given the nonexperimental setting, we combine matching and difference-in-difference (DID) methods to estimate the intention-to-treat effect of BTA. For each individual in the treatment group we form a control observation, weighting the outcomes of nonparticipant applicants. Weights are based on the probabilities of undertaking training conditional on a set of baseline characteristics. Then, we compute a DID model to measure the average effects of the programme on different labour outcomes. Overall, our results indicate a positive impact of BTA on earnings and a small negative impact on formal employment. We find evidence of heterogeneous effects, favouring earnings of lower-educated individuals and those who self-identified as expecting to change economic sector when they applied to the programme.

The rest of the paper is organized as follows: Section 2 provides a brief literature review on training programmes in LAC; Section 3 describes the BTA program; Section 4 presents the empirical strategy; Section 5 describes the data and summary statistics used; Section 6 presents the results; and, Section 7 concludes and offers policy recommendations.

2. Training programmes in LAC

Training programmes have been extensively studied in the economic literature in the last 50 years, with most of the evidence on their effectiveness coming from developed countries.³ The evidence from developed economies is mixed, but in general the estimated impacts on labour market outcomes are null or very modest in the short term and improve in the medium or long-term (Card *et al.*, 2017; Heckman *et al.*, 1999; Kluve *et al.*, 2014). Heterogeneous effects are sometimes found in relation to characteristics of participants, such as gender, age, or education level. Evidence also shows that programmes combining classroom training with on-the-job training or other services such as labour intermediation tend to be more effective.

Evidence on the effectiveness of training programmes in LAC is scarcer, although the number of evaluations has grown rapidly in recent years (Kluve, 2016; McKenzie, 2017). The studies differ in method, data usage, and time frame evaluated. Although most use nonexperimental methods and focus on short-term effects of the programmes (less than two years), some experimental evaluations for Colombia, Argentina, the Dominican Republic, and Peru evaluate longer-term effects. In general, evidence for the region suggests the presence of higher impacts than in developed countries, at least for some subgroups of the population (Card *et al.*, 2017; Ibarrarán and Rosas, 2009).

Attanasio *et al.* (2011) study the impact of the programme Jóvenes en Acción, which operated in Colombia from 2001 to 2005, after an economic crisis hit the country in the late 1990s. The programme was aimed at young unemployed people (18–25 years old) from the lowest deciles of the income distribution and provided classroom training in private institutions (ECAPs), including basic skills and vocational training as well as on-the-job training through internships.⁴ Random assignment was achieved by excess recruitment: the ECAPs were asked to accept up to 50 per cent more applicants than they were able to assign to each class, then randomly offer the programme to some of the applicants.⁵ By studying responses to a follow-up survey given 14 months after the treatment, the authors found positive effects of the programme for women only, both on the probability of being employed and on earnings.⁶ Ten years after the programme ended, Attanasio *et al.* (2015) use administrative data to assess the longer-term programme impacts on a variety of

outcomes. They find that the positive effects for women are sustained (increases of about 4 per cent in employment and 18 per cent in earnings), but no significant impacts are found for men.

Card *et al.* (2011) analyse the Dominican programme *Juventud y Empleo*, which was implemented in 2001 with a randomized evaluation design. It targeted low-income youths (18–29 years old) who had not completed high school. The treatment combined a period of classroom training (basic skills and vocational training) with a period of on-the-job training (2-month internship). Classroom training was provided by private institutions. The authors do not find significant impacts on the probability of being employed after completing the programme, although they find a positive effect of the programme on earnings in the subsample of better-educated workers.⁷ Ibararán *et al.* (2015) show that six years after the original randomization, the programme's overall effect on employment and earnings does not improve over time; however, the programme improves formality among men and earnings among young females living in dynamic labour markets.

Galasso *et al.* (2004) conducted an experimental evaluation of a programme implemented in Argentina from 1998 to 2000 that aimed to help beneficiaries of social plans transition to jobs through wage subsidies and job training (*Proempleo*). Three samples were randomly selected from the recipients of existing employment programmes: one sample received a voucher that allowed a private-sector employer to receive a subsidy covering part of the salary paid to the worker, a second sample received the employer-subsidy voucher as well as a vocational training voucher, and, finally, a third sample formed the control group. The authors find a positive but small overall impact of *Proempleo* on the probability of finding employment in the private sector (5 per cent), with the effect driven primarily by women and young workers. A slightly higher impact on employment was found for those who also took the training. No impacts are found on earnings.⁸

Díaz and Rosas-Shady (2016) evaluate the youth training programme *Projoven*, created in 1996 by the Ministry of Labour and Employment Promotion of Peru. The aim of the programme is to promote the employability of poor young people by supplying them with training in subjects that are in demand by firms.⁹ The results suggest that there are positive and statistically significant effects of the programme in terms of formal employment.

There are other evaluations of training programmes in LAC countries based on observational data. Alzuá and Brassiolo (2006) and Aedo and Nuñez (2004) evaluate the impact of a training programme in Argentina for young people with low educational levels (*Proyecto Joven*), using matching techniques.¹⁰ The former study does not find significant effects on employment or earnings but it does find a positive impact on the probability of being formally employed. Aedo and Nuñez (2004), though, find positive impacts on earnings for young men and adult women and employment for adult women.

Delajara *et al.* (2006) and Calderón-Madrid and Trejo (2001) evaluate *PROBECAT*, a training programme for unemployed workers launched in Mexico in 1984 and expanded after the economic recession in 1995. Beneficiaries received a grant equivalent to the minimum wage while attending a 3-month training course, which began in the classroom but later incorporated on-the-job training. Calderón-Madrid and Trejo (2001) apply propensity score matching methods to form a control group and then use DID to estimate the average effect of the programme. They find a negative impact of less than 10 per cent on men's earnings and a positive effect of a similar magnitude for women's. Delajara *et al.* (2006) find a positive effect on employment.

In summary, the empirical literature on the impact of training programmes on labour market outcomes in LAC shows mixed results, suggesting positive impacts mainly on formal employment. However, it is important to note that the programmes analysed in this section differ from BTA in some key dimensions. In the first place, most of these programmes include on the job training, while BTA training was only in the classroom. In the second place, while most of the programmes analysed in this section targeted low-income youth or unemployed workers, BTA beneficiaries had to be either employed in or recently unemployed from the formal sector. Finally, the duration of training was shorter under BTA compared to the programmes summarized in this section.

3. The BTA programme

During the 1990s and the 2000s, Chile underwent a process of strong economic growth and poverty reduction.¹¹ In order to sustain growth, particularly in a less favourable international scenario for LAC, there is a consensus in Chile regarding the need to increase productivity and the skill level of the workforce. Chilean workers have, on average, a relatively low level of schooling: in 2011, only 19.7 per cent had completed tertiary education, which is below the average for LAC countries (20.5 per cent) and OECD members (29.4 per cent) (World Bank, 2017).

At the beginning of 2011, Chile implemented BTA with the objective of increasing employability and job mobility through training. BTA consisted of a public grant allowing workers to freely choose training according to their preferences from a set of possible choices. In contrast to FT, where the demand for training was firm-driven, BTA was the country's first attempt to give workers the chance to be trained according to their own preferences. There were about 100 courses for workers to choose from in 11 areas of interest, as detailed in Table 1. However, not all courses were available in all regions. Each region offered 25 courses on average, but the variation is considerable. Some courses were held more than once, depending on the number of applicants (each course had a minimum of five and a maximum of 25 participants).

BTA was managed by SENCE, and the training courses took place at private institutions called technical training organizations (OTECs). SENCE promoted BTA's objectives and offered courses among the population through its usual dissemination channels (i.e. web, emails, radio, TV, newspapers, job fairs). Subsequently, applicants registered on SENCE's website, where their eligibility was validated according to the following eligibility requirements: (i) be at least 18 and no more than 60 years old (women) and 65 years old (men); (ii) have contributed to the social security system at least 12 months (continuously or intermittently) during their professional lives; (iii) have contributed to the social security system at least six months (continuously or intermittently) during the year prior to application; and (iv) have, on average, a monthly gross wage lower than USD 1,200 (CLP 600,000).¹²

Originally, BTA was designed to sort eligible workers according to an employability index.¹³ The workers with the lower scores were to be given priority in receiving the vouchers. In practice, however, the index was never used. Instead, all eligible applicants in 2011 were awarded training vouchers, and SENCE informed applicants whether they could enroll in their preferred course and OTEC.

Table 1. Descriptive statistics at baseline

	Unweighted variables			Weighted variables		
	Mean control	Mean treated	Pr($ T > t $)	Mean control	Mean treated	Pr($ T > t $)
Demographic characteristics						
Male = 1	0.543	0.548	0.287	0.559	0.554	0.203
Years of education	11.224	11.791	0.000***	11.840	11.946	0.000***
Age	33.013	33.379	0.000***	32.233	32.312	0.324
Immigrant = 1	0.005	0.015	0.000***	0.009	0.012	0.003***
Area of interest						
Administration	0.213	0.158	0.000***	0.176	0.168	0.011**
Farming	0.086	0.017	0.000***	0.018	0.017	0.385
Trade and services	0.062	0.074	0.000***	0.094	0.081	0.000***
Computer science	0.153	0.168	0.001***	0.171	0.156	0.000***
Construction	0.077	0.060	0.000***	0.065	0.064	0.694
Mechanics	0.053	0.091	0.000***	0.096	0.096	0.980
Mining	0.050	0.015	0.000***	0.017	0.017	0.590
Prevention	0.053	0.109	0.000***	0.100	0.105	0.105
Services	0.111	0.043	0.000***	0.041	0.041	0.869
Transport	0.073	0.088	0.000***	0.092	0.083	0.000***
Tourism and languages	0.069	0.178	0.000***	0.130	0.173	0.000***
Occupation						
Operator	0.121	0.139	0.000***	0.150	0.143	0.049***
Craftsman	0.003	0.002	0.254	0.002	0.002	0.549
Driver	0.031	0.043	0.000***	0.045	0.043	0.332
Office worker	0.160	0.194	0.000***	0.176	0.190	0.000***
Manager and supervisors	0.019	0.022	0.150	0.021	0.022	0.231
Construction workers	0.109	0.055	0.000***	0.063	0.056	0.001***
Teachers	0.049	0.037	0.000***	0.038	0.038	0.757
Professionals	0.123	0.130	0.062*	0.121	0.129	0.006***
Service workers	0.032	0.036	0.066*	0.030	0.034	0.019***
Sellers	0.102	0.100	0.473	0.107	0.104	0.218
Other	0.251	0.241	0.068*	0.247	0.238	0.026**
Labour market characteristics						
Employed = 1	0.812	0.823	0.011**	0.888	0.895	0.029**
Contributions previous year	10.096	10.122	0.476	11.006	10.986	0.268
Mean earnings previous year	617.799	646.677	0.000***	646.718	649.927	0.198
Application month						
May 2011	0.110	0.119	0.005***	0.118	0.135	0.000***
June 2011	0.101	0.113	0.000***	0.114	0.126	0.000***
July 2011	0.107	0.090	0.000***	0.107	0.102	0.088*
August 2011	0.110	0.126	0.000***	0.135	0.134	0.875
September 2011	0.162	0.159	0.426	0.177	0.168	0.007***
October 2011	0.114	0.123	0.012**	0.135	0.130	0.087*
November 2011	0.146	0.103	0.000***	0.105	0.100	0.037**
December 2011	0.149	0.167	0.000***	0.109	0.106	0.295

Note: The baseline is when (month) the individual applied to BTA. *Significant at 10%, **significant at 5%, ***significant at 1%.

By design, BTA funded courses lasting between 80 and 140 hours. The number of months the courses were held in varied with the type and number of weekly hours of the training chosen. In practice, the average length of the courses for 2011 was 2 months. In

general, the maximum BTA funding corresponded to USD 800 (approximately CLP 400,000) per beneficiary, though for more expensive courses the funding could reach up to USD 1,000 (CLP 500,000). Before their training began, the beneficiary was asked to pay 20 per cent of the total course fees. This initial copayment was designed as a guarantee, which was reimbursed to the beneficiary at the end of the course if the individual attended at least 75 per cent of the training, passed the course, and completed a satisfaction survey. If these conditions were not met, the OTEC could withhold the reimbursement.

4. Empirical strategy

To estimate the impact of the training programme on employment and earnings, we combine kernel propensity score matching and DID methods. First, we estimate the propensity scores by running a probit model (equation [1]) of the treatment variable D on a set of baseline covariates X , such as gender, years of education, age and age squared, months worked, and average wage during the year before the application to BTA, a dummy variable for migrant status, and dummy variables for the area of interest for training and the occupational categories. We also control for the month of application to BTA. The inclusion of the employment and wage history variables allows us to account for relevant unobserved characteristics related to labour market outcomes.

$$P_i^* = \alpha + \beta X_i + \epsilon_i, \quad [1]$$

where P_i^* is a latent variable that determines the observed outcome D under the following rule:

$$D_i = \begin{cases} 0 & \text{if } P_i^* \leq \bar{p} \\ 1 & \text{if } P_i^* > \bar{p} \end{cases}.$$

We calculate the estimated propensity scores and restrict the sample to the common support.¹⁴ Then, we implement the matching: the outcome of a treated individual i in the period t , y_{it} , is associated to a matched outcome, \hat{y}_{it} , given by the weighted outcomes of the observations j in the control group (D^0): $\hat{y}_{it} = \sum_{j \in D^0} w_{ij} y_{jt}$. The weight given to non-treated unit j , w_{ij} , is based on the proximity of the propensity scores of i and j , and is calculated, using the Epanechnikov kernel function.¹⁵ At the second stage, we run a DID regression on the weighted outcomes generated at the first stage.

$$\tilde{y}_{it} = \beta_0 + \beta_1 \text{period}_t + \beta_2 D_i + \beta_3 (\text{period} \cdot D)_{it} + \epsilon_{it}, \quad [2]$$

where \tilde{y}_{it} is the labour market outcome, y_{it} or \hat{y}_{it} , period is a dummy variable indicating the baseline (month of application to BTA) and follow-up (April 2016) periods¹⁶ and D_i is a dummy variable indicating the treatment status.

The DID approach allows us to control for time-invariant unobservable characteristics that might affect both participation in the treatment and labour outcomes. The key identifying assumption is that, in the absence of BTA, changes in earnings or employability in the control group would adequately represent changes in those variables for the treatment group (parallel trends assumption). Since we combine a DID estimator with propensity

score matching, we are creating a comparison group that is similar in terms of observables to the treated units, assuming that workers who share observable characteristics may exhibit similar trends in the labour market.

Although all 205,823 applicants fulfilling the eligibility requirements were offered a voucher, only 25 per cent enrolled in a training course. Among those who did not use the voucher were those who: (i) explicitly relinquished it or (ii) could not enroll in the training because the course they were interested in was not offered in their region or there were no available slots. Unfortunately, SENCE does not have information on the reasons applicants declined to participate in the programme. Our definition of the treatment group ($D_i = 1$) includes the 51,759 applicants who enrolled in a training course, while the control group ($D_i = 0$) consists only of those applicants in category (ii) who neither relinquished the voucher nor enrolled in courses (10,797 cases). We excluded applicants who voluntarily refused the training programme from the control group since they might have found promising labour market opportunities after applying to BTA, creating a dynamic selection problem that could bias our estimates of the impact of the programme.

5. Data and summary statistics

We use data from different sources to estimate the effect of BTA on labour market outcomes. First, we use administrative data from SENCE containing information on BTA applicants during the first year of the programme (2011). Second, we use data on Chilean UI system, which is administered by the Unemployment Fund Administrator and contains data from all formal dependent workers since 2002.¹⁷

The administrative data from SENCE contains information on BTA applicants in 2011. For every voucher used, it is possible to identify the starting and ending dates of the corresponding training.¹⁸ Figures A2 and A3, in the Appendix, show the distribution of the starting and ending months of training courses for individuals in our sample. Most training courses started between August 2011 and June 2012 (98 per cent) and finished between October 2011 and August 2012 (97 per cent). Moreover, the average length of the training courses was 58 days.

The UI system provides a detailed administrative dataset containing, as of April 2016, information on the gross monthly earnings of 8,848,234 formal workers. The data specifies workers' gender and the economic sectors and the regions of employers.¹⁹ We combined SENCE and UI data and ended up with our final dataset containing employment records for more than 62,000 workers in the treatment and control groups.

Table 1 shows the mean values of the covariates at the baseline (e.g. month of application to BTA) for workers in the control and treatment groups. According to the first three columns (unweighted variables), workers in our sample are mostly Chilean (98.5 and 99.5 per cent in the treatment and control group, respectively) and have on average 11.8 and 11.2 years of education, which corresponds to almost finishing secondary education.²⁰ On average, applicants are 33 years old in both the treatment and control groups, and male participation in the programme is larger than female participation (54 per cent in both the treatment and control groups). Regarding training preferences, the main areas of interest are administration (21.3 per cent in the control group and 15.8 per cent in the treatment group), computer science (15.3 and 16.8 per cent), services (11.1 and

4.3 per cent), and prevention (5.3 and 10.9 per cent). When applying to BTA, average earnings are close to USD 650 (USD 647 for the treated and USD 618 for the control group) and more than 80 per cent are employed (82.3 per cent within treated group and 81.2 per cent in the control).

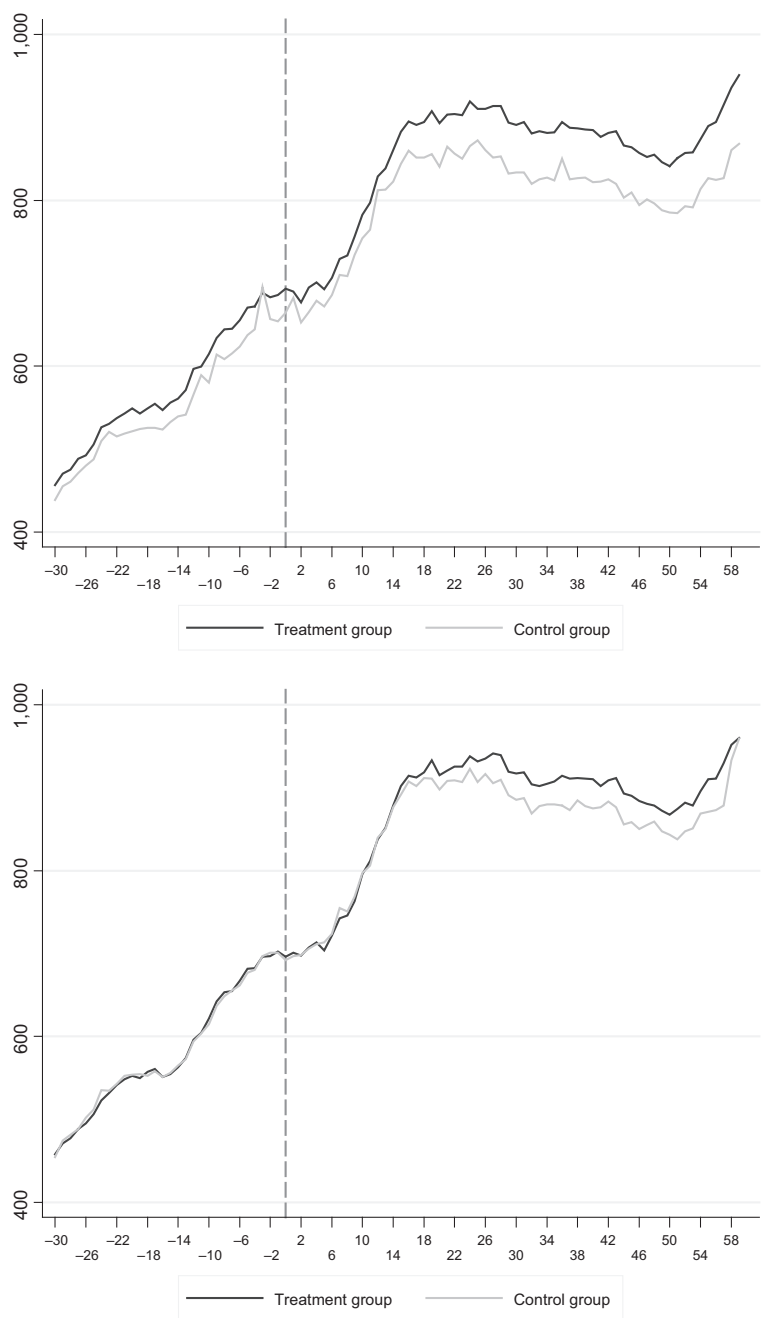
The last three columns of Table 1 present the mean value of pretreatment covariates after matching and a *t*-test for differences between treated and control units (i.e. balancing test). As shown in the table, differences in means between the two groups are considerably reduced after matching on many variables, although some remain statistically significant. However, for DID to be valid, treatment and control groups do not necessarily need to have the same pretreatment conditions, but the control group must accurately represent the change in outcomes of the treated in absence of treatment. Figures 1 and 2 show the evolution of our main outcome variables relative to the month of application to BTA, for weighted and unweighted samples. Particularly in the case of earnings, it can be seen that after matching, trends up to two years before the programme are very similar. It is also noteworthy that the trends appear to be quite similar for the first year after the programme, suggesting that the groups did not differ in terms of unobserved characteristics that would predict a difference in the short term. Only time-varying unobserved heterogeneity, materializing a full year after the programme, would appear to invalidate the earnings results. Unfortunately, the employment trends do not appear to be as similar between the treatment and comparison groups, questioning somewhat the statistical validity of the results on formal employment.

6. Results

Table 2 shows the estimates of the impact of BTA on formal employment probabilities. Overall, we find a negative impact five years after the participants applied to BTA, which is statistically significant but small in magnitude (2 percentage points). However, a visual inspection of Figure 2 shows that the impacts of BTA on formal employment are mainly insignificant at three and four years of applying to the programme. When we analyse the presence of heterogeneous impacts by gender and level of education, we find negative effects in the male sample (enrolling in a training course, using BTA reduces by 2.8 percentage points the probability of being employed five years later) and a similar effect in the lower-educated sample (2 percentage points). Even though these results seem to be counterintuitive for a training programme, they might be linked to a lock-in period that has been found in other studies (e.g. Doerr *et al.*, 2016, in Germany). That is, the training programme may temporarily inhibit transitions to better job opportunities, although this effect would presumably dissipate over time.

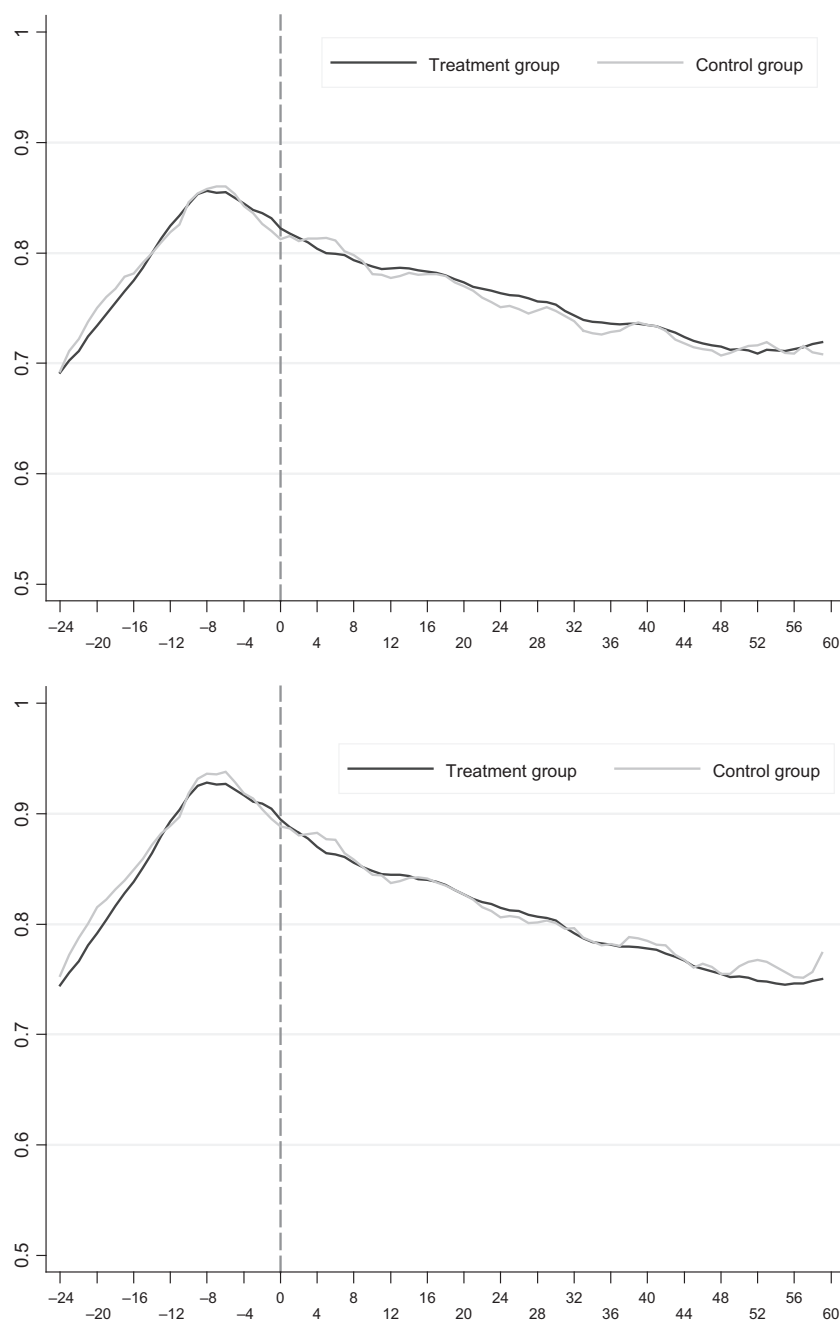
Our results on the impacts of BTA on (log) monthly earnings show a positive and statistically significant effect of 3.2 per cent overall, as shown in Table 3.²¹ The first column shows the estimates for the whole sample, while columns 2–5 present the results for different subsamples. These impacts seem to be driven by the effects in workers with lower levels of education. We assign a lower education (LE) dummy variable the value of 1 when the individual has 12 or fewer years of education. As can be seen from last column of Table 3, among the subsample of workers with lower education, BTA increases earnings 4.9 per cent five years after the programme.

Figure 1. Unweighted (top) and weighted (bottom) trends in earnings for treatment and control groups



Source: Authors' own elaboration based on Unemployment Insurance system. *Note:* Vertical axis: Monthly earnings in US dollars. Horizontal axis: Months relative to BTA application (vertical line represents the application month). Upper panel contains the unweighted variable and lower panel shows weighted earnings.

Figure 2. Unweighted (top) and weighted (bottom) trends in employment rate for treatment and control groups



Source: Authors' own elaboration based on Unemployment Insurance system. *Note:* Vertical axis: Employment rate. Horizontal axis: Months relative to BTA application (vertical line represents the application month). Upper panel contains the unweighted variable and lower panel shows weighted earnings.

Table 2. Impact of BTA on formal employment

	All (1)	Male (2)	Female (3)	HE (4)	LE (5)
Baseline					
Control	0.888	0.898	0.877	0.864	0.892
Treated	0.895	0.902	0.885	0.883	0.898
Diff (T-C)	0.006 (0.004)	0.004 (0.006)	0.009 (0.006)	0.019 (0.012)	0.006 (0.005)
Follow-up					
Control	0.752	0.794	0.694	0.715	0.757
Treated	0.739	0.770	0.700	0.722	0.743
Diff (T-C)	-0.013** (0.006)	-0.024*** (0.007)	0.006 (0.010)	0.007 (0.015)	-0.014** (0.007)
Diff-in-diff	-0.020*** (0.007)	-0.028*** (0.010)	-0.002 (0.012)	-0.012 (0.017)	-0.020*** (0.008)
Observations	93,390	51,740	41,704	18,230	74,990

Note: Standard errors are estimated, using bootstrap with 100 repetitions. *Significant at 10%, **significant at 5%, ***significant at 1%.

Table 3. Impact of BTA on (log) monthly earnings

	All (1)	Male (2)	Female (3)	HE (4)	LE (5)
Baseline					
Control	6.392	6.454	6.324	6.467	6.373
Treated	6.417	6.475	6.344	6.525	6.391
Diff (T-C)	0.025*** (0.009)	0.021 (0.013)	0.021 (0.013)	0.058** (0.027)	0.017 (0.011)
Follow-up					
Control	6.585	6.643	6.517	6.842	6.525
Treated	6.643	6.694	6.572	6.852	6.592
Diff (T-C)	0.057*** (0.013)	0.051*** (0.017)	0.055** (0.023)	0.010 (0.027)	0.067*** (0.014)
Diff-in-diff	0.032** (0.016)	0.030 (0.022)	0.035 (0.027)	-0.048 (0.036)	0.049*** (0.019)
Observations	73,231	41,611	31,625	14,077	59,059

Note: Standard errors are estimated, using bootstrap with 100 repetitions. *Significant at 10%, **significant at 5%, ***significant at 1%.

To further explore the heterogeneous impacts of BTA, Table A1 in the Appendix shows whether the effects vary among individuals who had expectations of changing economic sector at the time of application to the programme and those who did not.²² As mentioned above, a main objective of BTA was increasing job mobility, and we find some evidence of the training being more effective among those expecting to change economic sector. Among those participants, BTA increases earnings 4.6 per cent five years after the programme. At the same time, we find that the overall negative impact on employment probabilities is particularly larger among those expecting to change economic sector (2.7 percentage points).

7. Concluding remarks and discussion

In this paper, we used administrative data to evaluate the medium-term effects of a voucher programme in Chile called Bono Trabajador Activo. BTA was implemented in 2011 with the objective of increasing workers' employability and job mobility through training. Beneficiaries were given a voucher that allowed them to choose the subject of their training from a list of courses. Because they increase workers' choices, vouchers are presented as a means to create healthy competition between training providers. This competition might help to reduce inefficiencies in the delivery of training and improve labour market outcomes.

Although we are confident regarding the parallel-trends assumptions that underpin the empirical strategy, particularly in the case of the earnings results that show evidence of extremely similar trends prior to the programme between the treatment and comparison groups, it must be acknowledged that the key identification assumption is untestable. The fact that the employment trends prior to the programme appear to differ between the two groups particularly calls into question the statistical validity of the employment results. Nevertheless, all possible measures have been taken to achieve comparability between the treatment and comparison groups and, at least in the case of the earnings results, evidence presented supports the parallel-trends assumption.

Overall, our results indicate that five years after individuals applied to BTA, the program positively affected individuals' earnings, although by a moderate amount (3.2 per cent). In particular, gains from training are concentrated among less educated workers, which is an interesting finding from a public policy perspective because it addresses the concern that less educated workers might lack the information necessary to make a voucher programme effective. Moreover, impacts on earnings are also concentrated among the workers who wanted to change economic sector after training, which suggests this might be an important channel through which the training benefits operate.

On the other hand, the programme is estimated to have an insignificant effect on formal employment at 3 and 4 years after the participants applied to BTA and a small negative (although heterogeneous) effect at 5 years. However, given that: (i) the employment trends prior to the programme appear to be different for the treatment and comparison groups, and (ii) the erratic behavior of the employment outcome for the control group might be due to its small sample size, we are less confident in the employment results.

Notes

¹ Training can be performed directly by the employer or it can take place in a technical training organization (OTEC).

² The average income of individuals' main (primary) employment in 2011 in Chile was CLP 438,000 according to the Encuesta de Caracterización Socioeconómica Nacional (Ministry of Social Development of Chile, 2011).

³ For example, Barnow's findings on vouchers (2009) are in a comprehensive review of the use of this policy tool in targeted training programmes in the United States.

⁴ The ECAPs were paid a relatively small amount if the young person only completed the classroom component. A substantial fraction of the payment was conditional on the beneficiary completing the internship. Moreover, the ECAPs would receive an additional payment if the beneficiaries were hired by the firm that trained them. The programme covered the complete cost of the trainings

and included a small stipend for trainees (between USD 2 and USD 3 per day), depending on the number and age of a trainee's children.

⁵Eligible individuals freely chose which institution and course to enroll in.

⁶Positive effects on the probability of being in the formal sector were also found, for both men and women.

⁷Better-educated workers are defined as those with 10 or more years of education. Authors also find heterogeneous impacts by location.

⁸The follow-up survey was conducted 18 months after programme completion.

⁹Projovent offered in-classroom technical training for three months (in private or public training agencies), complemented with an internship for three additional months.

¹⁰The programme provided intensive training in private institutions and internships.

¹¹The average annual growth rate for the period of 1990 to 2010 was 3.8 per cent, and the incidence of poverty fell from 38.6 per cent of the population in 1990 to 10.9 per cent in 2011 (Ministry of Social Development of Chile, 2011 and World Bank, 2017).

¹²The average wage is calculated over the 12 months prior to the application. Eligibility criteria mean that BTA applicants could be either employed or recently unemployed (less than six months) in the formal sector.

¹³The employability index (EI) was defined as follows: $EI_i = \bar{S}_i \frac{Months_i}{12}$, where S_i corresponds to the average monthly earnings in the 12 months before the application. This average is represented in *unidades de fomento* (UF), which is the account unit used in Chile. The exchange rate between the UF and the CLP is constantly adjusted to inflation so that the value of the UF remains constant on a daily basis during low inflation. *Months* is the number of months in formal employment during the 12-month period prior to the application.

¹⁴Figure A1 in the Appendix shows the distribution of propensity scores for the treatment and control groups.

¹⁵We used a rule-of-thumb bandwidth.

¹⁶April 2016 corresponds to the last month with available data from Chilean UI system.

¹⁷UI is an individual savings account for each dependent worker. Both the worker and the employer contribute to this fund, although UI is supplemented by the Solidarity Fund, which is financed by public and private (employer) contributions. The Unemployment Fund Administrator of Chile is the private manager of the mandatory UI.

¹⁸We do not have information on whether workers in the treatment group effectively completed the training, so our results correspond to intention-to-treat estimates of enrolling in the course.

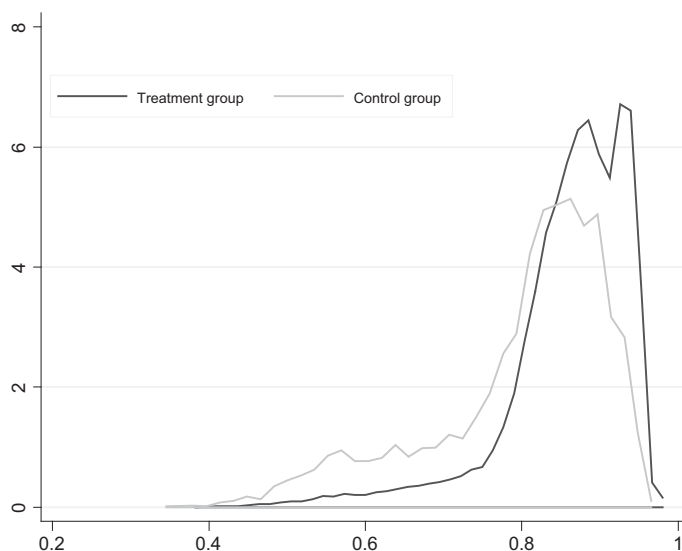
¹⁹Since employers may not report their workers to UI every month, but may do so quarterly, we used the following criteria to impute employment and income: we consider that a worker was employed in a particular month t in a given firm X if listed as employed in firm X both before (in $t - 2$ and/or $t - 1$) and after (in $t + 1$ and/or $t + 2$) t .

²⁰The 2003 constitutional reform in Chile established that primary (8 years) and secondary (4 years) education is mandatory for all the inhabitants in Chile up to 18 years old. Before 2003, compulsory education only covered the 8 years of primary education, and before 1965 and 1929, the minimum number of years for mandatory education was 6 and 4 years, respectively.

²¹Table 3 shows the impact of the programme in earnings for individuals who were working (i.e. positive earnings).

²²This variable does not reflect whether a worker actually changed sectors.

Appendix Table and figures

Figure A1. Distribution of the propensity scores for the treatment and control groups**Table A1.** Impact of BTA on formal employment and earnings

	Employment		Earnings	
	Change sector		Change sector	
	Yes	No	Yes	No
Baseline				
Control	0.883	0.888	6.362	6.418
Treated	0.890	0.899	6.379	6.451
Diff (T-C)	0.007 (0.007)	0.011** (0.005)	0.018 (0.015)	0.033** (0.014)
Follow-up				
Control	0.746	0.754	6.551	6.612
Treated	0.726	0.749	6.614	6.671
Diff (T-C)	-0.019* (0.010)	-0.005 (0.007)	0.063*** (0.021)	0.058*** (0.018)
Diff-in-diff	-0.027** (0.013)	-0.016* (0.009)	0.046* (0.025)	0.026 (0.023)
Observations	39,270	47,932	30,364	38,004

Note: Standard errors are estimated, using bootstrap with 100 repetitions. *Significant at 10%, **significant at 5%, ***significant at 1%.

Figure A2. Distribution of the start date of courses

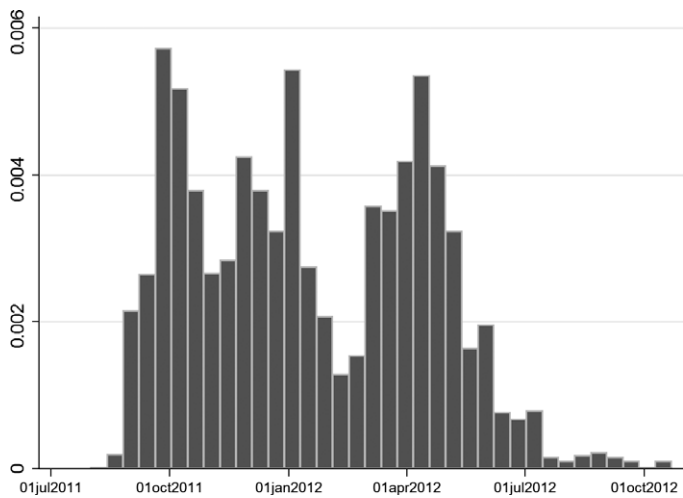
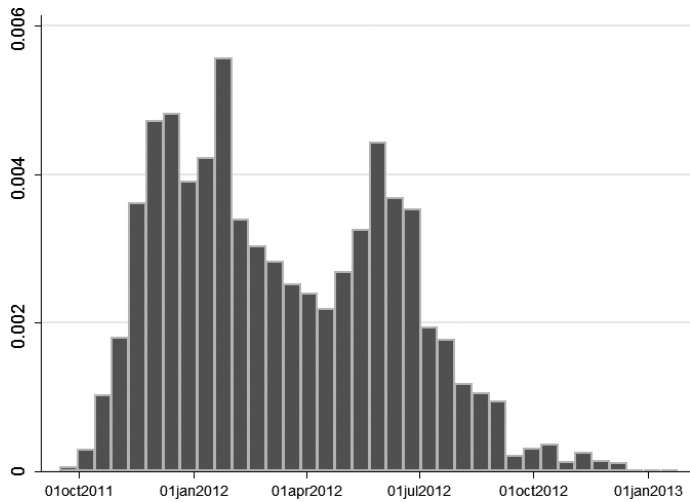


Figure A3. Distribution of the completion date of courses



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