



Jovem Aprendiz Program, Employability and Formal Labor Income: An Analysis of the First Generations Exposed to the Apprenticeship Act of 2000

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Introduction

Abstract. The Brazilian Apprenticeship Law (2000) created the *Jovem Aprendiz* program, establishing a specific hiring regime and minimum quotas for hiring apprentices, as well as incentives for companies to expand the admission of young people aged 15 to 17 through this type of contract. The law had marked effects on the country's formal economy: from 2001 to 2005, the number of employed apprentices increased by more than 10 times.

This technical note explores this temporal variation and its heterogeneity across the Brazilian territory to investigate the long-term effects of the program on formal employment and labor income. We use a difference-in-differences approach and data from individuals exposed to the program in the initial years of operation to establish comparisons between: (i) the performance in the labor market of individuals born between 1985 and 1988, who began their professional careers under the new legislation, with those born between 1982 and 1984, who were not directly affected by the law (first difference); (ii) across microregions with different levels of exposure to the effects of the new regulatory framework (second difference).

The results indicate that individuals from more recent cohorts, whose trajectories were influenced by the reform in microregions with high exposure, experienced increases in the probability of formal employment and income throughout the 2010s when they were 25 to 29 years old.¹

Dual apprenticeship systems—which combine formal certification in educational institutions with a period of on-the-job training in firms—have been widely adopted in developed and developing countries in recent decades (see Caicedo et al., 2022; Crépon & Premand, 2019, for instance). The main justification for implementing such policies is that employment opportunities and the accumulation of professional experience, combined with early-life training and certification, contribute to the development of technical, socioemotional, and work-readiness skills that are essential to professional trajectories.

This technical note analyzes the long-term effects of the Brazilian *Jovem Aprendiz* program, a public policy based on a dual apprenticeship system. A central methodological challenge in evaluating the effects of programs like this is that the decision to participate may be associated with unobservable characteristics, such as intrinsic capacity, resilience, or other socioemotional skills. Thus, a simple comparison between individuals who began their professional careers as apprentices and other groups of young people does not identify the program's causal effect. For example, if it is true that

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most apprentices tend to be more skilled than young people who enter the formal economy through other contracts, the difference in wages between the two groups could reflect a difference in skill and not something that could have been attributed to participation in *Jovem Aprendiz*.

To circumvent this identification problem, we explore regional variation that has affected the individual decision to participate in *Jovem Aprendiz*, but that is less likely to be strongly associated with individual differences that would determine future labor-market performance.

The Apprenticeship Law established minimum quotas for hiring apprentices and created incentives for companies to encourage the admission of young people aged 15 to 17 through this type of contract. The *Jovem Aprendiz* program, introduced by the law, focuses on social inclusion, reducing youth unemployment, and facilitating the transition to the formal labor market. In particular, the legislation mandated that medium and large companies allocate between 5% and 15% of their workforce to apprentices and introduced payroll subsidies to encourage the hiring and training of these young people.

In practice, the new regulatory framework led to a significant expansion of the program, increasing the number of apprentices from fewer than 10,000 between 1998 and 2000 to almost 150,000 between 2001 and 2005. This expansion, however, occurred in heterogeneous ways across Brazilian microregions: while some local labor markets replaced a large share of their formal temporary contracts with apprenticeships, others remained very close to the pre-reform situation.

To interpret this context and estimate causal effects, we use a difference-in-differences (DiD) framework with *fuzzy* participation (De Chaisemartin & d'Haultfoeuille, 2018), comparing younger individuals to older individuals in microregions with different levels of adherence to *Jovem Aprendiz*.² More specifically, we used admini-

nistrative data from the Annual Social Information Report (RAIS) to reconstruct the employment and income trajectories of individuals who entered the formal market through temporary contracts between the ages of 15 and 17 during 1998–2005, following them through 2019. Our DiD estimates compare:

(i) individuals born between 1985 and 1988, who began their professional careers at the age of 15 to 17 under the new legislation, with those born between 1982 and 1984, who were not directly affected by the law;

(ii) in microregions with different levels of exposure to the effects of the new regulatory framework.

The analysis focuses on the Southeast, South, and Midwest regions of Brazil, which, at the time, had microregions with consolidated temporary labor markets in the relevant age group (15 to 17 years) and accounted for 90% of apprenticeship contracts in the Brazilian formal economy during the period.

Our main estimates show that individuals who began their professional careers as apprentices in microregions most affected by the law achieved better outcomes in the formal labor market, with increases of 7 to 10 percentage points in the probability of formal employment and increases of 24% to 35% in income between 25 and 29 years of age.

Jovem Aprendiz Program

The *Jovem Aprendiz* program was created by the Apprenticeship Law (Law 10.097/2000) to facilitate the young individuals' entry into the formal labor market through apprenticeship contracts that combined theoretical and practical training. Apprenticeship contracts are fixed-term, non-renewable, with a maximum duration of two years and, at the time, were terminated when reaching the limit of 18 years.³

Firms must employ between 5% and 15% of their workforce in functions that require formal training.

²This empirical strategy has been adopted to assess the long-term effects of the expansion of childcare places in Norway in the 1970s (Havnes & Mogstad, 2015) and the expansion of primary education in Indonesia in the 1960s (Duflo, 2001).

³In 2005, the law was reformed, and the maximum age was extended to 24 years.

ning as apprentices, enrolling them in professional qualification courses offered by institutions certified by the Brazilian Ministry of Labor. Additionally, firms that join the program receive payroll subsidies, reducing the requirement to deposit in the Guarantee Fund for Length of Service. The training includes a variable workload of 400 to 1,960 hours, depending on the occupation, and focuses on the content required for the apprentice's new occupation. All courses also cover life skills such as citizenship, employment rights, occupational safety and health, alcohol and drug prevention, and financial education. Salaries are proportional to the workload and linked to the minimum wage.

As discussed in the introduction, the number of young apprentices employed in Brazil grew by about 10 times in the years following the new regulatory framework, from fewer than 10,000 contracts between 1998 and 2000 to almost 150,000 between 2001 and 2005. The main idea of this note is to explore this variation and its heterogeneity in the Brazilian territory to investigate the long-term effects of the Young Apprentice on employability and income.

Data

RAIS. The main data source used in this study was the Annual Report on Social Information (RAIS), collected by the Ministry of Labor and Employment, covering the universe of formal employment contracts in Brazil. The database contains detailed information on formal employment contracts, including wages, workload, occupation and type of contract, as well as the start and end dates of the contracts.

A registration number uniquely identifies each worker in RAIS. These identifiers were used to construct a panel of the universe of individuals aged 15 to 17 who had work contracts — including apprenticeship contracts — between 1998 and 2005.

To select the final sample of individuals, we followed the approach of Corseuil et al. (2019), who use other temporary workers as the rele-

vant comparison group.⁴ In addition, we restricted the analysis to states in the South, Southeast, and Midwest of the country, regions that, at the time, had microregions in their territory with consolidated markets for temporary work in the relevant age group (15-to-17-year-olds) and that represented 90% of apprentice contracts in the Brazilian formal economy in the period. The final sample comprises 156,009 workers, of whom 79,492 entered the labor market as young apprentices and 76,517 as temporary workers through other contracts.

Empirical Framework

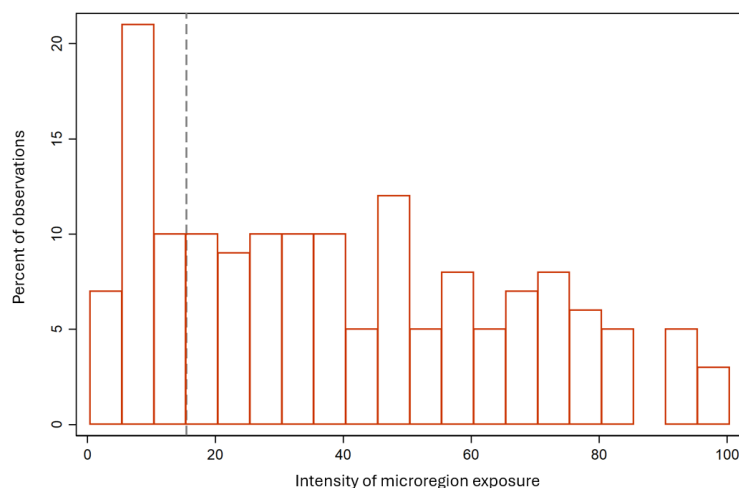
The empirical strategy is based on the division of the Brazilian microregions into two groups with different levels of exposure to the program. There are, therefore, two decisions that guide the operationalization of this strategy.

The first concerns the measure used to define exposure to the law's effects. One possible way, which closely follows Havnes e Mogstad (2015), is to classify the sample's microregions by growth in use of apprenticeship contracts for cohorts born between 1985 and 1988 and between 1982 and 1984. We began by calculating, for each microregion in the sample, the number of apprentices for cohorts born between 1985 and 1988 and between 1982 and 1984. In the next step, we divide this number by the number of young people who had temporary contracts in the microregion. Finally, we computed the percentage-point change in young apprentices' participation.

Figure 1 presents a histogram of the distribution of this variable and shows that there were marked differences in the adoption of the *Jovem Aprendiz* program among the Brazilian microregions: some local markets replaced a large portion of their formal temporary contracts with apprentices, while others remained closer to the pre-reform situation. Figure 2 presents a map of the microregions of the South, Southeast and Midwest, in which lighter colors indicate places

⁴This decision minimizes the heterogeneity in the set of potentially affected individuals, restricting the sample to those who chose to enter the formal labor market relatively early.

Figure 1. Variation in Exposure in Brazilian Microregions (N=108 microregions in the balanced panel)



Fonte: The graph is a histogram of the continuous variable used to define treated and control microregions.

with less variation in exposure to the program, and darker colors denote places with greater variation in exposure. It is interesting to note that, in almost all states, microregions sharing borders have adhered to the program in very different ways.

The second decision concerns the threshold used to define what “high exposure” means. In principle, there are multiple ways to define groups based on this criterion. The 25th percentile of the distribution shown in Figure 1 was used as the benchmark form. This means that our main models will compare the evolution of variables in the microregions denoted by the lightest color in Figure 2 with that in the three darkest microregions. In robustness exercises, we test whether the conclusion changes qualitatively when we compare the two lightest and the two darkest colors, using the 50th percentile.

Using data from the 1991 and 2000 Brazilian Demographic Census, we can better understand whether, and in what ways, regions that adhered more or less quickly to the program differ. In Table 2, column (1) presents means of variables for the 558 microregions of the country. Column (2) shows the mean of the same variables in the 108 microregions that make up the sample, indicated on the map. Thus, the comparison between columns (1) and (2) is illustrative of the type of sample selection carried out when the sample of microregions was restric-

ted to the South, Midwest, and Southeast regions, which had formal labor markets for young people aged 15 to 17 years. The microregions in the sample are substantially different from the average Brazilian microregion: larger, more urban, wealthier, and with higher levels of general schooling among the population.

Columns (3) and (4) restrict the sample to the microregions that make up the control and treatment groups, respectively. Finally, column (5) presents the p-value of an equality test between the means of each of the groups.⁵ In general, no statistically significant differences were found between the treated and control microregions. However, some differences in magnitude are substantial, particularly in population size. Therefore, in the regression models, we test the robustness of the results to the inclusion of flexible trends intersected with these variables.

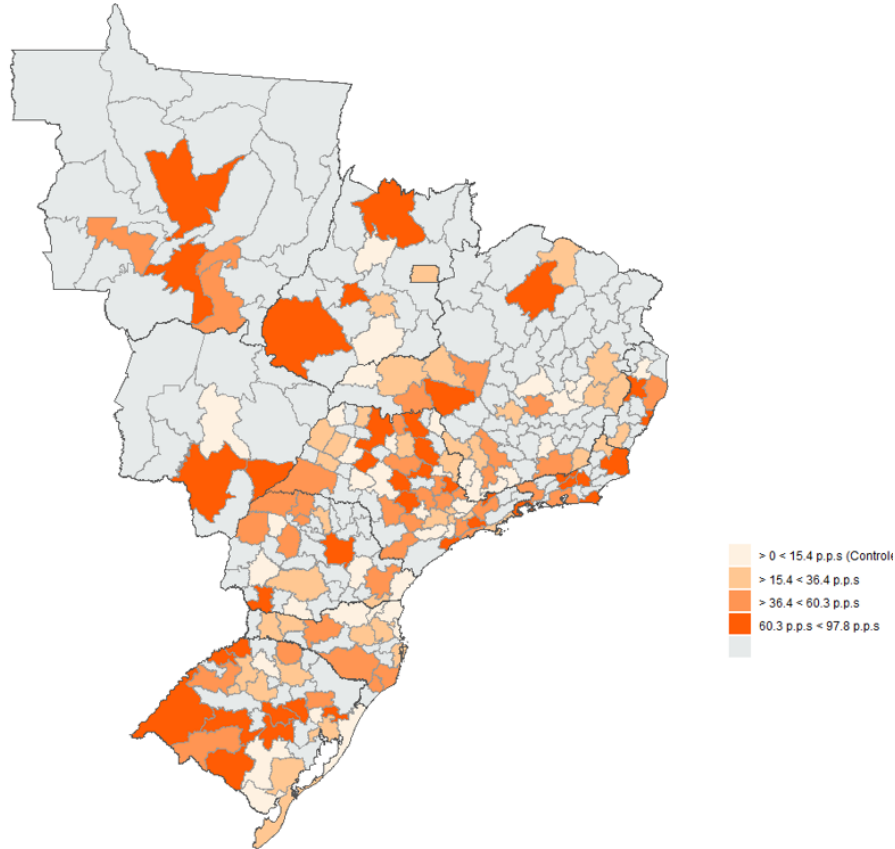
The main results presented in the note are based on the specification:

$$Y_{imc} = \alpha_c + \theta_m + \tau \text{Treat}_m \times \text{Post}_c + \Lambda X_{imc} + \varepsilon_{imc} \quad (\text{E.1})$$

where Y_{imc} represents a variable of interest (for example, the average of indicators characterizing the link with the formal labor market from 25 to 29 years of age) of individual i , in birth cohort c and who entered the formal labor mar-

⁵This information was grouped at the microregion level for use as a control in the regression models and for estimating a propensity score for high adherence to the program.

Figure 2. Growth in Participation in *Jovem Aprendiz* across Brazilian Microregions



ket in microregion m ; α_c is a cohort fixed effect; the indicator variable Treat_m equals 1 if i entered the labor market in a “treated” microregion, i.e., with high variation in program adherence (see Figure 3), and Post_c is an indicator variable equal to 1 when $c \geq 1985$. We discuss the variables included in X_{imc} in the presentation of the results in the subsequent paragraphs.

The parameter τ captures differences between variables of interest for individuals who have started their career: (i) in labor markets with high and low exposure to the effects of the reform; (ii) before and after the reform period. Note, however, that this parameter does not incorporate information on the evolution of the rate of adherence to the program and, therefore, gauges the intention-to-treat (ITT) effect and not that of the treatment itself (ATT). A simple way to recover the latter is to calculate the ratio between the DiD estimate on outcomes and the DiD estimate on a variable capturing participation in *Jovem Aprendiz* (Havnes & Mogstad, 2015). In presenting the results, we incorporate this step to discuss the magnitude of the program’s effects on the treated.

Results

Table 1 presents the results obtained after estimating the regression model (E.1) by ordinary least squares, using different controls (vector X_{imc}) and other specification decisions described in the lower part of the table.

Panel A presents the results for a variable of employability between the ages of 25 and 29, which is the average of formal employment indicators for each age (measured in months). The average of this variable in the sample is 54%, indicating that, in this age group, the young people in the sample were in the RAIS for a little more than half of the total months. Panel B, in turn, presents the results for average formal labor income, using the same age range.

Column (1) presents the results obtained when we include only fixed effects of birth cohort and microregion. We document that individuals entering the labor market as apprentices in high-exposure microregions were employed between 25 and 29 years old at a rate 3.3 percentage points higher than that of older individuals in

lower-exposure microregions. When we incorporate the first stage and convert this intention-to-treat effect into a treatment effect, we find a result of 9.5 percentage points, or 17% of the variable's average (54%). For the average income variable in Panel B, we found a treatment effect of 296.5 Reais in 2010 values, implying an increase of 31.4%.

Column (2) inserts in the specification a set of fixed cohort effects for each of the 11 states included in the analysis, to absorb the effect of initiatives –in education, in particular, which, in Brazilian public high school is a state attribution– that coincide with the *timing* of the expansion of *Jovem Aprendiz*. The point estimates are very similar to the ones presented in column (1). Column (3), in turn, includes two additional controls, at the worker level: the year of entry into the formal labor market, and a dummy for females. The inclusion of these variables does not substantially alter the magnitude or precision of the estimates.

In column (4), we include interactions between the cohort fixed effects and the characteristics of Brazilian microregions in 2000, as well as between the cohort fixed effects and the evolution of these same variables between 1991 and 2000. The central idea of the exercise is to test the robustness of the results to spurious patterns of convergence between the younger and older cohorts in the microregions of the control and treatment groups. Although this seems to mitigate the magnitude of the coefficients presented, they remain significant at conventional levels and represent still substantial effects of 6.9 percentage points, or 23.5% of the average.

Column (5), in turn, uses a microregion-level propensity score based on the variables presented in Table 2, dropping individuals who began their trajectories in microregions with a very high or very low propensity to join the program. The central idea of this stage is to exclude from the analysis regions that have observable characteristics that could be correlated with dynamic patterns that would create non-parallel trends between the variables (Abadie, 2005).⁶

⁶In the models presented, the propensity score was not used as a weight in the estimates.

The point estimates are similar to those presented thus far, although, as expected, there is a loss of precision due to the restricted sample. When we incorporate the first stage, we find an effect of 9.8 percentage points, or 18%. For the income variable, in Panel B, we found a treatment effect of 33% of the average in the period.

Column (6) changes the definition of the control and treated microregions, using the 50th percentile (median) of the exposure variable. The results remain very close to those previously discussed. Finally, in column (7), we present a specification that controls for the interaction between cohort fixed effects and the average level of participation in the microregion before the program. The idea of this last exercise is to incorporate some robustness to the presence of very different structures in local youth labor markets. We document effects of 3.8 percentage points and 34.4% of the average, for employability and formal income, respectively.

One of the fundamental assumptions in a DiD framework is the parallel trends assumption. This hypothesis is fundamental because it ensures that trends in the control group can be used to construct a valid counterfactual that captures the evolution of individuals in the treatment group had they not been treated. Although this hypothesis cannot be formally tested, its validity can be indirectly verified through event studies based on equation (E.1). Figure 4 presents the results of estimating the following equation:

$$Y_{imc} = \alpha_c + \theta_m + \sum_{c \neq 1984} \tau_c^{\text{ITT}} \text{Treat}_m \times I_{i(c)} + \Lambda X_{imc} + \varepsilon_{imc} \quad (E.2)$$

in which $I_{i(c)}$ is a random variable that takes the value 1 if individual i belongs to cohort c . Since cohort 1984 was omitted, the parameters τ in this equation represent difference-in-difference estimates with respect to individuals in this cohort, which we take as the last cohort with very low chances of having been affected by the reform.

The results are presented in Figure 4, for the same variables discussed above, using specification in column (7) of Table 1. For the em-

Figure 3. Growth in Program Participation in Brazilian Microregions, by Cohort and Control/Treated Group

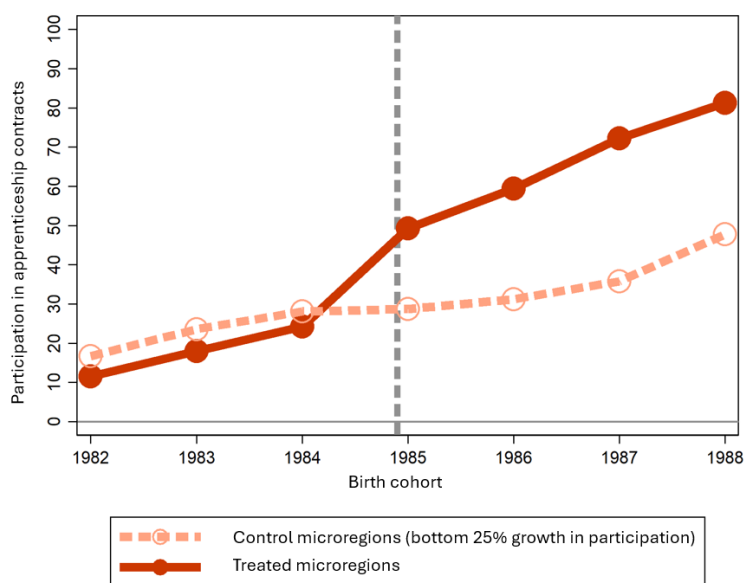
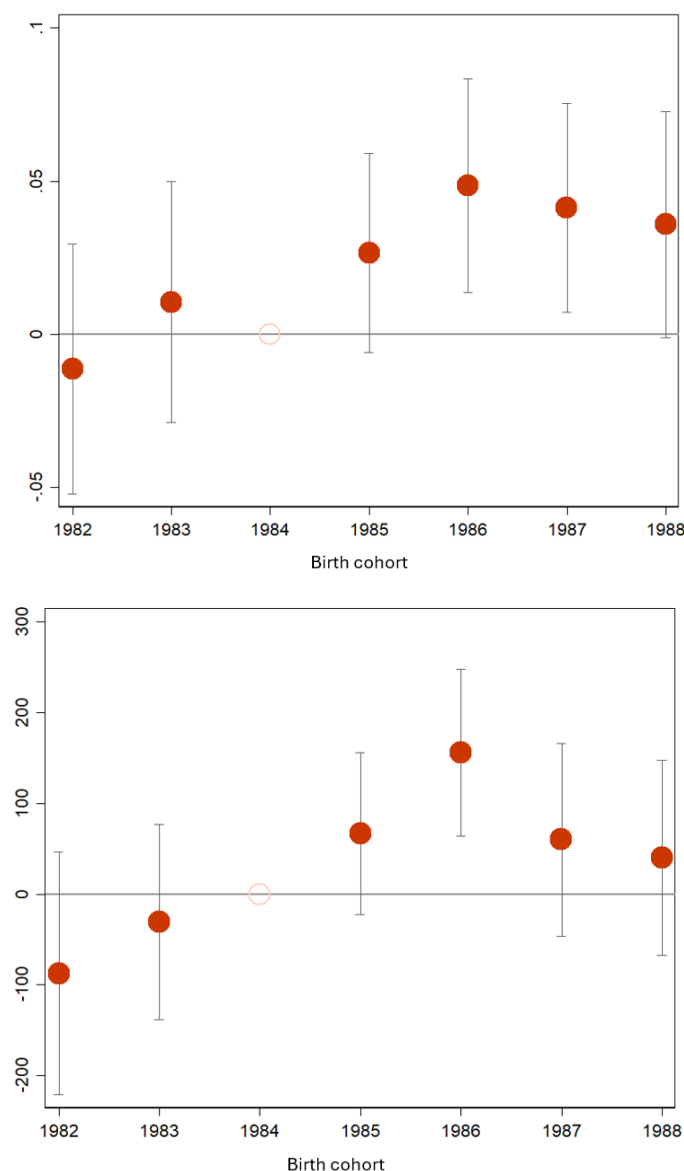


Table 1. Program Expansion, Employment and Formal Labor Income: DiD Estimates, *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Employment							
<i>Model 1</i>							
$\widehat{\tau}_{ITT}$	0.033**	0.034***	0.033**	0.024**	0.039***	0.032***	0.038***
(e.p.)	(0.016)	(0.013)	(0.013)	(0.010)	(0.014)	(0.012)	(0.015)
$\widehat{\tau}_{ATT}$ (in p.p.s)	9.5	9.6	9.5	6.9	9.8	9.5	9.8
Panel B. Formal Income							
$\widehat{\tau}_{ITT}$	102.3***	113.7***	108.5***	76.6**	108.10**	75.8**	112.2***
(e.p.)	(43.0)	(46.2)	(48.1)	(33.4)	(42.2)	(33.4)	(45.4)
$\widehat{\tau}_{ATT}$ (in % of Avg)	31,4%	34,9%	33,3%	23,5%	33,1%	22,5%	34,4%
Microregion Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Cohort Fixed Effects	✓						
Cohort-by-state Fixed Effects		✓	✓	✓	✓	✓	✓
Individual controls			✓	✓	✓	✓	✓
Cohort Fixed Effects × Controls				✓	✓	✓	✓
Propensity Score Trimming					✓		✓
Cohort Fixed Effects × Participation							✓
Percentile	25	25	25	25	25	50	25
Num. obs.	156,009	156,009	156,009	156,009	53,816	156,009	53,816

Note: The unit of observation is an individual who had at least one temporary formal employment contract between 1998 and 2005, aged 15 to 17. In each of the panels, we present estimates, standard errors and coefficients re-scaled by the first stage, as shown in equation (E.1) and discussed in the text. In Panel A, the variable of interest is formal employability at ages 25-29, the proportion of months in which a given individual was employed during this period of his or her life. In Panel B, the variable of interest is the average formal labor-market income. Column (1) presents the results obtained when we include only birth cohort and microregion fixed effects. Column (2) adds a set of fixed cohort effects for each of the 11 states included in the analysis. Column (3) includes two additional controls at the worker level: the year of their first formal employment in the labor market, and gender. In column (4), we include interactions between the fixed effects of the cohort and the characteristics of Brazilian microregions in 2000, as well as between the cohort's fixed effects and the evolution of these same variables between 1991 and 2000. Column (5) uses an estimated propensity score with the variables presented in Table 2 and excludes individuals who started their trajectories in microregions with a very high or very low propensity to join the program. Column (6) changes the definition of control and treated microregions, using the 50th percentile (median) of the exposure variable. Column (7) controls for the interaction between fixed cohort effects and the average level of participation in the microregion (share of apprenticeship contracts in the market) before the program.

Figure 4. Program Expansion, Employment and Formal Labor Income: Event Study Estimates



Note: The unit of observation is an individual who had at least one temporary formal employment contract between 1998 and 2005, aged 15 to 17. In the upper graph, the variable of interest is formal employability at ages 25-29 —the proportion of months during this period in which a given individual was formally employed. In the lower graph, the variable is the average formal income earned in the labor market. In each panel, we present estimates and confidence intervals based on the specification (E.2). The controls used in the specification are the same as in column (7), Table 1.

employability variable, the graphs suggests that the cohorts prior to 1984 followed trends similar to those of 1984, in the municipalities with low and high intensity of adherence, reinforcing the validity of the identification strategy. In addition, the cohorts of subsequent years seem to detach from the comparison of trends for previous years, especially for 1986 onwards. In the case of the income variable, the results of the individual coefficients associated with the event study tend to be imprecisely estimated but also indicate detachment.

Final Comments

Jovem Aprendiz is an initiative that promotes the inclusion of young people in the labor market by offering an opportunity to reconcile theoretical training with practical experience. The main objective is to train adolescents and young people for the world of work, especially those in situations of social vulnerability. Although there is reason to believe that such programs can have positive long-term effects, empirical evidence of

this type is rare. The results presented in this note indicate that the expansion of subsidized apprenticeship contracts in Brazil between 2001 and 2005 positively influenced long-run labor-market trajectories. An aspect not explored by this note is the analysis mechanisms by which the program may have achieved these effects—for example, by giving rise to educational investments in higher education, changing the occupational profile or the profile of the firms to which young people had access between the ages of 18 and 29. These questions are interesting topics for future research.

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Table 2. Microregion Sample Characteristics and Balance

	(1)	(2)	(3)	(4)	(5)
Total population in 2000	74,689.9	151,790.4	61,981.5	181,726.6	0.23
Population 15-17 y.o. in 2000	4,649.1	8,744.5	3,704.2	10,424.5	0.22
Variation in total population (2000-1991)	0.12	0.15	0.16	0.14	0.62
Variation in 15-17 y.o. population (2000-1991)	0.11	0.14	0.13	0.14	0.87
Per capita average household income in 2000 (logs)	5.79	6.36	6.30	6.37	0.16
Variation in per capita average household income (2000-1991, logs)	0.35	0.34	0.33	0.34	0.50
Urbanization rates in 2000	0.67	0.82	0.81	0.83	0.49
Variation in urbanization rates in (2000-1991, in pps)	0.07	0.05	0.05	0.05	0.76
Years of schooling in 2000	8.38	9.82	9.78	9.83	0.66
Variation in Years of schooling (2000-1991)	0.75	0.47	0.40	0.49	0.24
Illiteracy rates in 2000	22.17	10.35	10.43	10.32	0.89
Variation in illiteracy rates (2000-1991, p.p.s)	-8.66	-5.03	-5.08	-5.02	0.83
Rate of students between 15 and 17 in 6th to 9th grade	40.19	27.43	26.42	27.77	0.26
Variation in rate of students between 15 and 17 in 6th to 9th grade (2000-1991)	5.27	-2.78	-3.04	-2.69	0.76
Age-grade distortion rate in high school	13.95	8.31	8.41	8.28	0.79
Variation in age-grade distortion rate in high school (2000-1991)	-2.59	-3.76	-3.23	-3.93	0.21

Notes: Column (1) presents the average of the variables in the 1991 and 2000 Demographic Census for the 558 microregions of the country. Column (2) shows the average of the variable in the 108 microregions that make up the sample. Columns (3) and (4) restrict the sample to the microregions that make up the control and treatment groups, respectively. Finally, column (5) presents the p-value of an equality test between the means of each group.