Training Vouchers and Labor Market Outcomes in Chile[†]

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Abstract

This paper evaluates the impact of a recently implemented training voucher program in Chile, the *Bono Trabajador Activo*, on workers' earnings, employment, and the probabilities of changing job and economic sector. Using the detailed administrative datasets of the National Employment Service and the Unemployment Insurance System, we apply parametric and semi-parametric techniques to measure such effects. Our main results indicate that, in the short-run, the voucher program has no impact on earnings (conditional on employment) and positive effects on employment. We do not find evidence of heterogeneous effects by gender, age, and education.

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1. Introduction

The introduction of vouchers in public policies is one of the most significant and controversial reforms undertaken in the last decades. Despite the fact that vouchers are now a commonly used instrument for increasing access to public services, particularly to education, their use in the context of labor training is more recent. This paper examines the impact of a labor training voucher on workers labor market outcomes in Chile.

The economics literature suggest different ways through which voucher may affect labor market outcomes. On the one hand, vouchers are expected to increase the set of consumers' (workers, in our case) choices, which might increase competition among labor-training providers. More competition between training providers might reduce inefficiencies in the delivery of training, which is expected to improve labor outcomes. Moreover, vouchers might allow workers to choose training providers according to their own preferences. This flexibility is expected to lead to better matches between workers and training providers, which might also increase the effectiveness of the training. On the other hand, it is also possible that asymmetries of information could cause workers to use vouchers for training that is not completely in accordance with their preferences or that have lower returns in the labor market.

Although school vouchers have been extensively studied in the literature (Epple et al., 1998; Figlio and Page, 2002; Angrist et al., 2002 and 2006; Hoxby, 2003; Hsieh and Urquiola, 2006; Hanushek et al., 2007; Bettinger et al., 2010; among others), labor training vouchers have received less attention (Rinne et al., 2008; Doer et al, 2012). None of the papers on training vouchers brings evidence of the effects of labor training voucher in developing countries. The main objective of this paper is contributing with new evidence on the impact of a recent implemented labor training voucher on labor outcomes in Chile.

Chile represents an interesting case among developing countries (OECD, 2009). In the last two decades, Chile has experienced both strong economic growth and accelerated poverty reduction.[3] However, the unemployment rate is still high among the poorest (17 percent among the poorest quintile compared to 8 percent at national level) and inequality is substantial (Chile has a Gini index of 0.52 compared to an average of 0.32 for the OECD countries).[4] With the aim

[3] According to the CASEN 1990-2011, the poverty rate has decreased from 39 percent in 1990 to 15 percent in 2011.
[4] Income inequality in Chile is the highest among the OECD countries (OECD, 2012).

of reaching the living standards of developed countries, in the last years Chile has prioritized policies oriented to increase investment in human capital accumulation and productivity. In particular, Chile has implemented policies oriented to improve the educational system.[5] However, policies oriented to improve the labor training system, leading it to meet the requirements of the productive sector and improve workers' wellbeing, are still in progress.

Previous analysis of the training system in Chile indicates its low coverage among dependent workers with low productivity (SENCE, 2010). Evaluations of the *Franquicia Tributaria* (FT) [6] indicate that the mechanism is almost exclusively reaching workers in medium- and large-size companies (Rodriguez and Urzúa, 2012) as well as workers with higher productivity.[7] Furthermore, an analysis of the Chilean training system revealed the absence of public instruments allowing workers to express their preferences regarding the demand for labor training services (*Trabajo, Consejo Asesor Presidencial*, 2008).

To overcome this situation, in 2011 Chile implemented a series of measures to strengthen its training system, including the introduction of a voucher scheme: the *Bono Trabajador Activo* (BTA) program. In terms of budget, the BTA represents the second largest program of the National Training and Employment Service (SENCE).[8] In 2011, the BTA budget was USD 32.3 million (approximately 16.2 billion Chilean Peso (CLP)), which represented 15 percent of the total resources allocated to SENCE during that year (*Ley de Presupuesto*, 2011).[9] The BTA aims to address the training needs of workers with the final objective to increase their earnings and job mobility. The BTA consists in a public grant allowing beneficiaries to choose the subject (from a list of predefined subjects by SENCE) and location of the labor training.

This paper uses administrative data from different sources to evaluate the impact of the BTA on individual labor outcomes. First, we use data from the Unemployment Insurance System (UI),

[5] For instance, Chile is progressively increasing the public spending on education and has established secondary education as compulsory since 2003.

[6] FT is a subsidy for firms investing in off-the-job training programs for their workers. This subsidy functions in a highly competitive system; in which private providers offer training courses to firms in a massive industry of courses. Courses financed by FT cover 84 percent of all public-related training courses. Trained individuals under FT represent 12 percent of all employed individuals in Chile. FT also funds internal courses of firms and training instructors.

[7] The FT mainly benefits workers with higher incomes and education. The main users of the FT are administrative and high-skill workers (61.3 percent of total workers). They pay training completely or partially with the FT (SENSE, 2011).

[8] SENCE's largest program in terms of budget is the *Subsidio al Desempleo*, which in 2011 has a budget of USD 83 million (approximately 41.5 billion CLP). It is important to note that the BTA has suffered important reduction in terms of budget allocation after its implementation.

[9] The exchange rate used along this paper is the 2011 average of 1 US$ = 477 CLP (Source: Central Bank of Chile).

containing employment and earning histories of formal workers from 2002 to 2012. The UI data contain information from about 7.7 million formal workers. Second, we merge the UI dataset with administrative data from SENCE, containing information of the BTA beneficiaries (205,823 workers in 2011).[10] The rich nature of these datasets allows us to use panel data models for evaluating the impact of training on earnings, employment probability and the probabilities of changing jobs and economic sector. Given the non-experimental setting, we apply regression analysis and Propensity Score Matching (PSM) to measure the effects of the program. We use kernel PSM method to build a robust control group. Our key identifying assumption is that, in the absence of the BTA and after considering individual observable characteristics, any change in earnings, employability, or the probabilities of changing economic sector and jobs would not be systematically different between workers in the treatment and control groups.

Overall and in the short run, our results indicate a significant and positive (small) impact of the BTA on employment and no significant effect on earnings conditional on employment. These results are consistent with those found by the previous evidence which suggest that the impact of the training vouchers are observed in the long run (Barnow, 2009).

The main contribution of this paper is bringing evidence regarding the effect of training vouchers on labor market outcomes in a developing country. To the best of our knowledge, this is the first study in a developing country evaluating the effect of training vouchers on labor market outcomes.

The rest of the paper is organized as follows: Section 2 provides a literature review on voucher training programs; Section 3 describes the *Bono Trabajador Activo* program; Section 4 presents the research strategy implemented; Section 5 describes the data used; Section 6 presents the results; and, Section 7 concludes and suggests policy recommendations.

2. Training Vouchers

According to the economics literature, using vouchers as a public policy tool improves economic efficiency in two ways (Friedman, 1962). First, it is expected that well-informed workers are able to choose the training programs maximizing their individual well-being and hence social welfare. Second, it is expected that expanding the set of workers' choices increases competition among training providers, which potentially improves the quality of the training received.

[10] That is, workers who applied to the program in 2011 and were awarded a voucher.

An underlying assumption of these theoretical advantages is that individuals are well informed. However, when individuals 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). To overcome this potential reduction of efficiency, and considering that gathering information might be expensive for individuals with low levels of human capital, an alternative scheme to the one allowing individuals to choose training completely free is asking local workforce agencies to provide information or asking workers to demonstrate knowledge about their decision before training takes place (Steuerle, 2000).

The efficiency gains of vouchers are also at risk when the training level maximizing individuals' well-being does not maximize the one of the society as a whole. There are several reasons why individuals might not choose efficiently from a social point of view. For instance, it might be that although public policies of this kind aim to maximize workers' earnings, they might select training programs that increase their current consumption and not necessarily increase their future income, as it is socially desired (Barnow, 2009). Moreover, workers might choose training as a response to non-pecuniary incentives (e.g. social pressure, norms, etc.).

Vouchers have been extensively used as a public policy tool, particularly in education (Steuerle, 2000). Some countries (Chile, Denmark, the Netherlands, South Korea, and Sweden) have implemented universal voucher programs in education. Other countries have also implemented vouchers programs for education, targeted to specific geographical areas (Cote d'Ivoire and Czech Republic) or populations (Colombia, Guatemala, Pakistan, and the US).

The theoretical and empirical evidence of the impact of school choices on students' performance is vast and mixed. For instance, the several small-scale voucher programs have been implemented in the U.S., mostly targeted to low-income students, such as the Milwaukee Parental Choice Program, the Cleveland Scholarship and Tutoring Program, the Washington D.C. Opportunity Scholarship Program, and the New York City voucher experiment. In general, evaluations of these programs find modest effects of vouchers on students' educational achievements.[11] Evidence from Denmark suggests that the increase in competition between providers, generated as a response to the voucher system, does not affect educational outcomes

[11] A review of the literature on the impact of private school vouchers can be found in Rouse and Barrow (2009), Barrera-Osorio and Patrinos (2009), McEwan (2004), Somers et al. (2004), Levin and Belfield (2003), Belfield and Levin (2002).

of students. In contrast, competence positively affected the performance of Swedish public schools and the one of private and public schools in the Netherlands (Barrera-Osorio and Patrinos, 2009). For Chile, several evaluations of the educational voucher system, using different methodologies and datasets, find a small positive effect on students' educational outcomes (McEwan, 2001; Tokman, 2002; Sapelli and Vial, 2002 and 2005; Contreras et al., 2008, Lara et al., 2011).

Despite the fact that many developed countries have already introduced labor-training vouchers (Belgium, Germany, Australia, USA and the Netherlands), their use has received much less attention in the empirical economics literature. In the USA, many programs, operating at a state and local level, utilize vouchers in the provision of education, training and employment services. In its comprehensive review of the use of vouchers in targeted training programs in the USA, Barnow (2009) concludes that the empirical evidence is mixed. The effects seem to be determined by the design of the voucher program and the accompanying services. For instance, evidence from the *Seattle-Denver voucher experiment* shows that the program increased the amount of training and education received. However, it also negatively affected earnings of those eligible to participate.[12] On the other hand, the evaluation of the Individual Training Account Experiment finds results similar to those from the Seattle-Denver voucher. Participants declared that having more choices as consequence of the program was an advantage but also that the program implies losses in terms of earnings.[13] There is also evidence on the effectiveness of vouchers for dislocated workers.[14] Evidence from the Trade Adjustment Assistance program also show that individuals receiving training had slightly lower wages than those who did not take training, but the difference was generally not statistically significant.[15] Meanwhile, the evidence

[12] The Seattle-Denver program was the largest and last of a series of experiments that were conducted in the 1960s and 1970s to learn about the feasibility and behavioral implications of a "negative income tax" program. Members of the treatment group were provided a guaranteed income and any income earned by the participants was taxed at a specified rate. The experiment involved almost 5,000 families. The families in the experimental groups were randomly assigned to one of the four basic combinations: (i) counseling only; (ii) counseling plus a 50 percent subsidy for the cost of any education or training; (iii) counseling plus a full subsidy for the cost of any education or training in which the person enrolled; and (iv) no treatment (see Dickinson and West (1983) for further details).

[13] The Individual Training Experiment Account was implemented to learn the relative effectiveness of individual training accounts, with different levels of control by local programs. See McConnell et al. (2006) for further details.

[14] In the USA the terms "dislocated workers" and "displaced workers" are use synonymously. Displaced workers refers to workers 20 year of age and older who have lost or left their jobs because their company closed or moved, there was insufficient work for them to do, or their position or shift was abolished.

[15] The Trade Adjustment Assistance program was established in 1962 to provide financial assistance and training to workers who lost jobs as results of imports. See Corson et al. (1993), for further details about the evaluation of this program.

from the voucher program funded by Allegheny County, Pennsylvania finds that the program increased earnings by about 6.3 percent.[16]

For Switzerland, Schwerdt et al. (2011) evaluates the effects of a randomized intervention issuing vouchers for adult education. The paper finds no significant average effect of the program on earnings, employment, and subsequent education one year after the treatment. However, they find evidence of heterogeneous effects: among the group of individuals changing their participation decision in adult education in response to the voucher, substantially more individuals are highly educated rather than lower educated. On the other hand, returns to adult education, in terms of future earnings, are higher for individuals with low education than for individuals with more education.

For Germany, Rinne et al. (2008) analyzes the impact of the Hartz reform implemented in 2003, which introduced training vouchers and imposed more selective criteria on the applicants. Using rich administrative data and applying matching and regression methods, the paper first estimates the overall reform effect and then decomposes it into a voucher effect and an assignment effect. The authors find positive effects of the voucher on employment, measured 6 and 12 months after starting in the program. Also for Germany, Doerr et al. (2012) estimate the average causal effect of the voucher on the employment probability and monthly earnings for individuals who were awarded a voucher. The authors find positive effects on employment and earnings after a long lock-in period of three years. Their results indicate that after four years of being awarded a training voucher, recipients are, on average, 3.5 percentage points more likely to be employed and earn 50 Euro more per month than comparable non-recipients.

As mentioned above, experiences of labor training vouchers programs in developing countries are scarce. In Kenya, the World Bank launched a training voucher program for entrepreneurs in micro- and small-scale informal businesses (MSEs). The voucher covered up to 90 percent of the cost of skill and management training. Results from an ex-post evaluation, which surveyed over 300 training providers and MSE trainees, show that the program increased training but the impact of training was modest. A large share of the voucher subsidy was captured by the training providers rather than the trainees. Moreover, many trainers returned to their previous activities once the subsidies ended (Hallberg, 2006). Similarly, a program

[16] This program targeted dislocated workers. See Bednarzik and Jacobson (1996) for further details.

implemented in Paraguay in 1995 increased the demand of training (Schor and Alberti, 1999).[17] Unfortunately, these two studies do not analyze the effect of the voucher on workers' labor outcomes.

In summary, the empirical literature presented above shows mixed results of the impact of the training vouchers on educational and labor market outcomes. Furthermore, the magnitude of the impacts is generally small. In particular, it is unclear whether a training voucher scheme is more efficient than a scheme where the assignments of training are made by the government or its agents, or than any other active labor market policy.

3. The *Bono Trabajador Activo*

Despite the significant economic development observed in Chile during the last decades, inequality is still persistent in the country. Chile has the most unequal distribution of income among the OECD countries (OECD, 2012), and one similar to the average of the Latin-American region (Lustig, 2010).[18] The main source of household income (80 percent) in Chile comes from labor income (CASEN, 2009), which suggests that this is an important component related to inequality in the country. Moreover, workers in Chile present an important deficit of basic skills. For instance, according to Microdatos[19], in 2013, 44 percent of adults were functional illiterate (42 percent in reading comprehension and 51 percent in basic quantitative skills). There is a consensus in Chile that investing in human capital accumulation and productivity would lead at improving the labor conditions of workers and achieving the living standards of developed countries (*Consejo de Equidad*, 2008).

At the beginning of 2011, Chile implemented the *Bono Trabajador Activo* (BTA) with the objective of addressing the low levels of employability of particular groups of workers and improving their access to better quality jobs. The BTA consists of a public grant allowing workers to freely choose labor training according to their preferences from a set of possible choices. The BTA is managed by SENCE and the training courses take place at Technical

[17] The Training Voucher Program in Paraguay works as following: entrepreneurs obtain vouchers in government offices and attend to the training courses of their choice. Courses are paid with the vouchers and with an individual contribution. The only restriction on the choice of training course is that training has to be provided by a institution recognized by the Program.

[18] While the average Gini index among the OECD countries is 0.32, the one of Chile is 0.52. On the other hand, the average Gini of Latin America is 0.51.

[19] "Study of Basic Skills of Adult Population (2013)", available at: http://www.estudiocompetencias.ccc.cl/

Training Organizations (OTECs). By design, the BTA voucher funds courses lasting, on average, 6 months.[20] Moreover, applicants have to accomplish the following eligibility requirements to receive the BTA: be employed; be aged between 18 and 60 years (women) and 65 years (men); have contributed at least 12 months (continuously or discontinuously) during their professional lives; have contributed at least 6 months (continuously or discontinuously) during the year previous to application; and, have, on average, a monthly gross wage lower than USD 1,200 (CLP 600,000).[21] Administrative data from different public institutions (Civil Registry and Identification Service; Social Welfare Institute; Unemployment Fund Administrator; among other sources) allow the verification of the above information.[22]

In general, the maximum BTA voucher funding corresponds to USD 800 (approximately CLP 400,000) per beneficiary. For more expensive courses, the funding might increase up to USD 1,000 (CLP 500,000). Before the training starts, the beneficiary is asked to pay 20 percent of the total course fees. This initial copayment is designed as a guarantee, which is reimbursed to the beneficiary at the end of the course if he/she attends to at least 75 percent of the training, passes the course, and completes a satisfaction survey.[23] If these conditions are not met, the OTEC may retain the copayment.

Originally, the BTA planned on sorting eligible workers following an employability index (EI):

$$IE_i = \bar{S}_i \frac{Months_t}{12} \quad (1)$$

[20] This might vary with the type and number of hours of the training chosen. Although the design considered an average duration of courses of six month, in practice, the average length of the courses is 3 months, as shown in Figure 6A in the Appendix.
[21] Average calculated over the last 12 months previous to the application.
[22] The employment status data of the applicants is verified through administrative data from de Ministry of Labor. Although the data verification process, delays in updating administrative data might allow unemployed workers to receive the BTA even though they are unemployed.
[23] After completing the course, students are obliged to answer a satisfaction survey. The survey is filling-in on-line on the SENCE's website. In 2012 and 2013 the surveys were not conducted, because of problems in its implementation.

Where $\bar{S}_i$ is the average monthly earnings in the 12 months previous to the application.[24] *Months* is the number of months with formal employment on the 12 months-period before the application. By design, eligible workers were expected to be sorted by this index giving priority to receive the voucher to those with lower scores, but, in practice the IE were never used. Although the IE was designed as a targeting mechanism, it was not used during the first year of the program because the program's administration expected a low demand for vouchers. Instead, all eligible applicants were awarded training vouchers, on a first come first served basis, subject to availability of places in each course. This feature has a direct impact on the evaluation methods to use, as we discuss later in the paper.

3.1 Voucher Recipients

According the Ministry of Labor and Pensions, in 2011, there were 205,823 applicants meeting the minimum BTA eligibility requirements. As mentioned above, all applicants accomplishing the application requirements had the same probability of receiving a voucher and follow training, subject to the availability of spots on each course. This section describes some main characteristics of the eligible applicants in 2011.

The applicants are mostly Chilean (99 percent). Male participation is larger than female participation (54 and 46 percent, respectively, as shown in Table 1A, in the Appendix). On average, applicants are 34 years old and no large differences by gender are evident. Regarding their education level, most applicants have completed secondary education, either the regular Scientific-Humanist track or the vocational Technical-Professional track (21.2 and 36.8 percent, respectively).[25] The BTA seems to be a less attractive option for workers with higher education levels; only 20 percent of applicants have tertiary education (Table 2A, in the Appendix).

The most demanded areas of interest correspond to skilled white-collar jobs, as Administration (25 percent) and Computer and Software (13 percent). In contrast, courses related to primary activities are less demanded (Agriculture, Construction and Mechanics), as shown in

[24] This average is represented in *Unidad 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.

[25] Secondary education in Chile is divided in the following four-year tracks: Scientific-Humanist (regular), Technical-Professional (vocational) and Artistic. Schools offering Technical-Professional programs are denominated: Industrial schools (electricity, mechanics, electronics, and informatics, among others), Commercial schools (management, accountancy, secretary and similar), Technical schools (fashion, culinary, nursery and the like), and Polyvalent schools (offering careers of more than one of those listed above).

Figure 1A, in the Appendix. [26] While there are no significant differences in the age of applicants to different courses, there is evidence of gender specialization (Figure 2A, in the Appendix).

Even though all applicants were supposed to fulfill the eligibility requirements described above, we find some contrasting evidence in the data (Figure 3A, in the Appendix). Regarding the employment status requirement, Figure 3A shows that only 85 percent were actually employed at the time of the application. Moreover, 7 percent of the applicants had contributed fewer than 6 motnhs in the 12 month period before applying; and, 3 percent had contributed fewer than 12 times along their career. Regarding earnings, 5 percent of applicants have average earnings greater than USD 1,200 (CLP 600,000) in the last 12 months before applying to the BTA. Finally, in very few cases (0.1 percent) the applicants were not in the age range established by the program.

Despite the fact that all applicants fulfilling the eligibility requirements were offered a voucher, only 25 percent enrolled in a training course. Among those who were offered a voucher but did not use it are: (i) those who were not able to enroll in an OTEC given the existing places for each region; (ii) those who decide not to enroll because the course of their choice was not available; and (iii) those who did not enroll in an OTEC for any other unknown reason.

Therefore, given that all eligible applicants were offered a voucher, our definition includes in the treatment group only those applicants who were awarded a BTA voucher and enrolled in a training course. In contrast, it includes in the control group those applicants who were awarded a voucher but did not take any training course. Unfortunately, we do not have data on dropouts from training.[27] Therefore, it is possible that the treatment group includes individuals who started but did not complete the training courses. If this is the case our estimates would represent lower bound estimates of the real impact of the BTA.

4. Empirical Strategy

This section presents the empirical strategy for estimating the effect of the training voucher on the labor supply of workers. The non-experimental feature of the data determines the methodology to use. We use OLS and Propensity Score Matching (PSM) to evaluate the effect of

[26] Women are mainly represented in courses in Administration (66%), Commerce and Financial services (67%), Services (61%), and Tourism and Language (64%). Contrarily, men are mainly represented in courses related to Agriculture (61%), Construction (92%), Mechanics (97%), Mining (87%), and Transport (89%)

[27] The data are not available for the entire sample.

the voucher on employment, earnings, and the probabilities of changing jobs and economic sector.

The OLS (difference in difference approach), allows us to control for unobservable characteristics (e.g. ability, motivation) that might affect both participation in the treatment and the labor outcome. If these characteristics are time-invariant our estimates are unbiased. On the other hand, to take into account that participation into the program might be explained by observables characteristics, we control for selection bias through PSM. However, as it is well known, the PSM does not solve the problem of selection based on unobservable characteristics. The rest of this section describes in detail both methodologies.

4.1 Regression Analysis

We start estimating the effect of the BTA using the following OLS model:

$$y_{i,t} = \alpha + \beta D_{i,t} + \delta X_{i,t} + \gamma L_{i,t-1} + \tau_i + \gamma_t + \mu_{i,t} \quad (2)$$

Where $y_{i,t}$ is the outcome of interest for individual i in month t. As discussed above, the dependent variables considered in this paper are employment, monthly earnings and the probabilities of changing sector and job. $X_{i,t}$ is a vector of time-variant individual characteristics (age). $L_{i,t-1}$is a vector of individual labor history at month $t-1$ (months worked at $t-1$, average monthly income at $t-1$). On the other hand, τ_i is the individual fixed effect and γ_t is the time fixed effect (month). D_i is a dummy indicator for whether individual i had training voucher since the month t.[28]

Assuming that (i) there is no selection on unobservable characteristics; (ii) the treatment effect is homogeneous; and, (iii) the outcome and covariates have a linear relationship, the coefficient β in equation (2) represents the impact of the BTA.

The parameter of interest, β, in equation (2) is estimated by OLS. The key identifying assumption is that, in the absence of the BTA, changes in earnings, employability, and the probability of changing sectors or jobs would not systematically be different between workers in

[28] The D_i indicator activates (i.e. takes the value 1) when the worker starts training and last until August 2013 (the last month of the estimation).

the treatment and control groups. Under this assumption, the parameter of interest β represents the average effect of BTA on trained workers compared to workers who did not participate in the program. We also, explore heterogeneous effects by gender, age (younger or older than 35 years old) and education (more than secondary education and less of secondary education).

4.2 Propensity Score Matching

We also apply Propensity Score Matching (PSM) techniques to estimate the impact of the BTA voucher. Ideally, to evaluate the effect of the BTA one would compare the outcome with treatment y_1 and the one without treatment y_0, for the same worker. However, at a particular point in time a worker can only be observed in one of the two states. Therefore, to explore the treatment effect it is necessary to infer the outcome that a treated individual would have obtained if he would not had received treatment.

We use $D = 1$ to denote that a worker receives the treatment and $D = 0$ if he does not receive it. Then, the observed outcome for a particular worker is:

$$y_i = D_i y_{i,1} + (1 - D_i) y_{i,0} \tag{3}$$

While the distributions of the outcomes $F(y_1 \mid x, D = 1)$ and $F(y_0 \mid x, D = 0)$ are observed from the data, the joint distributions $F(y_1, y_0 \mid x, D = 1)$, $F(y_1, y_0 \mid x)$ and the distribution of the impact $F(y_1 - y_0 \mid x, D = 1)$ are not. Therefore, research is based on estimating characteristics of the distribution of impact, such as the mean. A common parameter of the distribution of the impact to estimate is the average of the treatment on the treated (ATT), which is calculated as:

$$ATT = E(y_{i,1} - y_{i,0} \mid D_i = 1) \tag{4}$$

The matching techniques assume that there is a set of observable characteristics (Z), such that:

$$E(y_{i,0} \mid Z_i D_i) = E(y_{i,0} \mid D_i = 0) = E(y_{i,0} \mid Z_i) \tag{5}$$

That is, one should ensure that individuals in the control $(D=0)$ and treatment $(D=1)$ groups are comparable prior to the application of the treatment or, alternatively that the expected outcome without treatment for both groups would be equal, conditional on Z.

If it is also found that $\Pr(D=1|Z)<1$, the problem of program evaluation can be resolved substituting the observed distribution of y_0 for comparable individuals in Z that did not receive the treatment as a counterfactual approach of treated individuals. Given this, the average effect on the treated is:[29]

$$ATT = E(y_{i,1} - y_{i,0} \mid D_i = 1) = E(y_1 \mid D_i = 1) - E_{Z|D=1}\left\{E_y(y \mid D = 0, Z)\right\} \tag{6}$$

Rosenbam and Rubin (1983) show that for two random variables Y and Z and a discrete variable D:

$$E(D \mid Y, P(D=1 \mid Z)) = E(E(D \mid Y, Z) \mid \Pr(D=1 \mid Z)) \tag{7}$$

Thus,

$$E(D \mid Z) = E(D \mid Z) \Rightarrow E(D \mid Y, \Pr(D=1 \mid Z)) = E(D \mid \Pr(D=1 \mid Z)) \tag{8}$$

In this way, if the result y_0 is independent from the status in the treatment conditional on Z, it also is conditional on dependents to the probability of participation $P(Z) = \Pr(D=1 \mid Z)$. As a result, the problems of dimensionality associated with the conditioning on Z are resolved conditioning on the propensity score. [30]

[29] The term $E_{Z|D=1}$ indicates that the expression is taken over the density $f(Z \mid D=1)$

[30] This problem emerges, for example, in the case of having a large number of discrete variables in the vector Z, as it is possible for cells with very few observations to appear, which has a negative impact on the estimate.

We use a Kernel method to build the control group[31] and define four different bandwidths a_n (0.2, 0.3, 0.4, and 0.5). Also, we use the Epanechnikov Kernel as function $G(s)$.[32] Moreover, we explore for the presence of heterogeneous effects of the BTA voucher by gender, age and education.

However, it is important to note that our PSM estimates might be biased under certain conditions. First, PSM assume conditional independence, that is, selection bias is eliminated controlling by observables. As we mentioned above, the assignment of vouchers was on a first come first served basis, subject to available vacancies in each course. Therefore, unobservable characteristics may play a critical role in explaining the training choice, such workers' ability or motivation which we do not observe. On the other hand, as we also mention above, our treatment group might include individuals who were awarded a voucher but have not completed the training courses. If these workers are less skilled or less motived, our estimates might represent underestimated effects of the impact of the voucher. Given this latter feature of the data, it is important to note that our estimates correspond to average intent to treat effect (AIT) instead of average effect on the treated (ATT).[33]

5. Data and Summary Statistics

This section provides descriptive statistics on individual characteristics and the outcome variables. We use data from different sources to estimate the effect of the BTA on labor market outcomes. First, we use administrative data from SENCE containing information on BTA beneficiaries. Second, we use data from the Chilean Unemployment Insurance System (UI),

[31] The Kernel method, $\hat{E}\left(Y_{0it} - Y_{0it'} \mid D=1, P_i\right)$ is constructed as $W(i,j) = \dfrac{G\left(\dfrac{P_j - P_i}{a_n}\right)}{\sum_{k \in I_0} G\left(\dfrac{P_k - P_i}{a_n}\right)}$.

[32] Pagan and Ullah (1999) argue that the parameter (a_n) determines the trade-off between the bias and the variance in the estimate of the conditional moment. Thus, for values greater than the bandwidth, the variance is expected to be lower but the bias is expected to be greater. This justifies that the choice of (a_n) is more relevant for the estimation than the choice of $G(s)$, which in turn leads us to perform a sensitivity analysis with the bandwidth values but to only use a Kernel function.

[33] AIT is a lower bound estimate of the impact of the program. In fact, ATT=AIT/(% of enrolled worker who took a training course).

which is administered by the Unemployment Fund Administrator, and contains data of all formal dependent workers since 2002.[34]

The administrative data from SENCE contains historical information on BTA beneficiaries since 2011. For every voucher received, it is possible to identify the starting and ending dates and the hours of the corresponding training. Figure 4A, in the Appendix, shows the distribution of the starting and the ending months of training courses. Most training courses started between August 2011 and May 2012 (98 percent) and finished between October 2011 and July 2012 (95 percent). Moreover, the average length of the training courses was three months (Figure 5A, in the Appendix).

The UI is a detailed administrative dataset containing, at August 2013, information of gross monthly earnings of 7,747,624 formal workers since October 2002. It also contains information of individuals' (gender and age) and firms' characteristics (economic activity, number of dependent workers, county and region).

In the treatment group we only include those applicants who received a BTA voucher and were enrolled in a training course. In contrast, workers in the control group are those applicants who were awarded a voucher but did not take a training course. The time spam of our evaluation corresponds to the period between July 2011 and August 2013. Thus, we can compare earnings and employment status in July 2011 (before treatment) and August 2013 (after treatment).

Combining the UI and the records of beneficiaries of the BTA, we ended up with a sample of 171,577 eligible workers. Out of them, 26 percent (44,153 workers) were enrolled in a training course in 2011 and form the treatment group. The remaining 74 percent (127,424 workers) form our control group, are those who were awarded a voucher but did not take a training course.[35]

Table 1, shows that workers in the treatment group are more likely to be employed and to change jobs and to change sector, are older, are mainly males, and have secondary education. Meanwhile, workers in the control group show higher earnings in August 2013, are less likely to

[34] The Unemployment Insurance is an individual saving account for each dependent worker. Both the worker and his employer contribute to this fund. The UI is supplement by the Solidarity Fund, which is financed by public and private (employers) contributions. The Unemployment Fund Administrator of Chile (AFC) is the private manager of the mandatory unemployment insurance.

[35] When merging these datasets 37,643 applicants of BTA were not found in the UI database. This may be due to the fact that the UI only captures labor histories of individuals with new contracts starting in October 2002. Thus, individuals whose contracts started before October 2002 are not in the UI.

change jobs or sectors, and are lower educated (concentrated in primary and secondary education) than those in the treatment group.[36]

Table 1: Descriptive Statistics

Variable	Treated Group	Control Group	Differences [a]
	Mean	Mean	
Employment [%], July 2011	0.86	0.85	0.01**
	(0.35)	(0.36)	(0.00)
Employment [%], August 2013	0.75	0.73	0.01**
	(0.00)	(0.00)	(0.00)
Earnings [CLP], July 2011	12.61	12.60	0.01*
	(0.54)	(0.56)	(0.01)
Earnings [CLP], August 2013	12.86	12.87	-0.01*
	(0.00)	(0.00)	(0.00)
Sector change (July 2011 to August 2013)	0.40	0.38	0.02**
	(0.00)	(0.00)	(0.00)
Job change (July 2011 to August 2013)	0.96	0.96	0.00*
	(0.00)	(0.00)	(0.00)
Months worked (before July 2011)	52.32	50.02	2.29**
	(26.34)	(25.85)	(0.14)
Average monthly income (before July 2011)	13.21	13.20	0.02**
	(0.61)	(0.64)	(0.00)
Age	33.80	32.85	0.95**
	(9.10)	(9.20)	(0.05)
Male	0.55	0.55	0.01**
	(0.50)	(0.50)	(0.00)
Primary education [%]	0.09	0.10	-0.01**
	(0.28)	(0.30)	(0.00)
Secondary education [%]	0.73	0.70	0.03**
	(0.44)	(0.46)	(0.00)
Tertiary education	0.19	0.20	-0.01**
	(0.39)	(0.40)	(0.00)
Migrant	0.01	0.01	0.00**
	(0.00)	(0.00)	(0.00)

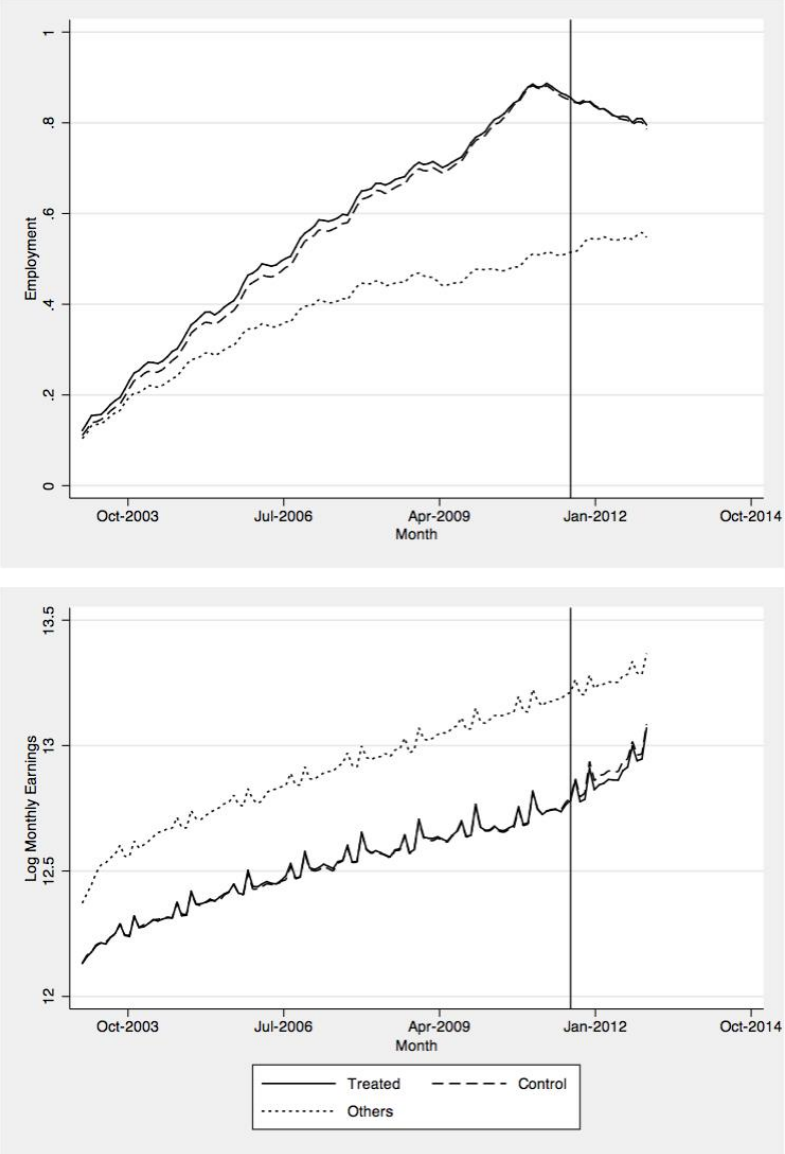
Note: a. t-test on the equality of means between control and treatment groups
b. Standard deviation in parentheses **Significant at 1%, *Significant at 5%,

Finally, Figure 1 shows the evolution of employment and monthly earnings since January 2003 to August 2013 for individuals in the treatment, control groups and the others workers, who are not in the control and treatment groups. This Figure shows the trends in employment and

[36] The t-test for differences in mean are calculated for variables at the baseline (June 2011). Additionally, it is important to note that the large sample size makes even small differences in magnitude to become statistically significant.

monthly earnings before the start of the implementation of the BTA (August 2011) to explore if there are pre-exiting trends in the treatment and the control groups. Figure 1 shows that both groups follow similar trends in employment and monthly earnings before the implementation of the BTA and small differences after de implementation of the BTA, which reflects that our results can be attributable to the BTA and not to pre-existing trends.

Figure 1: Employment and Monthly Earnings (January 2003- August 2013)



Source: Authors' estimates bases on administrative data from SENCE.
Notes: a: Line in the graph represents the start of the courses August 2011
b: Others are those worker in the UI who are not in the treated or control group.

6. Results

This section reports and discussed the effect of the BTA voucher on worker's employment and earnings, and the probabilities of changing jobs and economic sector. As discussed above, two main approaches are used: (i) OLS and (ii) Propensity Score Matching.

6.1 OLS

We start running OLS regressions for equation (2). We present estimates of the impact of the BTA on the probability of being employed, monthly earnings, the probability of changing economic sector and the probability of changing job. The results of these regressions are displayed in Table 2**.**

Table 2: (OLS) Effects of the BTA, All workers

	Employment	Income	Sector	Job
BTA	0.009**	-0.002	-0.049**	0.000
	(0.001)	(0.001)	(0.001)	(0.000)
Months worked (t-1)	-0.007**	0.010**	0.017**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)
Average monthly income (t-1)	0.14**	0.288**	-0.027**	0.018**
	(0.000)	(0.001)	(0.000)	0.000)
Age	0.01**	-0.004**	-0.07**	-0.013**
	(0.001)	(0.001)	(0.001)	(0.001)
Age 2	0.00**	0.000**	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.104**	8.985**	1.719**	0.901**
	(0.017)	(0.028)	(0.023)	(0.012)
R2	0.08	0.11	0.06	0.00
Individual Fixed Effect	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes
Observations	2,601,964	2,860,760	2,860,760	2,860,760

Source: Authors' estimates bases on administrative data from SENCE and the Unemployment Insurance System
a.Standard deviation in parentheses **Significant at 1%, *Significant at 5%,

As we mentioned above, our primary interest lies in the estimate of coefficient β, which represents the impact of the BTA. Table 2 shows a positive impact of the BTA voucher on employment and no impact on earning and the probability of changing job. After starting the training, the probability of being employed for workers taking the training courses is one percentage point higher than the for BTA eligible workers who did not take the training. On the other hand, Table 2 shows that the BTA decreases the probabilities of changing economic sector.

Table 3: (OLS) Effects of the BTA, by Gender

	Males				Females			
	Employment	Income	Sector	Job	Employment	Income	Sector	Job
BTA	0.006**	-0.003	-0.046**	-0.001*	0.013**	-0.001	-0.052**	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Months worked (t-1)	-0.007**	0.011**	0.017**	0.001**	-0.008**	0.008**	0.018**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Average monthly income (t-1)	0.125**	0.291**	-0.027**	0.023**	0.160**	0.282**	-0.027**	0.011**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Age	0.017**	-0.006**	-0.073**	-0.017**	0.000	-0.002	-0.064**	-0.007**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Age 2	0.000**	-0.001**	0.000*	0.000**	0.000**	0.00**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.072**	9.022**	1.728**	0.917**	-1.169**	8.967**	1.697**	0.890**
	(0.022)	(0.039)	(0.030)	(0.016)	(0.027)	(0.040)	(0.034)	(0.017)
R 2	0.07	0.11	0.05	0.01	0.09	0.11	0.06	0.00
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,740,698	1,621,600	1,621,600	1,621,600	1,344,005	1,239,160	1,239,160	1,239,160

Source: Authors' estimates bases on administrative data from SENCE and the Unemployment Insurance System
a. Standard deviation in parentheses **Significant at 1%, *Significant at 5%,

Table 3 explores heterogeneous impact of the BTA voucher by gender. The effect of the BTA on female employment is qualitatively larger than the one for males. The others columns suggest that qualitatively there are no differences in the impact of the program by gender in income and the probability of changing economics sector. Meanwhile, there is a decrease in both group of 0.5 percent in the probability of changing job. There is no significant impact of the BTA on incomes in both groups. On the hand, the BTA have a negative and significant effect on the probability of changing job for men and no significant impact for women.

Table 4: (OLS) Effects of the BTA, by Age

	Under 35 years old				35 year old and older			
	Employment	Income	Sector	Job	Employment	Income	Sector	Job
BTA	0.009**	-0.001	-0.045**	-0.001	0.008**	-0.002	-0.056**	0.000
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Months worked (t-1)	-0.008**	0.011**	0.017**	0.001**	-0.006**	0.009**	0.019**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Average monthly income (t-1)	0.139**	0.287**	-0.028**	0.017**	0.138**	0.273**	-0.021**	0.020**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Age	0.000	-0.024**	-0.066**	-0.005**	0.016**	-0.005	-0.080**	-0.021**
	(0.002)	(0.004)	(0.003)	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)
Age 2	0.000**	0.000**	0.000	0.000	0.000**	0.000**	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.882**	9.141**	1.325**	0.762**	-1.291**	9.362**	2.513**	1.169**
	(0.032)	(0.054)	(0.042)	(0.021)	(0.049)	(0.078)	(0.067)	(0.036)
R2	0.08	0.11	0.05	0.00	0.07	0.10	0.06	0.01
Individual Fixed Effect			Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,931,075	1,779,623	1,779,623	1,779,623	1,153,628	1,081,137	1,081,137	1,081,137

Source: Authors' estimates bases on administrative data from SENCE and the Unemployment Insurance System
a. Standard deviation in parentheses **Significant at 1%, *Significant at 5%,

On the other hand, Table 4 shows the impact of the program by age. The results again show similar effects of the BTA for younger and older than 35 years workers. There is a significant and positive effect of 1 percent increase on the probability of being employed for younger and older worker. There are no significant effect on earning and probability of changing job for both groups. Also, there is a negative and significant effect on the probability of changing economic sector for older and younger workers.

Table 5: (OLS) Effects of the BTA, by Education

	High Education				Low Education			
	Employment	Income	Sector	Job	Employment	Income	Sector	Job
BTA	0.009**	-0.002	-0.049**	0.000	0.011**	-0.007	-0.047**	-0.007**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.003)	(0.005)	(0.004)	(0.002)
Months worked (t-1)	-0.007**	0.010**	0.017**	0.002**	-0.006**	0.009**	0.017**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Average monthly income (t-1)	0.140**	0.291**	-0.028**	0.018**	0.133**	0.249**	-0.015**	0.025**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)	(0.002)	(0.001)
Age	0.010**	-0.004**	-0.070**	-0.011**	0.004	-0.013*	-0.064**	-0.019**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.005)	(0.004)	(0.002)
Age 2	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.109**	8.941**	1.717**	0.892**	-0.817**	9.660**	1.715**	0.924**
	(0.017)	(0.029)	(0.023)	(0.012)	(0.072)	(0.123)	(0.095)	(0.057)
R2	0.08	0.11	0.06	0.00	0.07	0.08	0.05	0.01
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,856,971	2,652,628	2,652,628	2,652,628	227,732	208,132	208,132	208,132

Source: Authors' estimates bases on administrative data from SENCE and the Unemployment Insurance System
a. Standard deviation in parentheses **Significant at 1%, *Significant at 5%,

Table 5 explores heterogeneous impacts of the BTA voucher by education. For this, we define a dummy variable for whether the worker has at least secondary education.[37] The results show that the BTA has a significant and positive effect on employment and no significant effect on earnings for both groups (higher and lower education groups). Also the results indicate that the BTA has a negative and significant effect on the probability of changing economics sector for both groups. Finally, the BTA has a negative and significant effect on the probability of changing for those workers with lower education, while there no significant effect on the probability of changing job for high educated workers.

[37] In Table 4A, in the Annex, we also estimate the effect of the BTA by education and gender.

6.2 Propensity Score Matching (PSM)

We also use the Matching estimator described above to estimate the average effect of the BTA training voucher on labor market outcomes.

Table 5A in the Appendix shows the estimated probability of participation in the BTA program. There is a significant and positive correlation of working experience (number of months), age, secondary education, expectations of changing economic sector and migrant status and the probability of participation in the program. Moreover, workers with primary education are, relative to workers with tertiary education, less likely to participate in in the program. Finally, there is no significant association of participation and individual average income.[38]

Table 6 displays the results of the matching exercises described above. We find a significant and positive effect of the program on employment and the probabilities of changing jobs and sector. On the other hand, the results indicate that there is no significant effect of the program on earnings.

Table 6 (PSM) Effects of the BTA, All workers

	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	0.006*	0.006*	0.007*	0.007*
	(0.003)	(0.003)	(0.003)	(0.003)
Earnings (Ln)	-0.005	-0.007	-0.007	-0.007
	(0.004)	(0.004)	(0.004)	(0.004)
Sector change	0.025**	0.024**	0.024**	0.024**
	(0.004)	(0.004)	(0.004)	(0.004)
Job change	0.005**	0.005**	0.005**	0.005**
	(0.00)	(0.00)	(0.00)	(0.00)

Note: t-statistics in parentheses **Significant at 1%, *Significant at 5%,
Source: Authors' estimates bases on administrative data from SENCE and Unemployment Insurance System

Table 7 shows the results of the matching by gender. First, for males the results indicate no effect of the BTA voucher on employment, while there is a positive and significant effect on females. On the other hand, the results show a negative and significant effect of the voucher on earnings for males and no significant effect for women. Also, there are significant and positive

[38] Common support is display en Figure 6A, in the Appendix.

effects on probability of change sector for both groups. Finally, there is a significant and positive effect on the probability of changing jobs for men and no significant effects for women.

Table 7: (PSM) Effects of the BTA, Male workers

	Males			
	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	0.002	0.002	0.002	0.002
	(0.490)	(0.004)	(0.004)	(0.004)
Earnings (Ln)	-0.010	-0.012*	-0.013*	-0.013*
	(0.006)	(0.006)	(0.006)	(0.006)
Sector change	0.026**	0.025**	0.025**	0.025**
	(0.005)	(0.005)	(0.005)	(0.005)
Job change	0.007**	0.007**	0.007**	0.007**
	(0.002)	(0.002)	(0.002)	(0.002)
	Females			
	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	0.001**	0.011**	0.011**	0.011**
	(0.005)	(0.005)	(0.005)	(0.005)
Earnings (Ln)	0.002	0.001	0.000	0.000
	(0.340)	(0.100)	(0.006)	(0.006)
Sector change	0.024**	0.022**	0.021**	0.021**
	(0.006)	(0.006)	(0.006)	(0.006)
Job change	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)

Note: : t-statistics in parentheses **Significant at 1%, *Significant at 5%,
Source: Authors' estimates bases on administrative data from SENCE and Unemployment Insurance System

Table 8 shows the effects of the BTA for older (35 or more) and younger workers. The results indicate that there is no effect of the program on earnings, employment and the probability of changing economics sector for older workers and positive and significant effect on the probability of changing jobs. In contrast, the program has significantly and positive effects on employment, and the probabilities of changing sector and jobs for younger workers. Similarly to older workers, the BTA does not affect the earnings of younger workers.

Table 8: (PSM) Effects of the BTA, by age

	Age>=35			
	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	0.000	0.001	0.001	0.001
	(0.005)	(0.005)	(0.005)	(0.005)
Earnings (Ln)	-0.002	-0.003	-0.003	-0.003
	(0.006)	(0.006)	(0.006)	(0.006)
Area change	0.025	0.025	0.025	0.025
	(0.006)	(0.006)	(0.006)	(0.006)
Job change	0.005*	0.005*	0.006*	0.006*
	(0.003)	(0.003)	(0.003)	(0.003)
	Age < 35			
	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	0.009*	0.009*	0.009*	0.009*
	(0.004)	(0.004)	(0.004)	(0.004)
Earnings (Ln)	-0.004	-0.005	-0.005	-0.005
	(0.006)	(0.006)	(0.006)	(0.006)
Area change	0.029**	0.029**	0.029**	0.029**
	(0.005)	(0.005)	(0.005)	(0.005)
Job change	0.006**	0.006**	0.006**	0.006**
	(0.002)	(0.002)	(0.002)	(0.002)

Note:: t-statistics in parentheses **Significant at 1%, *Significant at 5%,
Source: Authors' estimates bases on administrative data from SENCE and Unemployment Insurance System

Table 9 shows the effects of the BTA for higher and lower educated workers. The BTA does not affect workers' employment, earning and the probability of changing economic sector for lower educated workers. However, the program positively and significantly affects their probability of changing jobs. [39] For higher educated workers, the program positively affects their probability of being employed, and changing sector and jobs. In contrast, it has no effect on their earnings.

In summary, both the OLS and PSM estimations show that the BTA positively and significantly affects all workers employment but has no significant effect on their earnings. In contrast, the effects of the BTA on the probabilities of changing economic sector and jobs differ according to the empirical strategy used.

[39] Also Table 6A, in the Appendix, shows the result dividing the sample by gender and education

Table 9: (PSM) Effects of the BTA, by education

	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
High Education				
Employment	0.006	0.006*	0.006*	0.006*
	(0.003)	(0.003)	(0.003)	(0.003)
Earnings (Ln)	-0.005	-0.007	-0.007	-0.007
	(0.005)	(0.005)	(0.005)	(0.005)
Sector change	0.026**	0.025**	0.025**	0.025**
	(0.004)	(0.004)	(0.004)	(0.004)
Job change	0.004*	0.004*	0.004*	0.004*
	(0.001)	(0.001)	(0.001)	(0.001)
Low Education				
Employment	0.011	0.010	0.010	0.010
	(0.011)	(0.011)	(0.011)	(0.011)
Earnings (Ln)	-0.004	-0.007	-0.008	-0.009
	(0.016)	(0.016)	(0.016)	(0.016)
Sector change	0.010	0.008	0.007	0.007
	(0.014)	(0.013)	(0.013)	(0.013)
Job change	0.018*	0.018*	0.018*	0.018*
	(0.006)	(0.006)	(0.006)	(0.006)

Note:: t-statistics in parentheses **Significant at 1%, *Significant at 5%,
Source: Authors' estimates bases on administrative data from SENCE and Unemployment Insurance System

7. Concluding Remarks

Due to increasing workers' choices, vouchers are argued to create healthy competition between training providers. This might help to reduce inefficiencies in the delivery of training, improving labor market outcomes. However, publicly-funded vouchers might not lead to the maximization of social wellbeing in cases when individuals are poorly informed or when the training level maximizing individuals' well-being does not maximize the one of the society as a whole. Unfortunately, the existing empirical evidence on the effect of vouchers does not help to conclude whether the implementation of a training voucher is a better policy than other policies (e.g. programs where assignments to training are made by the government or its agents) mainly because results are mixed.

In addition to contributing to the scarce empirical evidence on the effects of training vouchers, particularly in developing countries, this paper is motivated by the fact that the *Bono Trabajador Activo* (BTA) has the second largest budget among the public training services offered in Chile. We consider that the magnitude of the program and the previous negative experience of educational voucher in the country support the evaluation carried out in this paper.

This paper examines the impact of a recently implemented training voucher program in Chile. Using a detailed administrative data from the SENCE and Unemployment Insurance System, we apply regression and propensity score matching techniques to evaluate the effects of the (BTA) on workers' earnings and employment.

Overall, our results indicate that in the short-run the BTA has significant impact on employment and no significant effect on earnings. We also find a negative effect on earnings for males and no significant effect for women. Another interesting finding is that the BTA seems to have a larger positive effect on female employment than on males. At the same time, the impacts of the BTA do not seem to vary greatly by age. On the other hand, the BTA seems to have a higher impact on high educated worker. In fact, there is a positive and significant effect on employment and the probabilities of changing economic sector and job. The BTA has only a positive and significant effect on the probability of changing job for workers with lower education.

The negative effect on males earnings are similar to previous evidence finding that individuals receiving training vouchers have slightly lower wages than those who did not take training (Dickinson and West, 1983; McConnell et al., 2006; Corson et al., 1993). It is however important to highlight that our results correspond to short-run estimates. In this regard, Doer et al. (2012) also find a negative effect of the voucher in the short-run but a positive and significant effect on earnings and employment after three years of the completion of training. According to the authors, in the short-run, the negative effect of the voucher could be the result of a lock-in period for participation in the program (i.e. individuals reduce the intensity of job searching or accepting job offers). Such effect could be neutralized in the long term. Unfortunately, we cannot measure the long-term effect of the voucher in this paper with the available data.[40] Other

[40] Our data contains information about earnings and employment until September 2012, that is, 5 months after finishing training, on average.

explanation, of the negative results in earning could be due because workers are changing jobs and sector.

Although, we have negative effect in the short-run on earning for males and no significant effect for women if the impacts of the BTA voucher will follow a similar pattern to those in Doer et al. (2012), we could expect that the BTA will have positive effects on workers' labor outcomes in the long-run. From a public policy perspective, what is now important to evaluate for Chile is whether the expected cost-effectiveness of the BTA justify continuing with the voucher program. This question is particularly interested given the existent empirical evidence about the effects of the voucher on workers' welfare and about the use of educational vouchers in the country. At this point of time and considering the small impacts of the BTA and its cost (US$32 million in 2011, being the second program in terms of budget of SENCE) the BTA seems not to be an efficient public program. Therefore, we argue that before continuing with the program as is designed now, it is recommendable to explore with larger detail which dimensions are missing or working wrongly in the program. In this process is necessary to disentangle between failures in design and implementation of the BTA. For instance, among the main implementation failures we distinguish: limited training menu for individuals; lack of mechanisms to incentive competition between OTECs; lack of vocational feedback and transmission of information to help individuals to take an informed decision about training.

Our main recommendations point towards: produce and bring information to individuals regarding costs and labor market returns of the training options, and quality and collocation rate of the OTECs, etc.; bring vocational support to individuals, particularly to those in larger disadvantage; verify the quality and pertinence of the training being offered by the OTECs; incentive competence among OTECs for public resources, according to their results; regulate the market of training providers to assure quality and pertinence of the training courses offered; test and evaluate any change to the current program before scaling it up.

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Appendix

Table 1A: Descriptive Variables of BTA Applicants

	All		Male		Female		Differences [a]
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Male %	54.35	49.81	-	-	-	-	-
Age	34.57	8.96	34.70	0.03	34.42	0.03	0 .28***
Migrant %	0.72	8.47	0.77	8.72	0.67	8.15	0.00**
Employed %	84.52	36.17	86.06	34.64	82.70	37.83	0.03***
Contribution (Last Year)	10.44	2.91	10.56	2.68	10.29	3.14	0.26***
Contribution (Along proffesional live)	67.69	28.06	72.02	27.57	62.52	27.76	9.50***
Wage	277836	131630	297730	132758	253670	126094	44.06***

Source: Authors' estimates bases on administrative data from SENCE

Note: a. t-test on the equality of means between control and treatment groups

Table 2A: Percentage of applicants by educational level

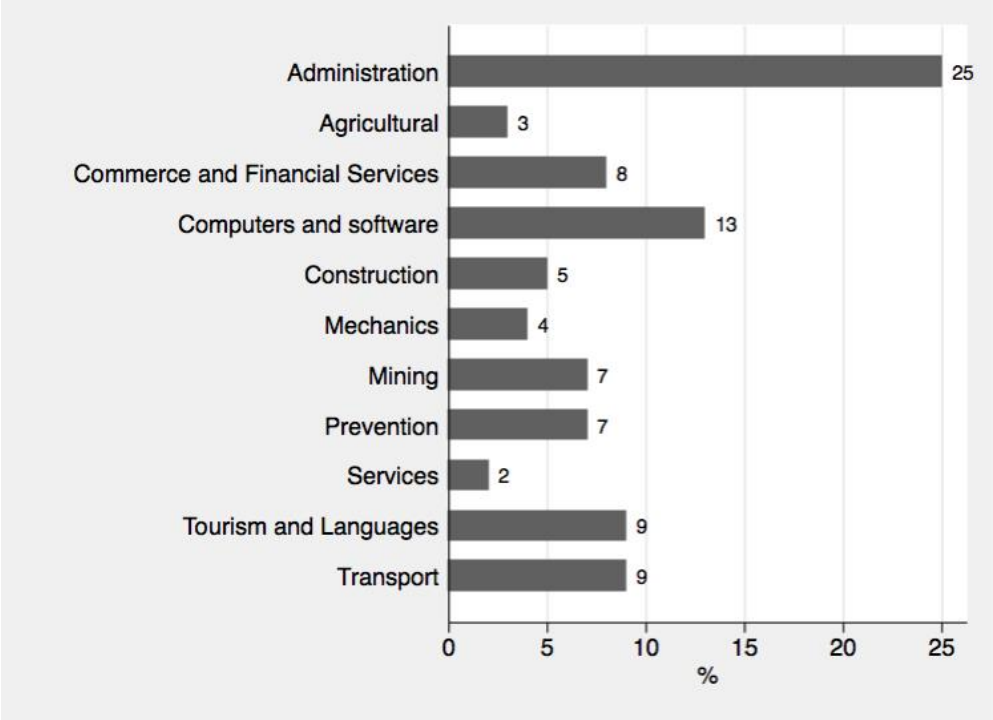
Educational Level	%
No Education	2.0
Incomplete Primary Education	1.3
Complete Primary Education	6.3
Incomplete Secondary Education (Scientific-Humanist)	6.2
Complete Secondary Education (Scientific-Humanist)	36.8
Incomplete Secondary Education (Technical-Professional)	6.6
Complete Secondary Education (Technical-Professional)	21.2
Incomplete Tertiary Education (CFT)	2.3
Complete Tertiary Education (CFT)	2.8
Incomplete Tertiary Education (IP)	2.1
Complete Tertiary Education (IP)	1.8
Incomplete Tertiary Education (University)	6.2
Complete Tertiary Education (University)	4.3
Total	100

Source: Authors' estimates bases on administrative data from SENCE

Note: a. Professional Institutes (IP)

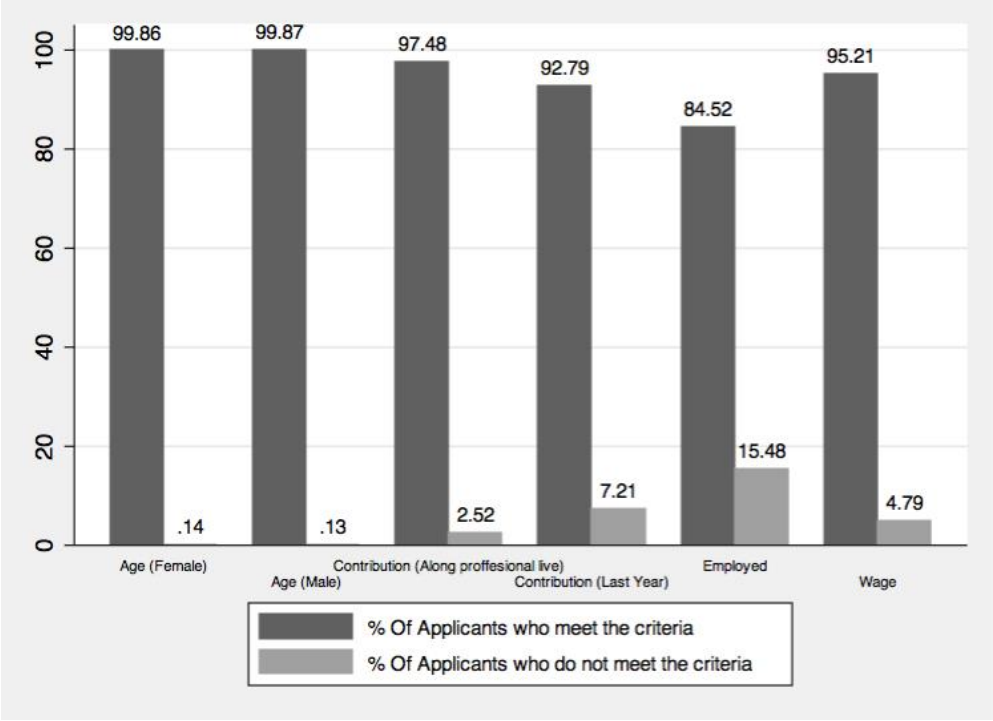
b. Technical Schooling Centers (CFT)

Figure 1A: Area of Interest (%)



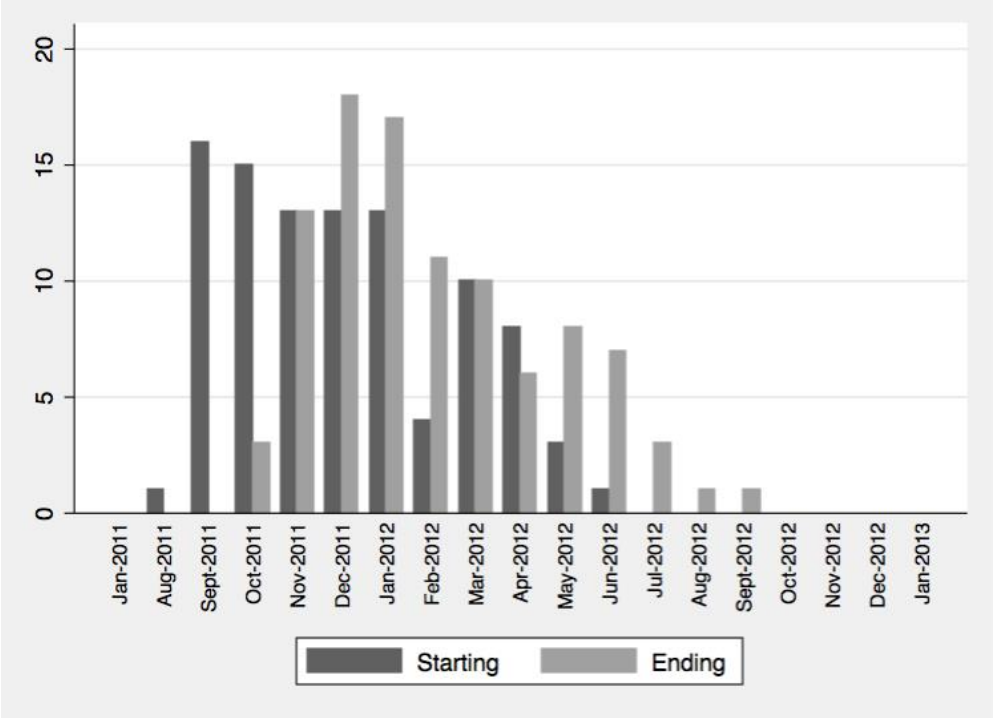
Source: Authors' estimates bases on administrative data from SENCE

Figure 3A: % of Applicants who meet the BTA eligibility criteria



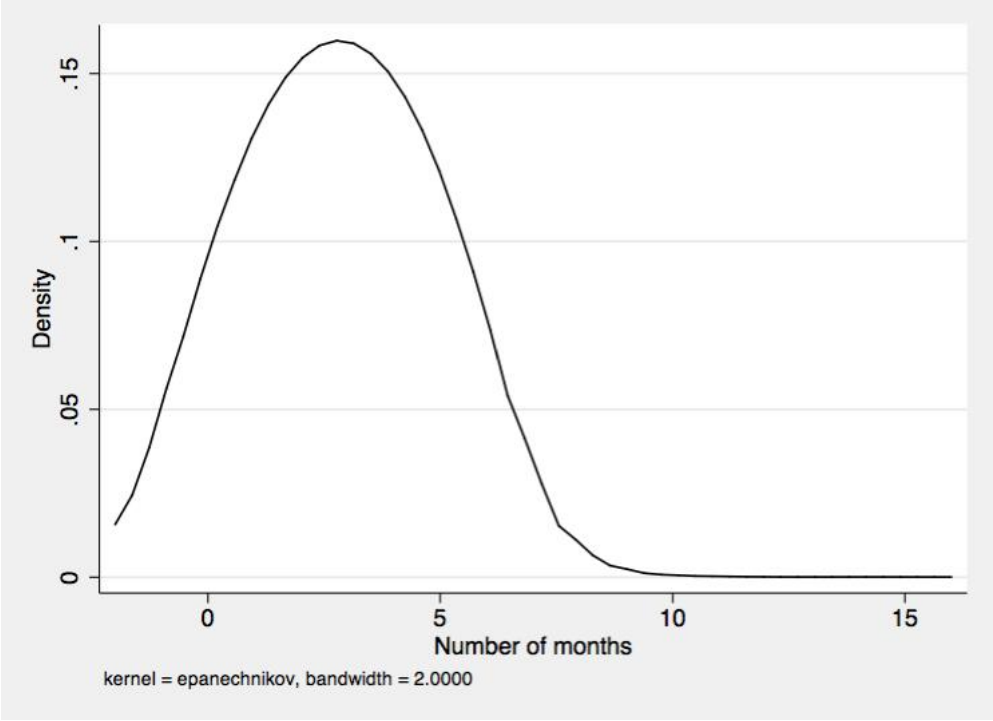
Source: Authors' estimates bases on administrative data from SENCE

Figure 4A: Distribution of the starting and ending month of the courses



Source: Authors' estimates bases on administrative data from SENCE

Figure 5A: Length of Training (Number of Months)-Kernel Density



Source: Authors' estimates bases on administrative data from SENCE

Table 3A: Variables Definition

Name of variable	Description	Source
Outcomes		
Earnings	Worker's monthly earnings	Unemployment Insurance
Employment	Dummy: 1 if the worker have an earnings record in a particular month, 0 otherwise	Unemployment Insurance
Sector change	Dummy: 1 if the worker change of sector 0 otherwise	Unemployment Insurance
Job change	Dummy: 1 if the worker change Job, 0 otherwise	Unemployment Insurance
Voucher	Dummy: 1 if the worker was awarded with the BTA, 0 otherwise	Administrative data from SENCE
Control Variables		
Age	Worker's age	Administrative data from SENCE
Male	Dummy: 1 if the worker is male, 0 otherwise	Administrative data from SENCE
Moths Worked	Number of months worked	Unemployment Insurance
Average monthly income	Sum of the incomes in the months worked divided by the total number of months worked	Unemployment Insurance
Primary education	Dummy: 1 if the worker has primary education (complete or incomplete), 0 otherwise	Administrative data from SENCE
Secondary education	Dummy: 1 if the worker has secondary education (complete or incomplete), 0 otherwise	Administrative data from SENCE
Tertiary	Dummy: 1 if the worker has tertiary education (complete or incomplete), 0 otherwise	Administrative data from SENCE
Migrant	Dummy: 1 if the worker is inmigrant, 0 otherwise	Administrative data from SENCE
Area of interest	Dummies variables that indicate the area of the courses to which individuals are applying	Administrative data from SENCE
Type of job	Dummies variables that indicate the kind of job of the individuals at the time of the application program	Administrative data from SENCE

Table 4A: (OLS) Effects of the BTA, by Education and Gender

Males								
	High Education				Low Education			
	Employment	Income	Sector	Job	Employment	Income	Sector	Job
BTA	0.006**	-0.002	-0.046**	0.000	0.005	-0.007	-0.049**	-0.016**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)	(0.006)	(0.004)	(0.003)
Months worked (t-1)	-0.007**	0.011**	0.017**	0.001**	-0.007**	0.009**	0.017**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Average monthly income (t-1)	0.126**	0.293**	-0.028**	0.022**	0.124**	0.265**	-0.017**	0.030**
	(0.000	(0.001)	(0.001)	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Age	0.017**	-0.007**	-0.073**	-0.015**	0.012**	-0.006	-0.071**	-0.026**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.004)	(0.006)	(0.005)	(0.003)
Age 2	0.000**	-0.001**	0.000*	0.000**	0.000**	0.000**	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.071**	9.003**	1.717**	0.898**	-0.943**	9.355**	1.781**	0.943**
	(0.023)	(0.040)	(0.031)	(0.017)	(0.084)	(0.151)	(0.112)	(0.070)
	0.07	0.12	0.05	0.00	0.06	0.08	0.05	0.01
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,587,524	1,481,145	1,481,145	1,481,145	153,174	140,455	140,455	140,455
Females								
	High Education				Low Education			
	Employment	Income	Sector	Job	Employment	Income	Sector	Job
BTA	0.013**	0.000	-0.053**	0.000	0.023**	-0.008	-0.041**	0.013**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.005)	(0.008)	(0.006)	(0.004)
Months worked (t-1)	-0.008**	0.008**	0.018**	0.002**	-0.006**	0.008**	0.017**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Average monthly income (t-1)	0.160**	0.286**	-0.028**	0.011**	0.154**	0.207**	-0.009**	0.012**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.002)	(0.004)	(0.003)	(0.002)
Age	0.000**	-0.001	-0.065**	-0.007**	-0.014*	-0.033**	-0.046**	-0.003
	(0.001)	(0.002)	(0.002)	(0.001)	(0.006)	(0.009)	(0.007)	(0.004)
Age 2	0.000**	0.000**	0.000**	0.000	0.000**	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.178**	8.893**	1.708**	0.894**	-0.517**	10.533**	1.491**	0.871**
	(0.027)	(0.041)	(0.035)	(0.017)	(0.137)	(0.209)	(0.177)	(0.097)
R2	0.09	0.11	0.06	0.00	0.08	0.06	0.05	0.00
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,269,447	1,171,483	1,171,483	1,171,483	74,558	67,677	67,677	67,677

Source: Authors' estimates bases on administrative data from SENCE and the Unemployment Insurance System
Note: a. Standard deviation in parentheses **Significant at 1%, *Significant at 5%,

Table 5A: Probability of Participation in the BTA (Marginal Effects)

Variables	All	Male	Female
Months worked (June 2011) [a]	0.150	0.170	0.140
	(0.030)**	(0.040)**	(0.040)**
Average monthly income (June 2011)	0.022	0.017	0.030
	(0.011)	0.014	(0.016)
Age	0.060	0.070	0.050
	(0.010)**	(0.010)**	(0.010)**
Age 2	0.000	0.000	0.000
	(0.000)**	(0.000)**	(0.000)**
Male	0.020	-	-
	(0.020)	-	-
Primary Education	-0.090	-0.090	-0.120
	(0.030)**	(0.040)*	(0.050)*
Secondary Education	0.040	0.020	0.040
	(0.020)*	-0.020	(0.020)
Migrant	0.370	0.300	0.500
	(0.060)**	(0.080)**	(0.090)**
Expectations of changing economic sector	0.08	0.100	0.050
	(0.010)**	(0.020)**	(0.020)**
Observations	129,570	72,063	57,507
Control by Region	Yes	Yes	Yes
Control by Area of interest	Yes	Yes	Yes
Control by Type of Work	Yes	Yes	Yes

Note: Standard deviation in parentheses **Significant at 1%, *Significant at 5%,
Source: Authors' estimates based on administrative data from SENCE and the Unemployment Insurance System.
Note: a. Months worked are divided by 100

Figure 6A: Probability of participation in the Voucher Training Program (Common Support)

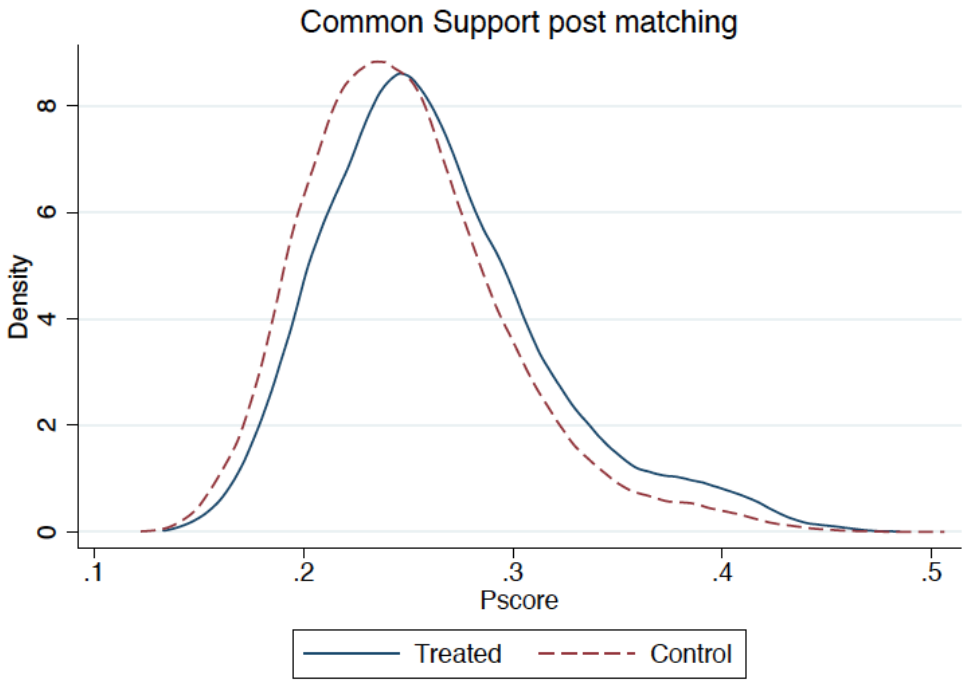


Table 6A: (PSM) Effects of the BTA, by education and gender

	a. High Education- Males				c. High Education- Females			
	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	0.003	0.003	0.003	0.003	0.008	0.009	0.009*	0.009*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Earnings (Ln)	-0.011	-0.013*	-0.014*	-0.014*	0.003	0.002	0.002	0.001
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Sector change	0.026**	0.025**	0.025**	0.025**	0.027**	0.025**	0.025**	0.024**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Job change	0.006**	0.006**	0.006**	0.006**	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	b. Low Education- Males				d. Low Education- Females			
	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5	Kernel a_n=0.2	Kernel a_n =0.3	Kernel a_n =0.4	Kernel a_n =0.5
Employment	-0.005	-0.006	-0.006	-0.006	0.038	0.040	0.041*	0.041*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.021)	(0.021)	(0.021)	(0.021)
Earnings (Ln)	0.002	-0.001	-0.002	-0.002	-0.013	-0.019	-0.022	-0.023
	(0.021)	(0.020)	(0.020)	(0.020)	(0.027)	(0.027)	(0.027)	(0.027)
Sector change	0.029	0.028	0.027	0.027	-0.031	-0.035	-0.038	-0.039
	(0.016)	(0.016)	(0.016)	(0.016)	(0.024)	(0.024)	(0.024)	(0.024)
Job change	0.019*	0.020*	0.020*	0.020*	0.017	0.017	0.017	0.016
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)

Note: t-statistics in parentheses **Significant at 1%, *Significant at 5%,
Source: Authors' estimates bases on administrative data from SENCE and Unemployment Insurance System