

THE EFFECT OF THE “APPRENTICESHIP LAW” ON THE EMPLOYMENT OF YOUNG APPRENTICES IN BRAZIL

ERIVELTON NUNES

Universidade Federal do Ceará, Brazil

AHMAD SAEED KHANFFER

Universidade Federal do Ceará, Brazil

CICERO LIMA

Universidade Federal do Ceará, Brazil

EDWARD MARTINS COSTA

Universidade Federal do Ceará, Brazil

GUILHERME DINIZ IRFFI

Universidade Federal do Ceará, Brazil

RAYSSA COSTA

Universidade Federal do Ceará, Brazil

This study analyze the effect and effectiveness of the apprenticeship quota rule in hiring young apprentices in Brazil. To this end, we used longitudinal data from the Annual Social Information List (RAIS), considering the period from 2006 to 2019, and estimated the causal effects of the Learning Law using fuzzy and sharp Regression Discontinuity Design (RDD). It was found that the percentage of employers that comply with the Apprenticeship Law ranged from 2.42% in 2006 to 26.61% in 2019. As for the causal effects of the Law in Brazil, despite the improvement observed in this period, the rate of apprentices hired by companies in the Retail and Services, and Industry and Construction sectors is still below the established quota. This result suggests the need to improve control and inspection mechanisms to increase the effectiveness of the Law in Brazil.

KEYWORDS: Apprenticeship law, Regression discontinuity, Brazil, Employment.

1. INTRODUCTION

Most young workers in Brazil face barriers in the early stages of their work-life, with firms having strict requirements on previous work experience and qualifications. These workers usually settle for temporary and low-skilled jobs, suffering from higher turnover and unemployment rates (Ichino et al., 2008; Eichhorst et al., 2015; Parey, 2016; Picchio and Staffolani, 2019; Corseuil et al., 2019). Due to the young worker’s lack of signals about their productivity levels, few or no previous experiences, and the training costs firms may face when hiring young employees, firms have a revealed preference to hire workers with references from former employers to reduce information asymmetry - this creates restrictions for younger workers to enter the job market (Ichino et al., 2008).

Erivelton Nunes: erivelton.s.n@hotmail.com

Ahmad Saeed Khanffer: saeed@ufc.br

Cicero Lima: cicerolimaclf@gmail.com

Edward Martins Costa: edwardcosta@ufc.br

Guilherme Diniz Irffi: irffi@caen.ufc.br

Rayssa Costa: rayssacosta_@hotmail.com

These issues led to a political debate resulting in the formulation of public policies in many countries, which started implementing programs focusing on the professional training of young people aiming their insertion in the labor market (OECD, 2010). The apprenticeship programs are composed of firms that conceal practical work experience with theoretical and instructive training. These programs are more efficient when compared to other types of temporary works, once they make it easier for the young workers to transition from school to the labor market (Biavaschi et al., 2012; Eichhorst et al., 2015).

According to Parey (2016), apprenticeship programs lead to the development of non-cognitive skills correlated to the job and increases the apprentices' academic performance, as noted by Alet and Bonnal (2011). According to Attanasio et al. (2011), these programs give unqualified young workers a certificate that can reduce the barriers usually faced in the formal labor market. In this process, the firms' role is to train more capacitated professionals (and fulfill their social function) to accomplish the labor market requirements and armed with a broad vision on the society.

In this context, and observing the relevance of the theme, this study aims to analyze whether firms in Brazil are obeying the Apprenticeship Law. To do so, we use longitudinal microdata from the Annual Social Information Report (RAIS) to observe formal labor ties and firms in Brazil from 2006 to 2019. Using this sample and the legal establishment of the apprenticeship quota according to the number of firm's employees, we adopt the Regression Discontinuity (RD) design as our identification strategy.

The empirical strategy relies on the Decree 5598/2005 (Brasil, 2005) that regulates the employment of apprentices and establishes a cutoff based on the firm's size measured by *faturamento das empresas*. Our goal is to analyze the Apprenticeship Law's effects and effectiveness on the employment of apprentices after the Decree. Each observation in our data consists of a firm in a given year, considering formal firms and workers connected by two identifiers: the National Registry of Legal Entities (CNPJ) and the linked Specific Registry of the Brazilian Social Security Institute (Linked CEI), that connects individuals to legal entities.

The data structure, as well as the period of analysis and identification strategy, allow for robust results, which contributes to the formulation of public policies, helping in the decision-making process, implementation, and reformulation of the apprenticeship program in Brazil. Also, in terms of contributions to the literature, this study adds to the body of existing evidence on the policy. Corseuil et al. (2019), for instance, verify if the program works as a bridge to permanent employment when compared to other types of temporary works. In its turn, this study analyzes both the effect on employment and the effectiveness of the Law, aiming to measure its impact on young workers' job opportunities and verify if firms are compliant with the apprenticeship quota, established according to their number of employees.

In addition to this introduction, this research is structured in five more sections. The Section 2 presents the literature review. Followed by Apprenticeship Policy Background in Brazil in Section 3. Section 4 considers the empirical strategy, the sources and the treatment of the data. The Section 6 analyzes and discuss the paper's results. Finally, in Section 7 are the final considerations.

2. LITERATURE REVIEW

One of the main causes of young people's limited insertion in the labor market is their lack of qualification. The vocational education and training programs are an efficient mechanism to reduce young worker's unemployment, according to Quintini and Martin (2006). The empirical literature emphasizes that Young Apprentice Programs (PJA) provide participants with relevant skills that prepare them to transition from school to the labor market (Quintini and Martin,

2006; Biavaschi et al., 2012; Eichhorst et al., 2015; Parey, 2016; Picchio and Staffolani, 2019; Corseuil et al., 2019).

In OECD countries, on average, 48% of young people are linked to vocational training programs during High School, of which approximately a third is part of combined school and work-based programs (OECD, 2008; Parey, 2016). In Sweden and Belgium, formal vocational training is completely, or in a large proportion, school-based, while in countries such as Denmark, Germany, and Switzerland, firm-based programs are more common.¹ In the United States, 16% of High School graduates obtain more than a quarter of their credits from career and technical education courses (Parey, 2016).

Eichhorst et al. (2015) provide a better understanding of vocational education and training in industrialized countries, proposing a typology with three categories of apprenticeship systems: 1) vocational and technical schools; 2) formal apprenticeships; and, 3) dual apprenticeship systems that combine school training with firm-based approaches. They describe the strengths and challenges of each system and review the empirical evidence on the efficiency of these programs when compared to regular education and on the relative efficiency of the different vocational education and training systems. Among the main results, they highlight that young people that finish their education and training in vocational schools perform well, and sometimes better than if they had remained in purely academic education. Vocational training facilitates the transition to paid jobs and can improve their income and employment results, especially for young people working in low-skilled sectors.

The conditions that influence young people entrance in the job market in developed and developing countries were analyzed by Biavaschi et al. (2012), that highlighted the role of vocational training and education policies in this process. The authors emphasize the importance of factors such as demographic evolution, economic growth, and the interaction between those aspects and long-term institutional patterns, in particular, regulations that impact the provision of resources. The authors argue in favor of vocational education and training systems formulated according to the economic and institutional context of each country. In addition to firms, this also needs to involve governments and other social partners to be a stable and effective process. Is also important to find solutions for the society to become a part of the vocational training, including the informal sector.

Using an open economy model with educational choice, in which price shocks affect the local number of apprentices, without a differential effect on factor reward, Parey (2016) compares the labor market results of apprenticeship training and full-time vocational education, focusing on income, unemployment rates, and labor market mobility in Germany. The results show that firm-based apprenticeship training leads to substantially lower unemployment rates for workers aged between 23 and 26 years old. Evidence suggests that former apprentices have a transitory advantage that tends to disappear over time. Regarding income disparities, there were no significant differences, suggesting that both alternatives confer similar overall levels of productivity and that apprenticeship programs generate better initial labor market results when compared to vocational education.

To analyze the efficacy of apprenticeship on permanent employment, Picchio and Staffolani (2019) made a comparison to other types of temporary work in Italy, using regression discontinuity and administrative data on labor ties from January 2009 to June 2012. The results show that apprenticeship is more effective than other types of temporary contracts, leading a greater amount of workers to permanent positions. In this sense, apprentices are more likely than other temporary workers to get a permanent job in the same firm and they have higher chances of

¹ According to Parey (2016), in Germany, vocational qualification based in dual (school and work-based) apprenticeship represented 61% of all vocational activities in 2006, while school-based ones represented only 19% of these.

achieving a permanent position inside it than in other firms. However, other types of temporary workers have a higher probability of finding a permanent position in different firms.

For Brazil, [Corseuil et al. \(2019\)](#) evaluate if the apprenticeship program works as a facilitating mechanism for young people to find permanent jobs when compared to other types of temporary work. They analyzed the discontinuity as an eligibility criterion to enter the program in the year 2000. They considered workers' (including apprentices) and firms' characteristics in the analysis for the private formal sectors in Brazil, correcting for possible selection bias of individuals based on non-observable characteristics.² The results show a positive effect of the program, with evidence that the skill requirements of the apprentice's occupation affect the likelihood of obtaining a permanent job in the short run and educational achievement in the medium run. Also, the effects are larger for workers who had their first job in large firms.

According to [de Alencastro Gonçalves \(2014\)](#), if all the eligible firms obeyed the required minimum quota of apprentices corresponding to 5% of total employees, Brazil would have 1.237.130 young apprentices in 2013, according to data from the Labor Ministry's General Register of Employed and Unemployed Workers (CAGED). However, apprentices working in Brazilian firms corresponded to only 27,68% of this estimate. The states with higher numbers of apprentice employees are Espírito Santo (43,62%), Rio Grande do Sul (40,15%) and Ceará (38,08%), while Paraíba (16,43%), Piauí (15,83%) and Maranhão (14,88%) had the smallest amount of hired young apprentices. According to the author, albeit the government and other institutions' efforts to mobilize, inspect, and punish, a relevant number of firms still try to dodge and disobey the legislation in Brazil.

Other authors, such as [Matsuzaki \(2011\)](#), [Calazans et al. \(2015\)](#), [Luz \(2015\)](#), and [Villar and Mourão \(2018\)](#), study the theme for Brazil using primary data. In this sense, [Matsuzaki \(2011\)](#) investigates the challenges of the Young Apprentice Law as a public policy for the inclusion of young workers in São Paulo's metropolitan region's labor market (by interviewing firms and apprentices) and concludes that the Law was well-executed by the participating firms. Although there are limitations in the program, in general, the firms seek to provide the young workers with training that prepares them for the labor market.

[Calazans et al. \(2015\)](#) observed the vocational education's contribution, by performing a case study with students, professors, and firms, in an educational institution in Piracicaba, Sao Paulo (Brazil). According to the authors, the young participants reported facing barriers to entering the labor market, correlated to the lack of work experience and professional qualification; however, students consider that being an apprentice stands for the incessant search for knowledge and skills that can improve their professional and personal life. For teachers, the training allows students to obtain the experience that firms require, making apprentices more likely to be hired by the employing or by other firms. Employers believe in the possibility of developing new talents and claim the program allows organizations to hire trained workers and apprentices to become engaged employees of the firm.

Similarly, [Luz \(2015\)](#) analyzed reports made by participants and graduates from the Young Apprentice Program in the state of Bahia, in the period of 2013 to 2014. In general, the apprenticeship program works as an instrument of qualification and insertion in the labor market, contributing significantly to society and young people, while training and qualifying individ-

²According to [Corseuil et al. \(2019\)](#), the decision to be part of the apprenticeship program may be a function of non-observable characteristics, both for workers and firms. In this sense, the authors compared the observed characteristics' average for both groups of workers (apprentices and other types of temporary workers) and found significant differences among them, indicating a possible unbalance in non-observable characteristics. To rectify this issue and obtain consistent estimates of the program's effect, the authors use the adjusted matching estimator proposed by [Dias et al. \(2013\)](#).

uals. However, they highlight the need for more policies focused on young individuals, as a mechanism of professional insertion.

Given the above researches, it is clear the relevance given in the literature of apprenticeship programs to the process of professional qualification and promotion of discerning capacity for young people to deal with a variety of situations in the labor market.

3. THE APPRENTICESHIP POLICY BACKGROUND IN BRAZIL

The Brazilian apprenticeship program follows the same pattern observed internationally. According to the Labor and Employment Ministries of the G20 (a group composed by the top 20 economies in the world), the countries forming the group should promote and share experiences on the design and implementation of apprenticeship programs, following the principles shared by these nations (Steedman, 2012). In that sense, we present the main aspects of the Apprenticeship Law in Brazil.

According to the Apprenticeship Manual (MTE, 2014), the apprenticeship program in Brazil is a public policy focused on the qualification of adolescents and young people, under the pedagogical orientation of qualified entities to provide methodological, technical and vocational training, combined with practical activities coordinated by firms. Such activities are implemented through an apprenticeship contract, based on programs organized and developed under the orientation and responsibility of qualified entities. The apprenticeship program is regulated by the Consolidation of Labor Laws (CLT, Decree-Law n° 5.452, May 1 of 1943), which went through a modernization process with the promulgation, among other measures, of Laws 10.097/2000, 11.180/2005, 11.788/2008 and 13.420 of 2017. According to the Article 428 of the CLT, the program guarantees a special employment contract, with a fixed term with a maximum duration of two years, to adolescents and young workers aged between 14 and 24, aiming to secure their access to a technical and professional qualification, guaranteeing an hourly minimum wage (Brasil, 1943; 2005a; 2008; 2017).

As a condition to participating in the program, the apprenticeship contract requires attestation of enrollment and attendance in high school from the apprentices, and the apprenticeship program (courses provided by the National Apprenticeship Services) should be developed under the orientation of a qualified entity. If the National Apprenticeship Services do not offer enough courses to meet the firms’ demand, other qualified entities, such as technical schools, non-profit entities, and sports entities, may offer “methodical technical and professional courses” (Brasil, 2008).

Following these criteria, all medium and large firms in Brazil – defined according to the number of employees, shown in Table I – should meet the employment quota of apprentices (except non-profit entities that work with vocational education), and micro and small firms have optional adherence to the program. The number of hired apprentices should correspond to a minimum of 5% and a maximum of 15% of all current employees in each establishment, occupying positions that demand vocational training³ (Brasil, 1943), as specified in the Brazilian Occupations Classification (CBO) system.

The quota calculation excludes positions that require technical or university level education, managers, coordinators, and trust positions, workers hired under temporary work contracts, and current apprentices (Brasil, 2018).

The offending firms are subject to a fine competing to the regional authority responsible for work inspection, as established by the Special Secretariat for Social Security and Labor of the Ministry of Economy. The application of administrative fines for violations of labor

³For further information, visit the Ministry of Labor website: <https://empregabrasil.mte.gov.br>.

TABLE I
CLASSIFICATION OF THE FIRM'S SIZE ACCORDING TO THE NUMBER OF EMPLOYEES

Firm Size	Retail and Services	Industry and Construction
Microenterprises (ME)	Up to 9 employees	Up to 19 employees
Small-Sized Firms (EPP)	From 10 to 49 employees	From 20 to 99 employees
Medium-Sized Firms	From 50 to 99 employees	From 100 to 499 employees
Large Firms	100 or more employees	500 or more employees

Source: IBGE (2001), SEBRAE (2013).

legislation follow variable and per capita nature criteria. In the first case, depending on the size of the offending firm, the fines will vary from R\$ 1.000,00 to R\$ 100.000,00, depending on nature and severity (mild, medium, severe, and very severe) of the offense. The fine related to per capita nature considers the offender's economic size and the number of employees in an irregular situation. The fine varies from R\$ 1.000,00 to R\$ 10.000,00, depending on the severity of the offense⁴ (Brasil, 1943; 2019).

Are considered as aggravating circumstances, to the purposes of the application of administrative fines, the acts of hindering inspection, employing workers under conditions analogous to slavery, and the occurrence of fatal work accidents. The configuration of aggravating circumstances will result in application of double the penalties (Brasil, 1943; 2019).

Regarding benefits, the firms participating in the apprenticeship program have many advantages, such as fiscal and tax incentives. Among these, are: the payment of only 2% of the Service Guarantee Fund (FGTS), representing a value 75% inferior to the amount paid to regular workers; exemption from paid notice; exemption from payment of termination fines; and firms registered in the simplified national taxation system (Simples Nacional) are not subject to the regular increase in social security contributions (CIEE, 2020). In addition, a positive corporate image and reputation related to fulfilling social responsibility concerns.

4. METHODOLOGY

4.1. Data

To analyze the apprenticeship quota's effect on Brazilian firms decision to hire young workers under the apprenticeship regime, we use administrative data from RAIS, provided by the Ministry of Labor and Employment, in a longitudinal sample containing information on labor ties and firms. tenha registro no órgão competente e apresente o faturamento anual dentro dos limites legais. For the identification strategy some features are important. First, according to the Normative Instruction 146 Brasil (2018), only firms with more than seven employees that demand professional training are obligated to employ apprentices. The 3rd article of the instruction states that micro and small enterprises that opt for the Unified Special Regime of Tribute Collection and Contributions are legally dismissed of the apprenticeship quota.

The Decree 5598/2005 (Brasil, 2005) also establishes that the employment of apprentices is not mandatory for micro and small enterprises. Furthermore, in accordance with the Normative Instruction 146/2018 (Brasil, 2018), to prove the firm is a micro or small enterprise, it is necessary to have a registration in the competent organ and present an annual income compatible with the legislation. In this sense, the criterion used by the Ministry of Labor to classify firms

⁴These values correspond to those in November 2019, being annually updated every February 1st, according to the variation in the IPCA-E index, or another index that may take its place, calculated by the Brazilian Institute of Geography and Statistics (IBGE).

size is based on its income. Nevertheless, the identified microdata of Annual Social Information Report (RAIS) does not present firms income, since it is sensible information. For that reason, this study follows the size classification presented by Brazilian Micro and Small Business Support Service (SEBRAE) and IBGE (2001) in the last section, using size as a proxy of income. The sectors analyzed are Industry, Construction, Retail, and Services since they account for almost 74,42% of apprentices’ employment between 2006 and 2019. Also, the size of firms belonging to these sectors can be easily determined by the number of employees, following the SEBRAE classification. Following Lalive et al. (2013), we restrict our analysis to firms belonging to the private sector once their main goal is to maximize profit. Through the National Classification of Economic Activities (CNAE) and the firms’ Legal Nature, we filter RAIS data to obtain a sample containing private firms belonging to the chosen sectors.

According to the Normative Instruction 146/2018 (Brasil, 2018), the apprenticeship quota calculation should consider the number of workers whose duties require vocational training, therefore excluding workers such as managers and occupations requiring technical or university level education from our sample. This procedure was done by observing the specifications and requirements of each job position as specified by the Brazilian Occupations Classification (MTE, 2010). Moreover, the above Normative Instruction also requires the exclusion of temporary workers from the quota calculation, which was done by analyzing each employee’s type of work tie. Furthermore, as pointed by Mariano et al. (2018), members of the Armed Forces have positions and wages that are not established by the market; therefore, they are also excluded from our sample.

Our sample was constructed using the age group of 14 years or older (minimum possible age for an apprenticeship contract) to count the number of employees in each company. Once the data has been identified, it is possible to calculate the number of apprentice workers and regular workers in each company, excluding the mentioned occupations. This information is relevant to analyze whether a particular company complies with the apprenticeship law.

5. EMPIRICAL STRATEGY

Our empirical strategy is based on the financial incentives given to firms in the Industry, Construction, Retail, and Services sectors to stimulate the employment of young workers under the apprenticeship regime. The Brazilian Apprenticeship Law requires that medium and large firms mandatorily hire young apprentices according to a minimum quota of 5% and maximum quota of 15% of the firm’s total number of employees if the number of regular employees (L_i) is greater than or equal to the cutoff. That cutoff point varies according to the sector, being $C \geq 50$ for firms belonging to the Retail and Services sectors, and $C \geq 100$ for firms belonging to the Industry and Construction sectors. Since the rule of apprenticeship quotas in Brazil presents a discontinuity in the employment of young workers, we use a discontinuity design based on the quota rule for hiring apprentices to estimate the causal effect of this law on the employment of young individuals.

In this design, we estimate the effects around the cutoff points established by the law. In this case, firms that hire young apprentices and are under the cutoff points belong to the control group (because they are not legally obliged to hire apprentices), while firms above the cutoff points and, therefore, under the law, belong to the treatment group, following the behavioral structure used in Lalive et al. (2013).

Imbens and Lemieux (2008), and Cappelleri and Trochim (2015) suggest the adoption of Regression Discontinuity Design (RDD) when we seek to estimate the treatment’s causal effects on the variables of interest to capture a local effect, in our case, related to the firm’s size based on its number of employees. In this sense, this study adopts the RDD method and, following Imbens and Kalyanaraman (2011), and Calonico et al. (2017), focuses on approaches

using local polynomial nonparametric estimators with data-driven bandwidth selectors and bias correction techniques.

According to [Calonico et al. \(2017\)](#), the nonparametric method allows for the construction of robust parameters, by using a local polynomial regression that adapts to the data structure and the assessment at the thresholds, minimizing possible heterogeneities and modeling functions.

However, [Cappelleri and Trochim \(2015\)](#) present the existence of two RDD approaches: sharp and fuzzy. In the sharp RD design, the allocation of treatment is given deterministically, that is, the probability of treatment jumps from 0 to 1 at the cutoff. On the other hand, in the fuzzy RD design, the allocation of treatment is given stochastically, in which the probability of treatment does not coincide with treatment eligibility.

According to [Pettersson-Lidbom \(2012\)](#), a transversal RDD approach considers that the local randomization guarantees that the sample of individuals located around both sides of the cutoff point is similar, on average, regarding observables and non-observables characteristics. However, in practice, reduced samples put to question the balance of control and treatment groups' pre-treatment characteristics. One solution is to use panel data that allows for the comparison of both groups, independently of sample size. Thus, we use longitudinal data following [Pettersson-Lidbom \(2012\)](#), [Allen and Burgess \(2012\)](#), [Hemelt \(2011\)](#), [Meng \(2013\)](#) and [Chang and Lin \(2016\)](#).

Regarding the dynamics of young apprentices' employment in Brazil, it is evident, through [Tables A.V and A.VI](#) in the Appendix, that many firms subjected to the quota system did not hire the required number of apprentices between 2006 and 2019, in all sectors considered in this study. Also, the legislation allows firms under the established cutoff point to hire young apprentices if they have at least seven regular employees. This dynamic can create an endogeneity problem, where our variable of interest may correlate to the error term. Another aspect that can generate endogeneity in this study, based on the use of panel data, is the natural dynamic of entrance and exit of firms from the market. Therefore, the same firms were kept in our database, maintaining only those that presented active ties in all years from 2006 to 2019. To correct the endogeneity problem and given the Brazilian apprenticeship law's design, we adopt, following [Mori and Sakamoto \(2018\)](#), the fuzzy RD design, once the quota rule increases the probability of treatment for only part of the firms. In this sense, we estimate the following model:

$$\text{Apprentices}_{it} = \alpha_0 + \alpha_1 D_{it} + \beta_0 E_{it} + \varepsilon_{it}, \quad (1)$$

where Apprentices_{it} is the number of workers hired as apprentices at firm i in year t ; $D_{it} = 1(T_{it} \geq C)$ indicates whether firm i was treated in year t , with T_{it} representing the adjusted size of firm i in year t , that is, considering all not apprentices employed temporary workers, management occupations, and positions that require technical or university level education, and C is the cutoff. E_{it} is the instrument for the number of regular employees of each firm (T_{it}), a score given by the difference between T_{it} and the initial sample size, consisting of 40 regular workers for Retail and Services, and 70 regular workers for the sectors of Industry and Construction. The parameters α_0 , α_1 and β_0 measure, respectively, the average number of apprentices in firms under and above the threshold, the average causal effect of the rule of apprenticeship quotas on the employment of young apprentices in firms around the threshold, and the correlation between firm size and the average number of employees working as apprentices, by firm. Lastly, ε_{it} is the error or residual term.

Posteriorly, aiming to analyze the effectiveness of the apprenticeship quota law, and considering that its fulfillment assumes a deterministic function, we adopt, following [Lalive et al. \(2013\)](#), the sharp RD design. Therefore, in each cutoff, we estimate the following model:

$$\text{Apprentices}_{it} = \alpha_0 + \alpha_1 D_{it} + \beta_0 T_{it} + \varepsilon_{it}, \quad (2)$$

where, on the contrary of equation (1), we use the actual number of regular employees (T_{it}), instead of the score ⁵(E_{it}). In this case, we excluded firms under the cutoff that had young apprentices among its employees, once they are not subjected to the quote system, and firms above the cutoff that did not have any hired apprentices, aiming to enable a deterministic function design.

To test the model’s robustness, we perform manipulation (density) tests, as recommended by Cattaneo et al. (2018), to verify if firms manipulate their number of employees due to the quota rule. The tests allow for the observation of the density of the eligibility variable around the cutoff. To validate the discontinuity design adopted in this study, we use placebo tests, developed by Abadie and Gardeazabal (2003) and Abadie et al. (2010) for the synthetic control method. Here, discontinuities in the employment of young apprentices are estimated according to firms’ size, using points under and above the legal cutoffs where there should not be a discontinuity: $C = 25$ and $C = 75$ for the Retail and Services sector, and $C = 75$ and $C = 125$ for the Industry and Construction sectors.

6. RESULTS AND DISCUSSION

6.1. Descriptive statistics

This subsection presents the total number of firms in Brazil, medium and large, complying with the apprenticeship law in the country from 2006 to 2019. Table II shows the total number of firms subject to the apprenticeship program law and the number of firms that effectively complied with the law. Results are available by sectors (retail, services, industry and construction) and company size (medium and large companies).

Analyzing RAIS data from 2006 to 2019, as shown in Table II, it is observed that the total number of companies that complied with the law in the four sectors (AFL variable) increased from 291 units in 2006 to 3817 in 2019. The percentage increase in companies that effectively complied with the law in relation to the total number of obliged companies was from 2.42% in 2006 to 26.61% in 2019.

These results are in agreement with Matsuzaki (2011). According to this author, the initial process of firms’ insertion in the apprenticeship program was more cautious since entering the program could create new challenges for firms. Among others, these included developing partnerships, capacitating the apprentices, and the due to accountability from firms to the Ministry of Labor and Employment.

We observe a higher number of firms participating in the apprenticeship program, acronym (FL), belonging to the Retail and Services sectors, when compared to Industry and Construction, for all years. The percentage of firms in the Retail and Services sectors following the apprenticeship law increased from 3,17% in 2006 to 29,83% in 2019. On the other hand, for

⁵The construction of this instrumental variable was based on the Two-Stage Least Squares Method (MQ2E), as well as in Matavelli and Menezes Filho (2020). The authors emphasize that the discontinuity itself is an instrumental variable for the treatment status in the application of fuzzy RDD. In this sense, in a first stage, accepting that D_i is a binary variable for the treatment and x_i is the execution variable, one has that the relationship between the treatment probability and the execution variable x_i can be represented by: $E(D_i = 1|x_i) = P(D_i = 1|x_i) = g_0(x_i) + [g_1(x_i) - g_0(x_i)]T_i$ where: $g_0(x_i)$ and $g_1(x_i)$ refer to polynomials of order p , with $T_i = 1(x_i \geq c_1)$, where T_i is a binary variable that stands for the point at which $E(D_i = 1|x_i)$ presents discontinuity. Also, according to the authors, the second stage can be obtained through the regression of the dependent variable Y_i in the estimated value of $E(D_i = 1|x_i)$, which is the score obtained in the previous stage. In formal terms, Matavelli and Menezes Filho (2020) indicate that the second stage can be given by: $\lim_{h \rightarrow 0} \frac{E[Y_i|c_1 < x_i < c_1+h]}{E[D_i|c_1 < x_i < c_1+h]} - \frac{E[Y_i|c_1-h < x_i < c_1]}{E[D_i|c_1-h < x_i < c_1]} = \rho$, where in an h -neighborhood of c_1 , T_i represents a binary instrument for handling D_i .

TABLE II

FIRMS COMPLYING WITH THE APPRENTICESHIP LAW IN BRAZIL BY SIZE AND SECTOR, 2006 TO 2019

Firms	Retail and Services, and Industry and Construction														
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
FT	12002	13203	13864	14324	15356	15924	16246	16545	16475	15473	14762	14461	14380	14346	
FLT	291	443	573	803	1114	1672	2219	2462	2799	3055	3123	3289	3654	3817	
%FLT	2,42	3,36	4,13	5,61	7,25	10,5	13,66	14,88	16,99	19,74	21,16	22,74	25,41	26,61	
Firms that complied with the law in Retail and Services sectors															
Firms	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
F	7320	8091	8499	8883	9449	9842	10080	10264	10299	9766	9409	9248	9175	9183	
FL	232	362	470	648	884	1281	1723	1941	2168	2329	2364	2505	2777	2739	
%FL	3,17	4,47	5,53	7,29	9,36	13,02	17,09	18,91	21,05	23,85	25,12	27,09	30,27	29,83	
%FLM	3,91	5,36	6,45	8,25	10,08	13,17	18,66	21,24	23,49	25,59	26,45	29,46	33,03	33,06	
%FLL	2,23	3,33	4,32	6,05	8,44	12,82	15,1	15,91	17,92	21,62	23,4	23,98	26,59	25,61	
Firms that complied with the law in Industry and Construction sectors															
Firms	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
F	4682	5112	5365	5441	5907	6082	6166	6281	6176	5707	5353	5213	5205	5163	
FL	59	81	103	155	230	391	496	521	631	726	759	784	877	1078	
%FL	1,26	1,58	1,92	2,85	3,89	6,43	8,04	8,29	10,22	12,72	14,18	15,04	16,85	20,88	
%FLM	1,38	1,79	2,2	3,12	4,24	6,91	8,55	8,81	10,58	13,51	14,58	15,78	17,54	21,43	
%FLL	0,64	0,57	0,55	1,53	2,18	4,11	5,59	5,83	8,44	8,63	12,16	11,43	13,39	18,17	
AFL	291	443	573	803	1114	1672	2219	2462	2799	3055	3123	3289	3654	3817	

Notes: (FT) = Sum of firms subject to the law in all sectors considered; (FLT) = Sum of law-abiding firms in all sectors considered; (%FLT) = Percentage of law-abiding firms in all sectors considered; (F) = Firms subjected to the Law; (FL) = Number of Firms complying with the Law; (%FL) = Percentage of Firms that comply with the Law; (%FLM) = Percentage of Medium Size Firms that comply with the Law; (%FLL) = Percentage of Large Firms that comply with the Law and (AFL) All firms that comply with the law in the four sectors analyzed. Source: Own elaboration based on RAIS microdata.

the Industry and Construction sectors, the growth was less pronounced, increasing from 1,26% to 20,88% during that same period.

Considering the analysis by firm size regarding the number of employees, medium-sized firms have a higher percentage of employers complying with the law, surpassing, in proportional terms, large firms. That occurred in all sectors analyzed in this study. There was an increase in employers participating in the program throughout the years, independently of firm size.

Based on these results, there was an increase in the number of firms participating in the Brazilian apprenticeship program in every analysis performed by this study. However, participation is still small, indicating that the Apprenticeship Law is not being efficiently obeyed by all eligible firms. These results corroborate with [de Alencastro Gonçalves \(2014\)](#).⁶ According to the author, in 2013, only 27,68% of the total number of young people (1.237.130) that should be hired as an apprentice in Brazil was linked to the apprenticeship program.

6.2. Effects of the Brazilian Apprenticeship Law in the sectors

To verify if the apprenticeship quota law has effects on the employment of young apprentices by Brazilian firms, with activities related to Retail and Services, and Industry and Construction, we follow [Cattaneo et al. \(2018\)](#) and perform manipulation tests,⁷ seeking to analyze if firms can deliberately change their location around the threshold, once the existence of such manipulation invalidates the use of the RDD.

⁶Differently from this study, which considered only the private sector, [de Alencastro Gonçalves \(2014\)](#) does not make a distinction between the private and public sectors in the analysis.

⁷For more details, see [Cattaneo et al. \(2018\)](#).

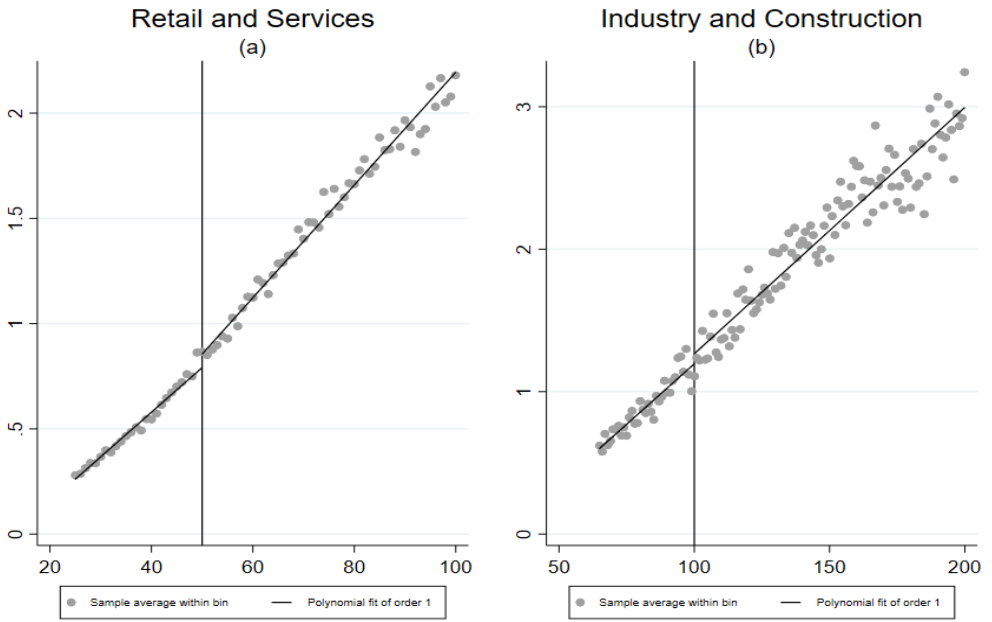


FIGURE 1.—Discontinuity in the effect and effectiveness of the apprenticeship law on the employment of apprentices. Source: Own elaboration based on RAIS microdata.

The results for the robust density tests, aiming to verify the existence of manipulation around the cutoff, is presented in Table III and indicates that, statistically, there are no systematic manipulations of the running variable in the estimates, given that the test statistics were non-significant at a 95% confidence level. Such results are valid for both fuzzy and sharp estimates, indicating that the regression discontinuity method is valid for both designs.

The results for the robust density tests, aiming to verify the existence of manipulation around the cutoff point, were not statistically significant at 5%. The statistic considering trade and services was 1,134, and for industry and construction was 1,88. The non-statistical significance of the tests evidenced the inexistence of systematic manipulations of the running variable in the estimates, since the test statistics were not significant at a 95% confidence level. Before proceeding to the estimation, it is relevant to verify the existence of discontinuity on multiple thresholds varying from 40 to 70 regular workers, and 70 to 150 workers for the sectors of Retail and Service, and Industry and Construction, respectively. Figure 1 presents the relation between the number of hired apprentices and firm size. Panels (a) and (b) in the figure present this relation for the Retail and Services, and Industry and Construction sectors, respectively.

In that sense, we observe a discontinuity exactly on the cutoffs, indicating a jump on the observations located before and after the cutoff point, established by the law, of $C = 50$ for the Retail and Services sectors, and $C = 100$ for Industry and Construction sectors, suggesting that the apprenticeship quotas rule has particular effects on the observations located around the threshold, both regarding the effect and effectiveness of the law, in all analyzed sectors.

The effects and effectiveness of the apprenticeship quotas law on hiring apprentices by private firms in the Retail and Services, and Industry, and Construction sectors are reported in Table III. The effectiveness is measured excluding firms not subjected to the law that hire young apprentices, and firms subjected to the law that do not employ such workers.

TABLE III

EFFECT AND EFFECTIVENESS OF THE APPRENTICESHIP QUOTAS RULE ON THE NUMBER OF EMPLOYED APPRENTICES IN THE SECTORS OF RETAIL, SERVICES, INDUSTRY AND CONSTRUCTION

Method	Law Effects		Law Effectiveness	
	Retail and Services	Industry and Construction	Retail and Services	Industry and Construction
Conventional	-0.10 (0.05)	0.18 (0.10)	0.87** (0.02)	1.18** (0.08)
Corrected Bias	-0.13* (0.05)	0.24* (0.10)	0.87** (0.02)	1.17** (0.08)
Robust	-0.13* (0.07)	0.24* (0.12)	0.87** (0.02)	1.17** (0.08)

Source: Own elaboration based on RAIS microdata. Standard errors in parenthesis. * Significant at the 5% level. ** Significant at the 1% level.

To estimate the bandwidth, we follow [Amorim et al. \(2019\)](#), using a data-driven process, in which by operationalizing an algorithm of the data itself (input), the result (output) is obtained, with no influence of empirical institutions. In addition to this method, the bands are selected following [Ludwig and Miller \(2007\)](#), [Imbens and Kalyanaraman \(2011\)](#), and [Calonico et al. \(2014\)](#), using the latter due to its higher robustness.

Considering, for all cases, the robust method for interpretation, as it presents greater robustness, it seems that for the Retail and Services sector, the apprenticeship quotas law presents a negative effect with an average decrease of 0,13 in the number of workers hired under the apprenticeship regime, indicating its inefficiency in this sector. Regarding the Industry and Construction sectors, the effects are positive but small in magnitude, with the law generating an increase of 0.24 in the number of workers employed through apprenticeship contracts.

Regarding the effectiveness of the law, we can infer that it has not had any effect, since, considering the commerce and services sectors, for every 50 regular workers hired, only 0,87% are under apprenticeship – a lower percentage to the minimum of 5% required by law. For the Industry and Construction sectors, the results also indicate the ineffectiveness of the law, since, for every 100 regular workers, only 1,17% of young apprentices are employed – also lower than the minimum required by the law.

From these results, we observe that the Brazilian apprenticeship quotas law has a positive impact, although the effect on the number of hired young apprentices is small in the analyzed sectors. Therefore, despite the law's existence, the proper insertion of young workers in the labor market, under the apprenticeship regime, did not occur. Such results corroborate with evidence found by [de Alencastro Gonçalves \(2014\)](#), which highlights the low percentage of hired young apprentices in firms subjected to the apprenticeship law⁸; [Retiz \(2014\)](#) points out that, although there was a relevant increase in the number of hired apprentices from 2005 to 2013, it is still far from the ideal.⁹

According to [de Paula et al. \(2014\)](#), non-compliance with the law may be related to firms' resistance and lack of awareness, of knowledge or neglect, and end up not fulfilling their social responsibility of inserting these young workers in the labor market. However, [Ramos \(2018\)](#) indicates that many firms do not fulfill their quota of apprenticeship due to insufficiency in the number of available courses provided by entities tied to the S System. Therefore, [Retiz \(2014\)](#)

⁸According to the author, although the government and other institutions continuously try to mobilize, inspect and punish employers, there is still a relevant number of companies that keep offending the law in Brazil.

⁹For the author, the admission of young workers under the apprenticeship regime accounts for only 27,13% of the firms' potential for hiring apprentices, which indicates that companies did not comply with the law during this period.

TABLE IV

PLACEBO TESTS FOR THE EFFECT OF THE APPRENTICESHIP LAW ON APPRENTICES EMPLOYMENT IN BRAZIL
– RETAIL AND SERVICES, AND INDUSTRY AND CONSTRUCTION SECTORS

Sector cutoffs	Retail and Services		Industry and Construction	
	25	75	75	125
Conventional	-0.007 (0.009)	-0.064 (0.061)	0.006 (0.061)	0.113 (0.153)
Corrected Bias ²	-0.006 (0.009)	-0.074 (0.061)	0.015 (0.061)	0.169 (0.153)
Robust ³	-0.006 (0.011)	-0.074 (0.074)	0.015 (0.077)	0.169 (0.180)

Source: Own elaboration based on RAIS microdata. Standard errors in parenthesis.

call attention to the growing need of creating integration and consolidation policies in multiple sectors of the economy, in addition to increasing inspection by the Regional Labor Offices (DRT), through Labor Tax Auditors (AFT), regarding the quota’s calculation and fulfillment by every eligible firm.

For [Martins and Oliveira \(2017\)](#), the inspection of the quota compliance by firms is extremely important, once it increases the number of regularly hired apprentices, decreasing illegal child labor. According to data from the Brazilian Institute of Geography and Statistics [IBGE \(2016\)](#), two million Brazilians, aged between 14 and 17 years old, are working irregularly.

To verify if the effect of the apprenticeship quotas law in Brazil happens around the cutoffs considered in our study, we performed placebo tests considering inferior and superior thresholds for all sectors, as presented in [Table IV](#). Considering the conventional, corrected bias, and robust estimates, we do not observe a local effect of the law in cutoffs equal to 25 and 75 for the Retail and Services sector, and 75 and 125 for the Industry and Construction sectors.¹⁰ Therefore, we can infer that the Brazilian law does not have effects beyond the established legal cutoffs regarding the number of employees in the Retail and Services, and Industry and Construction sectors.

In summary, the results suggest that the apprenticeship law had small effects on the number of apprentices hired for the Trade and Services and Construction and Industry sectors. The law was also ineffective for these sectors. Despite these inferences, [Corseuil et al. \(2019\)](#), reported that the Brazilian apprenticeship law has been relevant in terms of the probability of young people getting their first job. In addition, the law has been effective in reducing turnover, both in the short and long term. The authors also reported that the effects of the Brazilian apprenticeship program are greater for young people who obtained apprenticeship positions in large firms.

7. CONCLUSION

To analyze the effects and effectiveness of the apprenticeship quotas law on the employment of young workers under the apprenticeship regime in Brazil, we use data on the Brazilian labor

¹⁰As reported by [Barbosa and Corseuil \(2014\)](#), there is no specific procedure to determine the optimal window size for the case of a diffuse regression discontinuity design, and alternative sizes are acceptable. The choice of optimal windows was performed using the `rdwselect` package of the Stata software, following the recommendations of [Calonico et al. \(2017\)](#). In the present study, initial sizes of windows were used, which contemplated about 50% of the observations to the right and left of the cut-off points, both for Construction and Services and for Industry and Construction, making the number of observations around the cut-offs balanced.

market from 2006 to 2019. We adopt the method of fuzzy Regression Discontinuity Design to verify the law's effect, and the sharp RD design to analyze its effectiveness, using a subsample of firms that comply with the law by hiring young apprentices.

Regarding the results, the law presented small effects on the number of hired apprentices for the Retail and Services, and Construction and Industry sectors. The law was also ineffective for these sectors, once the percentage of hired young workers under the apprenticeship regime is inferior to the minimum required by the law for most firms in our database. These results corroborate with evidence for Brazil presented in the literature: while the law contribute to an increase in the number of firms employing young apprentices, the number of apprentices that should be hired, according to the minimum quota established, is far from being met. The reduced number of firms tied to the apprenticeship program implies that a lower number of young people are being trained to enter the labor market through the apprenticeship program, which can increase the number of informal workers in the future.

We emphasize that, according to the supplementary law of 2006 and the normative instruction 146 of 2018, the definition of micro-enterprise or small business is based on annual revenue meeting the legal limits of the respective companies. The use of the number of employees as a proxy can be considered a limitation in this work as the number of companies used differs from the actual number following the law based on billing. More specifically, this limitation can change the true number of companies around the cut-offs specified in the methodology. However, it should be noted that the Identified Microdata of the Annual List of Social Information (RAIS) does not provide the companies' billing, given the confidential nature of this information. Given this impossibility of adopting the billing criterion and considering the classification of companies presented by SEBRAE and IBGE, based on the number of employees, it is believed that the results are consistent with the effect of the apprenticeship law on the hiring of young people in Brazil, although the magnitude of the differences between the cuts considered and the actual cuts (based on revenue) cannot be measured.

Given the body of evidence found in the literature, it is necessary to reinforce the importance of the inspection and implementation of public policies related to the enforcement of the apprenticeship law and the insertion of young workers in the Brazilian labor market. This is necessary, once Villar and Mourão (2018) found that the Young Apprentice Program contributed positively for adolescents to perceive themselves, after only a short period in the program, in more favorable conditions regarding professional development and employability variables, and since work and apprenticeship experiences can contribute to the development of adolescents' self-efficacy.

APPENDIX: ADDITIONAL TABLES

TABLE A.V

FIRMS IN THE RETAIL AND SERVICES SECTORS THAT HIRED YOUNG APPRENTICES, BY SIZE, 2006 TO 2019

Year	2006			2007			2008		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	0,61	99,39	10578	0,77	99,23	7791	0,99	99,01	6185
Small-sized Firms	3,62	96,38	39437	4,41	95,59	41372	5,39	94,61	42414
Medium-sized Firms	17,40	82,60	4093	22,61	77,39	4574	24,91	75,09	4821
Large Firms	26,15	73,85	3227	31,93	68,07	3517	36,84	63,16	3678
Year	2009			2010			2011		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	1,39	98,61	5384	2,24	97,76	4471	3,93	96,07	4172
Small-sized Firms	6,31	93,69	42831	7,94	92,06	42847	10,05	89,95	42805
Medium-sized Firms	28,10	71,90	5017	31,85	68,15	5300	36,15	63,85	5536
Large Firms	41,36	58,64	3866	46,44	53,56	4149	51,02	48,98	4306
Year	2012			2013			2014		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	3,91	96,09	3943	4,13	95,87	3655	6,22	93,78	3585
Small-sized Firms	11,89	88,11	42824	13,76	86,24	42816	16,11	83,89	42780
Medium-sized Firms	41,90	58,10	5649	48,43	51,57	5782	51,36	48,64	5785
Large Firms	54,52	45,48	4431	57,92	42,08	4482	62,32	37,68	4514
Year	2015			2016			2017		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	6,82	93,18	4093	6,96	93,04	4743	7,41	92,59	5535
Small-sized Firms	17,66	82,34	42720	18,38	81,62	42469	20,51	79,49	41841
Medium-sized Firms	53,15	46,85	5483	54,14	45,86	5327	58,00	42,00	5245
Large Firms	64,14	35,86	4283	65,14	34,86	4082	67,05	32,95	4003
Year	2018			2019					
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms			
Microenterprises	8,99	91,01	6460	8,96	91,04	7564			
Small-sized Firms	23,34	76,66	40864	26,35	73,65	39614			
Medium-sized Firms	61,34	38,66	5241	65,72	34,28	5196			
Large Firms	70,54	29,46	3934	74,59	25,41	3987			

Notes: Yes (%) = Percentage of companies that hired apprentices. No (%) = Percentage of companies that did not hire apprentices. Source: Own elaboration based on RAIS microdata.

TABLE A.VI

FIRMS IN THE INDUSTRY AND CONSTRUCTION SECTORS THAT HIRED YOUNG APPRENTICES, BY SIZE, 2006 TO 2019

Year	2006			2007			2008		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	0,75	99,25	13756	0,92	99,08	12405	1,16	98,84	11606
Small-sized Firms	5,62	94,38	14598	6,21	93,79	15600	7,24	92,76	16302
Medium-sized Firms	23,21	76,79	3904	26,99	73,01	4239	30,68	69,32	4456
Large Firms	33,80	66,20	778	40,09	59,91	873	44,11	55,89	909
Year	2009			2010			2011		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	1,509	98,491	11265	1,836	98,164	10459	2,093	97,907	10034
Small-sized Firms	7,605	92,395	16567	8,226	91,774	17238	10,547	89,453	17436
Medium-sized Firms	31,793	68,207	4523	34,102	65,898	4900	39,706	60,294	5037
Large Firms	47,277	52,723	918	49,851	50,149	1007	56,459	43,541	1045
Year	2012			2013			2014		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	2,36	97,64	9913	2,64	97,36	9832	3,14	96,86	10102
Small-sized Firms	12,37	87,63	17445	13,59	86,41	17523	15,53	84,47	17429
Medium-sized Firms	44,91	55,09	5110	46,64	53,36	5201	50,41	49,59	5122
Large Firms	59,00	41,00	1056	62,69	37,31	1080	64,71	35,29	1054
Year	2015			2016			2017		
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms
Microenterprises	3,68	96,32	11035	3,20	96,80	11953	3,52	96,48	12417
Small-sized Firms	17,77	82,23	17050	18,18	81,82	16444	19,49	80,51	16117
Medium-sized Firms	52,34	47,66	4780	52,81	47,19	4473	57,17	42,83	4329
Large Firms	65,59	34,41	927	66,02	33,98	880	67,31	32,69	884
Year	2018			2019					
Firm size / Hire apprentices	Yes (%)	No (%)	All Firms	Yes (%)	No (%)	All Firms			
Microenterprises	4,59	95,41	12987	5,06	94,94	13467			
Small-sized Firms	22,72	77,28	15680	25,77	74,23	15380			
Medium-sized Firms	58,75	41,25	4339	64,83	35,17	4288			
Large Firms	71,94	28,06	866	75,66	24,34	875			

Notes: Yes (%) = Percentage of companies that hired apprentices. No (%) = Percentage of companies that did not hire apprentices. Source: Own elaboration based on RAIS microdata.

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