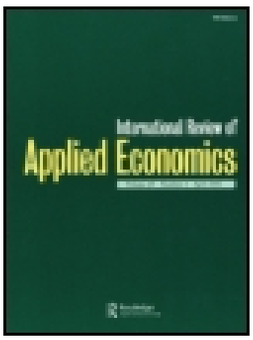

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The quotas law for people with disabilities in Brazil: is it a guarantee of employment?

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ABSTRACT

This study aims to evaluate the effects and effectiveness of establishing legal employment quotas for people with disabilities (PwD) in Brazil for the years of 2007 and 2016. By estimating Regression Discontinuity Design (RDD) models, we verify that, in 2007, the Law of Quotas did not affect the employment of people with disabilities. However, in 2016, the effects are positive for firms that employ 100 to 500 workers. Regarding the effectiveness of the law, in 2016, the increase in the number of employed workers with disabilities is approximate to the required quota for firms with 100 to 200 employees.

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1. Introduction

People with disabilities represent 15% of the world's population. Despite the improvement in rights equality throughout the years, they present worse health perspectives, lower educational attainment, lower economic participation, and higher poverty rates when compared to people with no disabilities. (WHO, The World Bank 2011)

Many countries adopt affirmative policies aiming for the insertion of people with disabilities (PwD) in the labor market. Employment quotas policies are implemented in Germany, France, Japan, Italy, and Brazil, while countries like United States, Australia, United Kingdom, Canada, and New Zealand have anti-discrimination laws that make employment discrimination against people who have disabilities illegal.

Studies regarding anti-discrimination laws in the United States, such as Deleire (2000), Acemoglu and Angrist (2001), and Beegle and Stock (2003), point to the existence of disparities in wages and employment rates between workers with and without disabilities. In the United Kingdom, where there is a similar anti-discrimination law in place, Bell and Heitmueller (2009) verify that the law did not have an impact on the employment of people with disabilities and that it possibly made it worse in the period immediately after its implementation.

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Regarding employment quotas, studies for Germany, such as Wagner, Schnabel, and Kölling (2001), Lechner and Vazquez-Alvarez (2011), and Verick (2004), suggest that inclusion policies are not effective in reducing the participation cost of workers with disabilities in the labor market. For Italy, Parodi e Sciulli (2013) find that transferring resources to low-income families with a member with disabilities is effective in the short run and helps prevent the risk of being categorized as low-income in the future. Addabbo, Krishnakumar, and Sarti (2014) observe that the impact of having a disability in Italy is different according to the type of disability. Agovino, Garofalo, and Marchesano (2016) note that the Italian law had a positive but small impact on the labor market participation of people with disabilities. In some countries, the establishment of employment quotas is effective, as pointed by Humer, Wuellrich, and Zweimüller (2007), Wuellrich (2010), and Lalive, Wuellrich, and Zweimüller (2013), for Austria, and Mori and Sakamoto (2018), for Japan.

In Brazil, the employment quota for PwD is regulated by Article 93 of the Law no. 8.213, of July 24th, 1991, establishing that firms with 100 or more employees are obliged to fulfill quotas varying from 2% to 5% of its total employees with workers who have a type of disability. According to Decree no. 5296, of December 2nd, 2004, that includes physical, hearing, visual, intellectual, and multiple disabilities, as well as rehabilitated individuals.

According to the Special Secretariat for Social Security and Labor and the Ministry of Economy, observing data from the Annual Social Information Report (RAIS), there were 486,7 thousand employed people with disabilities, representing only 1% of the total number of work ties in 2018. A few studies, such as Neri et al. (2003), verified the effect of the employment quotas law in Brazil. The study analyzes the law's initial phase, a period in which it was not fully adjusted, and concludes that larger firms are far from adapting to the law. Thomasi et al. (2018) examined the labor market for people with disabilities before and after the establishment of the Ordinance no. 1.199, of October 28th, 2003, that approved the application of fines to firms that fail to comply with the quotas. The main results point that people with visual and hearing disabilities face fewer insertion restrictions in the formal labor market and that workers who are 50 years or older have a higher probability of insertion as autonomous workers in the labor market. Neri et al. (2003), and Thomasi et al. (2018), however, do not analyze how the quota system affects the firms' demand for workers with disabilities, nor the law's effect.

In this context, this study aims to contribute with the literature on affirmative policies for the Brazilian labor market, using microdata from RAIS, for the years of 2007 and 2016, to estimate the Law of Quotas' causal effects on the demand for workers with disabilities. To do so, we use a Regression Discontinuity Design (RDD) based on the size of the firm, estimated considering its number of employees. However, an increase in demand is not a guarantee that the law is being followed. Thus, we must also evaluate its effectiveness on the employment of people with disabilities, based on the quota percentages established according to the firm's size. And finally, we analyze the law's impact on each sector of economic activity, aiming to verify which sectors are complying with the law.

2. International experiences on the insertion of people with disabilities in the labor market

The establishment of the 159 Convention of the International Labor Organization (ILO) in 1983, regarding the professional rehabilitation and employment of people with disabilities, was a milestone to the inclusion of workers with disabilities in the labor market worldwide (ILO 1983). This norm brought relevant progress in the sense of establishing definitions and fundamental guidelines, ensuring equal work opportunities for workers with disabilities and workers without disabilities in countries integrating the UN. As a result, several national laws emerged to guarantee access to work for people with disabilities.

The literature on national legislation is expressively composed by studies on the effects of anti-discrimination laws for people with disabilities in the labor market, especially for the United States. Beegle and Stock (2003) examined anti-discrimination laws on the state level before the enactment of the Americans with Disabilities Act (ADA) and found that they are associated with lower relative earnings and relative labor force participation rates for workers with disabilities when compared to PwD in states that did not have any anti-discrimination legislation. Analyzing the period after ADA, Deleire (2000) observed a decrease in the employment rate of over 7 percentage points for males with disabilities, when comparing to the employment of males with no disabilities, with wages remaining unchanged.

To observe if ADA improved economic conditions for people with disabilities, Acemoglu and Angrist (2001) analyzed employment and wages for workers with and without disabilities, using data from the Current Population Survey (CPS) and the Equal Employment Opportunity Commission (EEOC) on discrimination rates by state, for the years of 1988–1997, connecting changes in labor market variables to ADA-related fines. The CPS data shows a decrease in the employment of women and men with disabilities, aged between 21 to 39 years old, in the period after the implementation of ADA, with wages remaining unchanged. There was also a decrease in the share of people receiving disability insurance and Supplemental Security Income (SSI). In that sense, the authors concluded that ADA reduced the employment of workers with disabilities aged between 21 to 39 years old. Additional results suggest that the employment of people with disabilities decreased in higher proportion in medium-sized firms, possibly due to the small-sized companies being exempt from ADA and large companies being more prepared to absorb the costs related to ADA. Also, there was no evidence on the effect of ADA on workers without disabilities.

Similar to ADA, the Disability Discrimination Act (DDA) was established in the United Kingdom in 1995, aiming to overcome the barriers to the employment of people with disabilities in the country. It was expected that the rights guaranteed by the law would significantly increase job opportunities, both in obtaining and keeping employment. In that sense, Bell and Heitmueller (2009), using data from the British Household Panel Survey (BHPS) for the years of 1991–2002, estimated a model of differences in differences and verified that DDA had no impact on the employment of people with disabilities in the immediate period after its implementation. The authors point to low financial support, low levels of general awareness about the law among people with

disabilities and employers, and limitation of knowledge about the costs required to follow the law, as possible causes for its ineffectiveness.

Using panel data to analyze the Quotas Law, studies performed by Wagner, Schnabel, and Kölling (2001) and Verick (2004) verified the impact of the German labor legislation, the People with Severe Disabilities Act (PSDA), on workers with severe disabilities. Such law imposes that companies with 16 or more employees must hire workers with disabilities corresponding to 6% of the total number of workers. Wagner, Schnabel, and Kölling (2001) did not find clear evidence of changes in labor demand for companies in the first limit of the law, suggesting that the amount paid by firms as a penalty may be too small to encourage the employment of PwD. Verick (2004) evaluated the impact of the PSDA reform in 2003, analyzing three years before (1998–2000) and after (2001–2003) the reform, to compare people with severe disabilities (treatment group) to people with moderate disabilities or without disabilities (control group). The results did not show evidence that changes in the financial incentives given by the PSDA had a long-term positive impact on the employment of people with severe disabilities. Moreover, the adjustments in the financial incentives of the law were not sufficient to increase the demand for workers with disabilities, due to the small magnitude of noncompliance fines and to the adverse economic conditions at the time the reform took place.

Lechner and Vazquez-Alvarez (2011) analyzed the impact of the status of disability in the labor market, using data from the German Socio-economic Panel (1984–2001) to estimate the impact of having disabilities on labor market variables and different income measures. The results point out that workers with no disabilities had higher employment rates when compared to workers with a disability and that the established inclusion policies did not reduce the cost for workers with disabilities to participate in the labor market.

Mori and Sakamoto (2018) analyzed the effect of the employment quota system for people with disabilities in Japan, in 2008, using administrative data to estimate a Regression Discontinuity Design (RDD). According to the employment policies directed to PwD in Japan, firms with 301 or more workers had to pay fines in case of noncompliance with the established quota. The authors used the number of employees with disabilities as an instrumental variable (IV) to evaluate if the employment of PwD decreases firms' profit. The results show that the establishment of fines promotes the hiring of people with disabilities in the manufacturing industry in Japan and that there's no clear correlation between the number of employed PwD and the profit of the firm, although this result, estimated using RDD, contradicts the OLS result, which showed a negative relationship between profit rate and the employment of people with disabilities.

In Austria, companies must hire at least one PwD for every 25 workers without disabilities, and those that are noncompliant with the law are subject to a tax used to subsidized compliant firms, according to the Disabled Persons Employment Act (DPEA). Lalive, Wuellrich, and Zweimüller (2013) analyzed if an employment quota imposed on firms can help increase the demand for workers with disabilities, by estimating an RDD to explore the discontinuity in the relative cost of employment for workers with and without disabilities. The results indicate that companies with over 25 workers without disabilities employ 12% more PwD than without the established tax, and the employment of workers with disabilities is higher in companies with lower wages than in those with

higher wages. Another observed result is that an increase in the noncompliance tax increases the employment of people with disabilities, while a bonus to companies that employ workers with disabilities above the established quota slightly decreases the fine's effects on employment.

Using regression with fixed effects, Humer, Wuellrich, and Zweimüller (2007) examined the impact of the Austrian employment quotas law on the labor market perspectives and gains for workers with severe disabilities, defined relative to the degree of disability due to a physical, mental, intellectual, or sensory disorder, so that the worker's work capacity is reduced by at least 50%. The study found that employed workers that obtain a severe disability status have higher job perspectives after acquiring it, while unemployed workers have an extreme reduction in their employment perspectives after receiving this status. That happens due to the extended employment protection for the beneficiaries, which imposes substantial dismissal costs to firms when firing workers with disabilities. Therefore, they highlight that the employment protection legislation regarding PwD has a high impact on the hiring decisions made by firms.

In continuity, using interrupted time series, Wuellrich (2010) verified if a 30% increase in the single tax related to the Austrian employment quota affected the firms' demand for workers with disabilities. This study indicates that there was a relevant increase in the demand for workers with disabilities after this measure took place. Corroborating with Lalive, Wuellrich, and Zweimüller (2013), the author points out that the non-compliance tax increase had a positive impact on the employment of people with disabilities.

Some studies find that disabilities affect insertion in the labor market and employment, both for people with disabilities and their family members. In Italy, Parodi and Sciulli (2012) study the determinants of the probability of being considered low-income for families with a family member with disabilities for the years 2004 and 2007. They find that these families depend significatively on government assistance, which is also determined by structural variables such as employment of people with disabilities in the South, size of the family, and partner's employment.

In a similar study, Mussida and Sciulli (2015) examined the direct and indirect effects of having a disability, aiming to understand how living with a family member with a disability affects an individual's probability of being employed. The authors performed a comparative analysis in four European countries (Italy, Spain, France, and United Kingdom), for the years 2007 and 2010, and found negative direct impacts of disability on the chance of employment for all countries.

Addabbo, Krishnakumar, and Sarti (2014) analyzed data on people with disabilities in Italy, focusing on employment opportunities and participation in the labor market, and found that the impact on employment varies according to the type of disability and other individual and environmental characteristics, such as age, gender, education, and place of residence.

A few studies analyzed the effect of Italian legislation – in particular, Law number 68 of March of 1999, which regulates and promotes the employment of people with disabilities in Italy, establishing a 7% quota for companies with 50 or more employees; two workers with disabilities in companies with 36 to 50 workers; and one person with a disability if the company employs 15 to 35 people. According to Addabbo, Krishnakumar, and Sarti (2014), Italy is considered an international reference due to its specific legislation towards the professional insertion of people with disabilities.

Agovino and Rapposelli (2014) analyzed the effectiveness of this law in Italian provinces for the year 2005 and found that the efficacy in each province depends on its ability to coordinate actions aiming to insert PwD in the labor market. Agovino, Garofalo, and Marchesano (2016) verified the effect of these measures for people with disabilities in 2008 and 2010 and found that the law had a positive, but small impact on labor market participation.

Still regarding the Italian legislation, focusing on the limitations of this law, Agovino, Marchesano, and Garofalo (2019) examined its strengths and the employment opportunities generated by the policy in the years of 2006 to 2013. The authors point out that, for the law to have a positive effect on the employment of PwD, greater incentives must be introduced for employers, especially to allow for adaptation and adjustment of the workplace.

In Spain, there is a quota of 2% of employees with disabilities for firms with over 50 workers. Malo e Pagán (2014) analyzed the effect of this quota using an RDD and found an increase of 1.4 percentage points on the number of workers with disabilities – an increase corresponding solely to the 2% quota. This increase relates only to firms located around the cutoff, making it impossible to observe the quota's effect on larger companies (located further away from the cutoff).

In France, the law establishes a mandatory quota of 6% for companies with over 20 employees and the application of fines in case of non-compliance. Barnay et al. (2019) found a negative impact of this law on the employment of PwD in the private sector. The authors suggest that this result can be due to the possibility of paying a fine instead of hiring workers with disabilities.

3. The law of quotas and the insertion of people with disabilities in the Brazilian labor market

The Federal Constitution of 1988 seeks the insertion of people with disabilities in the labor market by prohibiting wage discrimination, reserving a share of public office for people with disabilities, guaranteeing their rehabilitation and integration to life in society, among other attributions. The law no. 7853, of 24 October 1989, regulates the National Policy for People with Disabilities (Política Nacional da Pessoa Portadora de Deficiência), securing PwD's rights to social integration and opportunities, social justice, respect, wellbeing, and other constitutional rights, such as health, education, and social assistance, ensuring their personal, social, and economic wellbeing (Brasil 1988, 1989).

The affirmative policy for the employment of people with disabilities in Brazil is regulated by Law no. 8213, of 21 July 1991, in its Article 93, known as 'Law of Quotas', aiming to guarantee the social inclusion of workers with disabilities in the labor market. The legislation regulates the labor obligations of firms regarding the number of PwD that should be employed, and the financial consequences in case of non-compliance. Paragraph 1 of Article 5 of Decree no. 5296, of 2 December 2004, regulates the types of disabilities considered by the law.[1]

The rule of employment quotas requires companies with 100 or more employees to fulfill from 2% to 5% of its positions with workers with disabilities or rehabilitated beneficiaries (Brasil 1991). By this rule, we calculate the quota of firm i in the following manner:

$$Quota_i = \{0,02\,\mathrm{x}\,T_i, if\, 100 \geq T_i \leq 200; 0,03\,\mathrm{x}\,T_i, if\, 201 \geq T_i \leq 500; 0,04\,\mathrm{x}\,T_i, \\ if\ 501 \geq T_i 1000; 0,05\,\mathrm{x}\,T_i, if\ T_i 1001\} \quad (1)$$

In which T_i is the number of workers employed in the company i. Following the Normative Ordinance nº 98, of 15 August 2012, the quota percentage calculation established by the Law, Equation (1), considers the total number of employees in all establishments owned by a company. Moreover, the decimals in the quota calculation will be rounded up to employ one extra worker with a disability.

To verify compliance with the quotas for the employment of workers with disabilities or beneficiaries rehabilitated by the Social Security, the Ministry of Economy's Secretariat of Labor has the duty of inspecting firms, through its Labor Tax Auditors (AFT), and generating data and statistics on the total number of employees and positions occupied by workers with disabilities. The quotas consider only the direct employment of people with disabilities, not including apprentices with disabilities.

The employers' perception of disabilities may be an obstacle to the integration of PwD in the employment policy. (WHO, The World Bank 2011). According to Neri, Carvalho, and Costilla (2002), larger companies claim that the obligation to hire workers with disabilities corresponding to 5% of its positions may obligate them to dismiss an equal number of workers without disabilities, once the company may have already fulfilled its hiring capacity and would not need more employees. Moreover, some firms claim that they do not have the appropriate structure to receive people with disabilities, such as transportation and adapted access.

Companies that fail to comply with the Quotas Law are subject to fines that vary according to the level of noncompliance and firm's size, Table 1, and that are updated annually. For the year of 2020, the minimum amount specified in Ordinance no. 914/2020 was R$2.519,31, with a maximum amount of R$251.929,36 (Brasil 2020). The amount of the fine is obtained by multiplying the number of workers with disabilities or rehabilitated employees that the firm failed to employ in observance of the minimum legal quota, plus a variable amount, according to the Ordinance no. 1.199/2003 (Brasil 2003).

To acquire the PwD status, it is necessary to obtain proof, through a medical report (whether from a professional tied to the company or not), that attests to the disability according to definitions of Decree no. 3.298/99 and alterations established by Decree no. 5.296/2004 (Brasil 1999, 2004). The medical report must contain information on the type of disability, specifying its code according to the International Classification of Diseases (ICD), and the employee's authorization to disclose this information. This procedure aims to avoid fraud in the employment of workers with disabilities.

Table 1. Fine amount for noncompliant companies, according to the numbers of employees (active ties).

Number of Employees	Fine Amount
100 to 200	nº of workers with disabilities that were not hired x year's minimum fine amount + (0 to 20%)
201 to 500	nº of workers with disabilities that were not hired x year's minimum fine amount + (20 to 30%)
501 to 1000	nº of workers with disabilities that were not hired x year's minimum fine amount + (30 to 40%)
Over 1000	nº of workers with disabilities that were not hired x year's minimum fine amount + (40 to 50%)

Own elaboration based on the Ordinance no. 1.199/2003.

The general norms of the Consolidation of Labor Laws (CLT) regarding the employment of workers without disabilities are also applied to employees with disabilities, prohibiting any discrimination regarding wages and admission criteria. In that sense, the Law of Quotas establishes that the dismissal of workers with disabilities or rehabilitated workers at the end of a fixed-term contract with a duration superior to 90 days, or the unmotivated dismissal in a contract with no fixed term, can only take place after the employment of a substitute worker in the same condition. Moreover, according to Decree no. 3.298/99, dependent on the level of disability, transitory or permanent, special procedures will be employed, such as variable shifts, flexible schedule, the proportionality of wages, adequacy of the workspace to the worker's needs, among others.

4. Empirical strategy

The empirical strategy adopted to evaluate the effect and effectiveness of the affirmative policy on the employment of people with disabilities, the Quotas Law, is based on the RD design, proposed by Lee and Lemieux (2010), and initially approached by Thistlethwaite and Campbell (1960). Since there is an increase in the quota percentages correlated to the firm's size (number of employees), we make an analysis according to the cutoff point for each percentage increase of the employment quota. In that sense, we evaluate firms according to the following cutoffs[2]:

$$100 \geq c1 \leq 200$$

$$201 \geq c2 \leq 500$$

$$501 \geq c3 \leq 1000$$

$$c4 \geq 1001$$

Trochim (1984) points to the existence of two RDD approaches: sharp and fuzzy. In the sharp RD design, participation in the treatment is associated with the assignment of a variable with a deterministic function, that is, the probability of receiving treatment jumps from zero to one at the cutoff point. On the other hand, the fuzzy RD design is used when the variable has a stochastic function, that is, the probability of receiving treatment increases around the cutoff, but not from zero to one, since the treatment allocation may depend on additional factors.

To analyze the effectiveness of the law, we employ the Sharp RD design. To that end, we excluded firms located below the thresholds, that is, companies that were complying with the law even though they were not obliged to hire people with disabilities. We estimate[3] the model at each cutoff point to verify compliance with the law using the following equation:

$$L_{it}^{D} = \propto_0 + \propto_1 D_{it} + \beta_0 \tilde{L}_{it}^{N} + \beta_1 D_{it} \tilde{L}_{it}^{N} + \varepsilon_{it} \tag{2}$$

L_{it}^{D} is the variable of interest in this model, $D_{it} = 1(\tilde{L}_{it}^{N} \geq C)$ indicates whether a firm belongs to the treatment or control group, that is, if the number of employees is equal or greater than C, and equals 1 if treated and 0 otherwise. $\tilde{L}_{it}^{N}$ is the difference between the

current active employment and the cutoff (C) of firm i at time t (this variable indicates whether the firm is below or above the threshold). The parameter α_1 measures the average causal effect of the Quotas Law on the number of employed PwD for firms located around the cutoff C. α_0 measures the average number of workers with disabilities in firms right below the cutoff, and parameters β_0 and β_1 capture the correlation between firm's size and the average number of workers with disabilities employed by the firm.

Due to an increase (decrease) in the firm's size, in terms of the number of employees, companies may change their location around the cutoff over time, placing below the threshold for a given year, and above it in a different period. That creates a correlation between the error term and the variable of interest. Another source of endogeneity is the fact that firms located below the cutoff can hire PwD, even though they're not obliged by the law, and that there are noncompliant companies subject to the law, that is, located above the cutoff point, that do not employ workers with disabilities, as seen in Table 2, which can also generate a correlation between the error term and the variable of interest.[4] In that sense, we adopt the fuzzy RD design to analyze the firm's decision to hire workers with disabilities, in a scenario where the quotas rule increases the likelihood of treatment, but that it does not happen to all firms equally, that is, the variation is not from 0 to 1.

To estimate the effect of quotas on the employment of people with disabilities in the Brazilian labor market, we consider the following model:

$$D_{it} = \delta_0 + \delta_1 C_{it} + \gamma_0 L_{it} + \mu_{2it} \tag{4}$$

Since we assume endogeneity regarding the dependent variable from Equation (3) and the error term, we estimate Equation (4) for the fuzzy RD model. Where D_{it} is the number of workers with disabilities in firm i at year t, representing the variable of interest of our model, C_{it} is a dummy variable that equals 1 if the firm belongs to the treatment group and 0 otherwise, L_{it} represents the firm's adjusted number of workers, used as an instrument, which is the instrumental score that interacts with C_{it}. The parameter δ_1 measures the average causal effect of the Quotas Law on the number of workers with disabilities for firms around the cutoff C. δ_0 measures the average number of workers with disabilities for firms right below the cutoff, and the parameter γ_0 captures the correlation between firm size and the average number of employed PwD.

We carry a robustness analysis of the results by inspecting the density of firm size (number of employees, in 2007 and 2016). The density tests, as recommended by

Table 2. Firms that employed workers with disabilities and complied with the quotas, %.

Year	2007				2016			
Firm Size	Do Not Employ PwD	Employ PwD	Comply with the Quotas	Total	Do Not Employ PwD	Employ PwD	Comply with the Quotas	Total
<100	84,99	15,01	-	37.291	72,39	27,61	-	41.892
100 to 200	62,63	37,37	15,05	16.194	37,43	62,57	33,57	18.368
201 to 500	41,26	58,74	14,36	9.306	21,25	78,75	30,11	10.036
501 to 100	32,72	67,28	10,97	2.570	12,86	87,14	23,91	2.878
>1001	24,39	75,61	5,91	1.558	7,36	92,64	13,31	1.781

Own elaboration based on RAIS Data (Brasil 2018).

Cattaneo, Jansson, and Xinwei (2016), verify the continuity of the density of the eligibility variable around the cutoff point, aiming to check for the existence of manipulation of the firm's number of employees. We observe, in Figure 2 of the Appendix, that there is no manipulation of the eligibility variable around the cutoff. Therefore, the premise that employers can't control the eligibility variable is sustained.

Furthermore, we also perform placebo tests simulating arbitrary cutoff points, not established by the Quotas Law, to test if there are statistical differences between firms located under and above these thresholds. According to our results, Table A1 of the Appendix, we can reject the null hypothesis of the placebo tests. Therefore, there is no evidence of significant discontinuity on the arbitrary cutoff points. These tests corroborate the validity of the empirical strategy adopted in this study.

5. Data

The RAIS database contains detailed information on characteristics of employees (sex, age, gender, race, and schooling) and firms (location, number of work ties, and the national classification of economic activities) in the Brazilian formal sector. As of 2007, the RAIS database also indicates whether a worker has a disability and of which type. That allows for the calculation of the number of workers with and without disabilities in each company.

Using the firm's identification, the National Registry of Legal Entities (CNPJ), it is possible to group data from the company throughout Brazil and, thus, calculate the total number of employees (headquarters and all branches) as determined by the Normative Ordinance no. 98/2012. From that, it is possible to determine if a firm is subject to the rule of employment quotas and whether it is compliant with the law.

In that sense, we use RAIS microdata from 2007, the first year of analysis of information regarding the work ties of workers with disabilities. To capture possible changes in the Brazilian labor market, we use RAIS data from 2016 as well.

Since there are specific laws[5] in Brazil that secure the right for people with disabilities to apply for public office, our analysis focuses on private sector firms. According to the Decree-Law no. 3298/99, the minimum percentage of vacancies to be fulfilled by people with disabilities in public office's exams corresponds to 5% of all positions, thus the employment quota law does not apply in these cases.

To calculate the number of employees with and without disabilities in each firm, we excluded public sector employees and young apprentices from our sample, since there is no quota overlap according to Law no. 13.146 of 2015 (Brasil 2015). Therefore, if there is a young apprentice with disabilities employed by the company, and he or she is part of the apprenticeship quota, it is not possible to include this employee in the calculation of the employment quota for workers with disabilities.

Table 3 shows the characteristics of PwD employed in the Brazilian private sector, considering the firm's size, according to the Quotas Law, for the years of 2007 and 2016. Independent of the firm's size, there is a larger number of people with disabilities employed in the labor market in 2016, when compared to 2007.

The percentage of employed men is at least twice as high as that of employed women. Regarding age, the majority of workers are between 30 and 50 years old. Concerning color or race, white employees occupy at least 50% of all positions.

Table 3. Characteristics of workers with disabilities, %, RAIS data, 2007 and 2016.

Year	2007				2016			
Firm Size	100	201	501	1001	100	201	501	1001
Disability Type								
Physical	44,08	50,04	47,86	47,76	45,18	47,75	49,41	47,37
Hearing	22,7	22,08	27,04	32,71	18,95	20,42	22,27	21,69
Visual	3,73	3,38	3,89	3,57	12,62	12,62	12,86	13,46
Mental	5,06	4,59	3,62	2,15	14,22	10,43	6,93	4,65
Multiple	1,50	2,05	3,19	3,82	2,56	1,97	1,47	1,11
Rehabilitated	22,65	17,64	14,26	9,40	6,47	6,80	7,05	11,72
Gender								
Male	71,39	74,08	72,68	74,79	71,10	70,82	71,44	68,96
Female	28,61	25,92	27,32	25,21	28,90	29,18	28,56	31,04
Age								
Age<30	37,97	33,09	30,87	28,13	29,77	25,80	22,71	20,08
30≤Age≤50	50,73	54,72	55,08	57,61	55,88	58,87	60,53	61,67
Age>50	11,30	12,18	14,06	14,26	14,35	15,32	16,76	18,25
Color/Race								
White	60,97	51,25	56,98	58,00	51,33	51,73	53,2	52,20
Others	39,03	48,75	43,02	42,00	48,67	48,27	46,80	47,80
Schooling								
Illiterate	2,01	1,01	1,06	2,71	1,06	0,91	0,90	0,90
Middle School	41,64	49,00	42,46	43,47	32,12	30,93	30,47	30,11
High School	46,64	42,79	47,51	43,00	54,89	55,36	52,48	51,00
Higher Education	9,66	7,15	8,92	10,78	11,74	12,61	16,00	17,79
Masters/Doctorate	0,05	0,04	0,05	0,05	0,19	0,19	0,14	0,18
Observations	25.498	47.490	28.024	44.502	42.805	64.865	46.104	74.915

Own elaboration based on RAIS data (Brasil 2018).

Most workers with disabilities have at least a High School diploma, which puts them on an equal footing in the labor market with people without disabilities with the same qualifications. From 2007 to 2016, there is a relevant decrease in the proportion of people still in Middle School, while there is an increase in the proportion of people in High School or Higher Education in all firms' size, indicating that people with disabilities are seeking more professional qualification. However, we must emphasize that the percentage of illiterates is higher than the number of people with disabilities with a Masters or Doctorate, which can be explained by the low human capital accumulation observed for workers with a disability, as well as reduced perspectives of a professional future.

6. Analysis and discussion of results

6.1. The effect of the quotas law on the demand for workers with disabilities

The relationship between the number of people with disabilities and the firm's size for the whole sample is shown in Figure 1.[6] We observe a discontinuity exactly on the established cutoff points, for both years considered in this study (2007 and 2016), indicating that there is a jump in the variable of interest between those below and above the thresholds. That suggests, therefore, that the law has particular effects on firms located around the cutoffs.

Tables 4 and 5 present the estimation results for the effects of the Quotas Law on the number of PwD employed in private firms for each cutoff point established by Federal Legislation, for the years of 2007 and 2016, respectively. We analyze aggregated and disaggregated results, first estimating the aggregate effect for Brazil, and then by sector of activity.

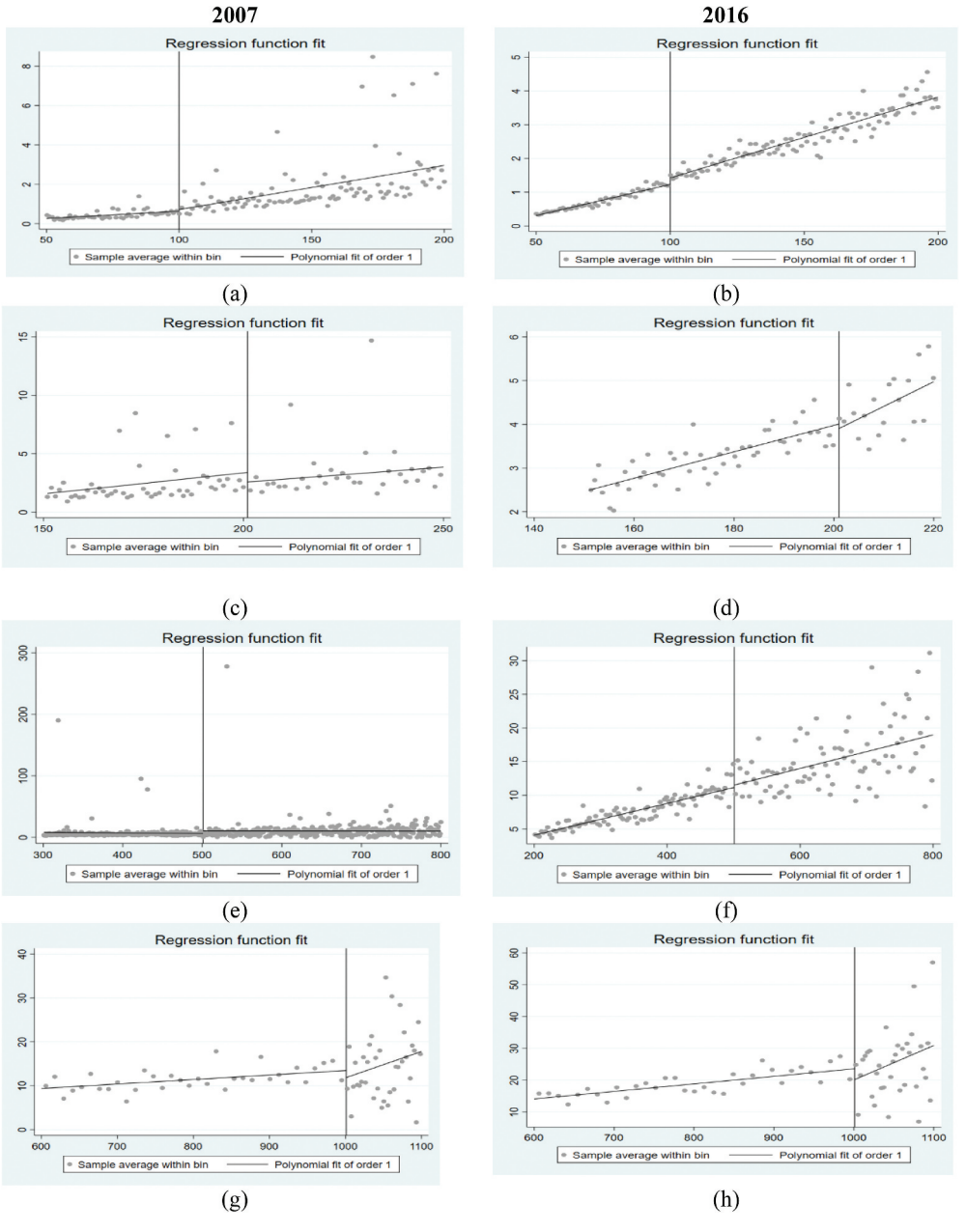

Figure 1. Relationship between the number of workers with disabilities and the size of Brazilian companies for the entire sample. Own elaboration based on RAIS data (Brasil 2018).

When estimating for Brazil, it is clear that the Quotas Law did not have any effect, in the year of 2007, in any of the established thresholds. This may be associated with the lack of inspection and the non-application of fines, given that the rules were not yet well adjusted. Regarding the year of 2016, we observe a positive impact of the law on firms located around the first and second cutoff points. In the first cutoff, according to the robust method estimate, the employment of one extra worker leads to an increase of

Table 4. Effect of the law of quotas on the employment of people with disabilities for the year of 2007.

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Brazil	0,01966	0,00583	0,00583	−0,34,422	−0,30,512	−0,30,501	1,9773	1,9965	1,9965	−3,2205	−3,7991	−3,7991
	(0,10,032)	(1,0032)	(0,11,623)	(0,63,999)	(0,63,999)	(0,66,468)	(1,4914)	(1,4914)	(1,5778)	(5,2577)	(5,2577)	(5,8105)
Agriculture	0,1539	0,17,781	0,17,781	−0,2042	−0,02764	0,02764	−5,2469*	−6,0919*	−6,0919*		ND	
	(0,25,354)	(0,25,354)	(0,30,375)	(0,972)	(0,972)	(1,0744)	(2,3551)	(2,3551)	(2,8145)			
Extractive Industry	−0,06082	−0,06624	−0,06624	1,1067	1,0021	1,0021	0,78,523	1,5557	1,5557		ND	
	(0,16,874)	(0,16,874)	(0,2249)	(1,7845)	(1,7845)	(2,0184)	(2,3393)	(2,3393)	(3,1728)			
Manufacturing	0,31,225	0,28,112	0,28,112	−0,28,311	−0,18,444	−0,18,444	1,0711	1,1088	1,1088	−4,6815	−5,0767	−5,0767
	(0,2643)	(0,2643)	(0,30,669)	(0,45,433)	(0,45,433)	(0,63,556)	(1,1863)	(1,1863)	(1,3204)	(6,0708)	(6,0708)	(7,2688)
Electricity	0,17,495	0,30,576	0,30,576	2,746	3,3823	3,3823		ND			ND	
	(0,96,644)	(0,96,644)	(1,0849)	(4,0174)	(4,0174)	(4,727)						
Water and Waste Management	−0,6425	−0,75,345	−0,75,345	6,0391	9,3015	9,3015	6,0083	13,072*	13,072	15,139	19,959	19,959
	(0,73,366)	(0,73,366)	(0,84,919)	(6,2303)	(6,2303)	(9,4081)	(6,3821)	(6,3821)	(9,3053)	(8,5136)	(8,5136)	(11,013)
Construction	−0,08286	−0,10,368	−0,10,368	−1,7043	−1,5562	−1,5562	1,2977	2,8351	2,8351	−15,519*	−18,629*	−18,629*
	(0,18,458)	(0,18,458)	(0,22,748)	(1,2191)	(1,2191)	(1,3594)	(3,3357)	(3,3357)	(3,9123)	(6,2661)	(6,2661)	(7,1399)
Retail	−0,17,363	−0,14,592	−0,14,592	−0,65,488	−0,75,608	−0,75,608	0,66,117	0,88,073	0,88,073	−9,1945	−9,5574	−9,5574
	(0,17,875)	(0,17,875)	(0,20,592)	(0,61,831)	(0,61,831)	(0,66,551)	(3,8316)	(3,8316)	(4,4763)	(8,4579)	(8,4579)	(9,867)
Transportation	0,01401	−0,02259	−0,02259	0,19,963	−0,11,714	−0,11,714	0,86,262	0,981	0,981	−1,0439	−3,0411	−3,0411
	(0,16,931)	(0,16,931)	(0,1939)	(1,8003)	(1,8003)	(1,9249)	(2,4492)	(2,4492)	(2,7865)	(6,0873)	(6,0873)	(6,9456)
Lodging and Food	−0,28,161	−0,32,383	−0,32,383	−0,25,494	−0,42,223	−0,42,223	0,91,941	2,3037	2,3037	15,744*	19,229*	19,229
	(0,24,252)	(0,24,252)	(0,27,727)	(1,2362)	(1,2362)	(1,5079)	(3,9153)	(3,9153)	(4,5458)	(5,428)	(5,428)	(10,018)
Information and Communication	−0,74,373	−0,92,738	−0,92,738	−1,9767	−2,3432*	−2,3432	−0,31,863	0,33,231	0,33,231	2,0721	3,1154	3,1154
	(0,65,852)	(0,65,852)	(0,79,537)	(1,2638)	(1,2638)	(1,5316)	(6,611)	(6,611)	(8,2432)	(6,0924)	(6,0924)	(8,6731)
Financial Services	−0,0717	−0,05823	−0,05823	−2,3553	−2,8151	−2,8151	1,1585	0,52,673	0,52,673		ND	
	(0,70,758)	(0,70,758)	(0,82,214)	(3,4999)	(3,4999)	(4,0285)	(6,779)	(6,779)	(8,2563)			
Real Estate	−0,38,237	−0,49,017	−0,49,017		ND			ND			ND	
	(0,31,803)	(0,31,803)	(0,39,325)									
Professional, Scientific, and Technical Activities	0,54,857	0,61,097	0,601,097	−1,3642	−1,6044	−1,6044	−22,592	−27,699	−27,699	−1,6581	1,9652	1,9652
	(0,6647)	(0,66,473)	(0,78,449)	(0,90,117)	(0,90,117)	(1,0072)	(18,499)	(18,499)	(21,139)	(7,6852)	(7,6852)	(11,242)
Administrative Services	−0,06486	−0,068	−0,068	0,64,427	0,36,543	0,36,543	11,228	12,684*	12,684	−2,9282	−3,1634	−3,1634
	(0,12,415)	(0,12,415)	(0,14,218)	(1,3474)	(1,3474)	(1,4198)	(6,3216)	(6,3216)	(7,1464)	(3,1751)	(3,1751)	(3,6877)
Education	0,51,622	0,63,959	0,63,959	−2,5508*	−2,9826*	−2,9826*	−4,1881	−5,2133	−5,2133		ND	
	(0,34,816)	(0,34,816)	(0,3887)	(1,2458)	(1,2452)	(1,3985)	(3,3502)	(3,3502)	(3,7008)			
Health	−0,24,081	−0,30,848	−0,30,848	−10,468	−12,486	−12,486	2,2201	2,576	2,576		ND	
	(0,25,506)	(0,25,506)	(0,30,202)	(10,171)	(10,171)	(12,355)	(3,0928)	(3,0928)	(3,7155)			

(*Continued*)

Table 4. (Continued).

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Arts, Culture, Sport and Recreation	−0,4824 (0,253)	−0,33,369 (0,253)	−0,33,369 (0,23,984)	3,9953 (6,1204)	6,1597 (6,1204)	6,1597 (8,6481)		ND			ND	
Other Activities and Services	−0,20,735 (0,4265)	−0,36,245 (0,4265)	−0,36,245 (0,57,792)	0,7653 (1,5438)	0,24,068 (1,5438)	0,24,068 (2,0318)		ND			ND	

Own elaboration based on RAIS data (Brasil 2018). Standard error in parentheses, * p-value < 0.05. 'ND' is used when the sector does not have sufficient observations around the cutoff to perform the estimation.

Table 5. Effect of the law of quotas on the employment of people with disabilities for the year of 2016.

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Brazil	0,20,836*	0,2348*	0,2348*	0,8590	1,0027*	1,0027	−0,0958	−0,2335	−0,2335	−0,2792	−0,2410	−0,2410
	(0,09271)	(0,0927)	(0,1095)	(0,5263)	(0,5263)	(0,5534)	(0,9052)	(0,9025)	(1,0713)	3,1018	3,1018	(3,7204)
Agriculture	0,8467	1,0021*	1,0021	2,1793	2,1713	2,1713	−8,7427	−9,2950	−9,2950	11,7990	14,9740	14,9740
	(0,5620)	(0,5620)	(0,6593)	(3,2182)	(3,2182)	(3,9296)	(6,6403)	(6,6403)	(7,7999)	(12,4620)	(12,4620)	(14,7090)
Extractive Industry	0,1403	0,1319	0,1319	7,3174*	8,6692*	8,6692*		ND		1,9301	−4,7544	−4,7544
	(0,6808)	(0,6808)	(0,8237)	(3,0495)	(3,0495)	(3,4414)				(49,508)	(49,508)	(60,3)
Manufacturing	0,1787	0,16,258	0,16,258	0,32,983	0,34,357	0,34,357	−0,09549	−0,02497	−0,02497	−9,4957*	−10,168*	−10,168
	(0,11,492)	(0,11,492)	(0,13,818)	(0,39,795)	(0,39,795)	(0,47,973)	(1,4081)	(1,4081)	(1,6879)	(4,1976)	(4,1976)	(4,9662)
Electricity	−0,02136	0,43,478	0,4378	2,4281	3,1657	3,1657		ND			ND	
	(1,4024)	(1,4024)	(1,6196)	(3,3329)	(3,3329)	(3,6504)						
Water and Waste Management	0,79,113	0,71,281	0,71,281	−1,5973	−0,92,657	−0,92,657	2,5026	3,8078	3,8078	17,009	23,284	23,284
	(0,7775)	(0,7775)	(0,91,624)	(3,4269)	(3,4269)	(4,6209)	(5,3327)	(5,3327)	(6,2815)	(24,904)	(24,904)	(34,983)
Construction	0,47,158	0,63,011*	0,63,011*	1,2181	1,5717	1,5717	2,9205	2,2812	2,2812	2,3196	1,5962	1,5962
	(0,29,068)	(0,29,068)	(0,36,753)	(1,5027)	(1,5027)	(1,8320)	(3,9363)	(3,9363)	(3,9773)	(13,216)	(13,216)	(15,538)
Retail	0,21,327	0,20,664	0,20,664	0,10,257	0,16,471	0,16,471	2,2516	2,6968	2,6968	16,454*	19,305*	19,305
	(0,19,141)	(0,19,141)	(0,2311)	(0,6102)	(0,6102)	(0,7315)	(3,1459)	(3,1459)	(3,5487)	(7,7042)	(7,7042)	(10,632)
Transportation	0,23,334	0,24,259	0,24,259	−0,03127	0,05067	0,05067	−0,98,431	−0,58,606	−0,58,606	21,248*	25,044*	25,044*
	(0,2093)	(0,2093)	(0,24,682)	(0,60,074)	(0,60,074)	(0,72,354)	(2,5406)	(2,5406)	(3,0527)	(9,5089)	(9,5089)	(11,058)
Lodging and Food	−0,06843	−0,05586	−0,05586	−1,4684	−1,6739	−1,6739	−8,361*	−8,532*	−8,532*	−5,4215	−5,9276	−5,9276
	(0,33,724)	(0,33,724)	(0,40,808)	(1,1169)	(1,1169)	(1,3324)	(3,4581)	(3,4581)	(3,7882)	(8,1955)	(8,1955)	(9,3924)
Information and Communication	−0,48,411	−0,50,448	−0,50,448	−2,2195*	−2,6964*	−2,6964*	3,4537	4,8438	4,8438	−2,9539	−2,818	−2,818
	(0,46,552)	(0,46,552)	(0,55,248)	(0,97,463)	(0,97,463)	(1,0888)	(5,3374)	(5,3374)	(6,2648)	(17,635)	(17,635)	(21,627)
Financial Services	−0,27,793	−0,07789	−0,07789	0,62,889	0,49,413	0,49,413	6,208	10,416	10,416	54,47*	65,583*	65,583*
	(0,60,326)	(0,60,326)	(0,70,542)	(1,4028)	(1,4028)	(1,6341)	(9,4584)	(9,4584)	(11,082)	(21,679)	(21,679)	(25,766)
Real Estate	−1,5325	−1,4892*	−1,4892	−1,3346	−1,7686	−1,7686		ND			ND	
	(0,81,742)	(0,81,742)	(1,031)	(3,5383)	(3,5383)	(4,2712)						
Professional, Scientific, and Technical Activities	0,23,512	0,06778	0,06778	−0,06652	0,38,412	0,38,412	15.321	18,221	18,221	−20,153	−23,014	−23,014
	(0,59,166)	(0,59,166)	(0,6974)	(1,2553)	(1,2553)	(1,4754)	(17,256)	(17,256)	(21,177)	(17,604)	(17,604)	(19,711)
Administrative Services	0,20,619	0,34,071	0,34,071	−0,2903	−0,38,668	−0,38,668	0,80,283	0,86,659	0,86,659	3,6142	1,5747	1,5747
	(0,22,196)	(0,22,196)	(0,28,495)	(0,49,902)	(0,49,902)	(0,56,003)	(1,7302)	(1,7302)	(2,0894)	(5,3906)	(5,3906)	(6,332)
Education	0,21,897	0,20,227	0,20,227	−0,33,958	−0,61,791	−0,61,791	−1,4287	−2,3201	−2,3201		ND	
	(0,41,509)	(0,41,509)	(0,4691)	(0,93,033)	(0,93,033)	(1,1146)	(10,68)	(10,68)	(13,241)			
Health	0,47,306	0,46,899	0,46,899	0,58,609	0,925	0,925	−4,9554	−5,6326	−5,6326	−12,06	−14,267	−14,267
	(0,33,681)	(0,33,681)	(0,40,542)	(1,2384)	(1,2384)	(1,4506)	(3,3256)	(3,3256)	(3,8159)	(9,5616)	(9,5616)	(12,22)

(*Continued*)

Table 5. (Continued).

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Arts, Culture, Sport and Recreation	1,1103 (0,80,208)	1,2108 (0,80,208)	1,2108 (0,93,062)		ND			ND			ND	
Other Activities and Services	0,82,396 (0,69,952)	1,0338 (0,69,952)	1,0338 (0,83,038)	2,3078 (1,7362)	2,9636* (1,7362)	2,9636 (1,9503)		ND			ND	

Own elaboration based on RAIS data (Brasil 2018). Standard error in parentheses, * p-value < 0.05. 'ND' is used when the sector does not have sufficient observations around the cutoff to perform the estimation.

0,2348 employed PwD for firms around this threshold. In the second cutoff, the results suggest an additional 1,0027 employed workers with disabilities, which corroborates with studies by Mori and Sakamoto (2018), and Lalive, Wuellrich, and Zweimüller (2013), that identified that employment quotas have a positive effect on the employment of people with disabilities.

Subsequently, we perform estimations disaggregating by the firm's sector of activity, considering the specificities of different economic sectors. We observe that, in 2007, there were no effects of the law on firms employing at least 100 workers in any of the analyzed sectors. In 2016, there is a negative effect for the Real Estate Sector, with a decrease of 1,4892 employed workers with disabilities; on the other hand, the sectors of Agriculture and Construction had positive effects on the demand for workers with disabilities.

Regarding firms in the agriculture sector, there was a decrease of 6,0919 PwD occupying positions in companies with over 500 employees, in 2007. Firms in the Construction sector, located on the cutoff point c4, also presented a reduction of 18,629 employed workers with disabilities. For the year 2016, the law's effect changed, and the quotas had a positive impact on the c1 threshold only, with an increase of 1,0021 employed workers with disabilities in the Agricultural sector, and 0,63,011 in the Construction sector.

Regarding the second cutoff, for the year of 2007, the law had negative, significant effects for a few sectors. Professional, scientific, and technical activity firms had a decrease of 1,6044 employed workers with disabilities. Firms in the Education sector also employed 2,9826 fewer PwD. That can be explained by the usual requirement of a Higher Education degree to occupy positions in these sectors, and the difficulties of insertion in Higher Education Institutions faced by people with disabilities due to the lack of investments in inclusion policies and actions to adapt the physical space of these institutions. According to a study performed by Tanaka and Manzini (2005), one of the main reasons given by employers to the lack of employed workers with disabilities is their low educational attainment and professional qualification.

Still regarding the second cutoff, we verify that the law also had negative effects for the Information and Communication sector and that it persisted over time. It can then be said that the law failed to fulfill its goal of persuading employers to hire the share of workers with disabilities established by the legislation.

Regarding the Extractive and Manufacturing industries, we do not observe any significant effects for the year of 2007. However, in 2016, the law had a positive impact on firms located around the second cutoff (>200) for the Extractive industry only, with an average increase of 8,6692 employed workers with disabilities for the robust estimation. On the other hand, the Manufacturing sector was negatively affected, for firms located in the last threshold (≥1.001), indicating a decrease of approximately ten employees with disabilities in companies belonging to this sector. This result contradicts the one found by Mori and Sakamoto (2018), that when analyzing quotas for workers with disabilities for both sectors, found that, in the presence of mandatory fines, firms comply with the established quotas, sometimes even exceeding the number of employed workers with disabilities required by law.

The law had expressive results in the Water and Waste Management sector, with positive effects for firms located around the higher cutoff points for the year of 2007. In this sector, for firms with 501 to 1.000 employees, the law caused an increase of

approximately 13 employed workers with disabilities, while for companies with over 1.001 employees, the employment of people with disabilities increased by approximately 20 additional employees. However, in 2016, this sector did not present significant results regarding the effect of the law. Therefore, challenges faced by the firms in the insertion of workers with disabilities may explain the sector's involution. As highlighted by Tanaka and Manzini (2005), the reasons commonly given by employers for not hiring PwD are the costs of adapting and modifying the physical structure of companies, and the recruitment and training of workers with disabilities.

The law did not have a significant impact on the Retail, Transportation, and Financial Services sectors for the year of 2007. However, in 2016, large firms belonging to these sectors had positive effects for firms located around the last cutoff ($c4 \geq 1.001$). In particular, Retail companies had an increase of approximately 19 employed workers with disabilities for all estimation methods. Companies in the Transportation sector employed around 25 additional workers with disabilities.

Firms belonging to the Financial sector presented a relevant positive result, corresponding to a local average treatment effect of over 65 additional employees with disabilities, indicating that Quotas Law positively impacts the demand for workers with disabilities. This result corroborates with Lalive, Wuellrich, and Zweimüller (2013) that observed that large companies have more favorable conditions for hiring workers with disabilities, once they can accommodate these workers more easily. That means that these firms can make changes in infrastructure so that the workspace can be adequate to attend to these workers' needs.

The law had positive effects on firms in the Food and Administrative Services sectors for the year of 2007. There was an increase in the employment of approximately 19 and 13 additional workers with disabilities, for companies in the Food sector located around the last cutoff, and for Administrative firms located around the 501 employees threshold, respectively. In 2016, there were no significant effects for the Administrative sector, while the legislation had a negative impact for firms in the Food sector located around the 501 employees cutoff point, where we observed the employment of an average of 8 workers with disabilities. Therefore, in general, the firms in these sectors are not complying with the law.

The law had no significant effects for firms in the Health, and Other Activities and Services sectors in 2007. However, in 2016, we observe a significant, negative effect for firms located around the 501 employees' cutoff point, pointing to a reduction of 5,6326 positions occupied by workers with disabilities. The firms belonging to the Other Activities and Services sectors had a positive result – an increase of approximately 3 additional employed workers with disabilities. Therefore, this sector had an improvement in the employment of PwD.

In summary, the effect of the Quotas Law is heterogenous for companies in different sectors, and that can be driven by many factors, such as the capacity to adapt the physical structure and the lack of qualification of workers with disabilities (Neri, Carvalho, and Costilla 2002). Moreover, we verify that there is an improvement regarding the demand for workers with disabilities throughout the years, especially for companies with over 1.000 employees, in the sectors of Retail, Transportation, and, mainly, Financial Services. However, other sectors have regressed as to the effect of the law: The Water and Waste Management sector, which was positively impacted by the law in 2007, had no effect in 2016 for any of the cutoffs.

From some positive effects, we can infer that the Law causes an increase in the employment of people with disabilities by firms located around the established cutoffs. However, we must analyze the effectiveness of the Law, that is, if the legal percentage of employed workers with disabilities, based on the firm's size (number of employees), is being followed.

6.2. The effectiveness of the quotas law

The aggregated results for Brazil, Table 6, show that, in 2007, the quotas law had positive effects on firms located around the first cutoff, leading to the employment of 1,2388 additional workers with disabilities. However, the magnitude of this effect is below the legally established minimum quota, which in this case is 2%, that is, firms with 100 employees without disabilities must employ a minimum of 2 workers with disabilities. Therefore, in the year of 2007, in general, the law was not effective. This result may be correlated to the lack of enforcement and application of fines, since only in 2003 the norms for the application of administrative fines to non-compliant firms were sanctioned.

When analyzing the results for 2016, Table 7, we verify that the effect of the law was approximate to the established quota, with the employment of approximately two additional workers with disabilities in firms around the cutoff.

That may be associated to greater enforcement of the law through the Normative Ordinance no. 98, of 2012, which determined new inspection rules for tax auditors, adopting a more rigorous procedure to inspect firms and ensure compliance with the quota for workers with disabilities or rehabilitated workers (Brasil 2012).

When analyzing each sector in 2007, only the Electricity and Manufacturing sectors complied with the legislation, employing 2,6302 and 2,2452 additional workers with disabilities, respectively. In 2016, the law's effects were positive and significant in all sectors and for the majority of the legal cutoffs, except for the Construction, Food, Financial Services, Real Estate, Administrative Services, and Services sectors, which did not meet the legally established employment quota.

For firms located around cutoff points where there were no positive effects in 2016, the quotas law had negative effects in both years, 2007 and 2016. This result corroborates with estimates by Neri et al. (2003), in which the likelihood of hiring people with disabilities in smaller companies is higher than in companies with over 1.000 workers.

Therefore, the majority of companies do not fulfill the legally established minimum quota, that is, large companies located above c2, c3, and c4 (respectively, 200, 500, and 1.000 employees) are not complying with the minimum 3%, 4%, and 5% employment quota for workers with disabilities. The Quotas Law appears to have little effectiveness in these types of companies, indicating the need to increase inspection by labor tax auditors. According to Lalive, Wuellrich, and Zweimüller (2013), larger companies pay higher wages, which implies that financial incentives are less relevant when compared to smaller companies. That is, many large firms choose to be non-compliant with the rule of quotas and pay the established fines.

In this sense, the percentage of employed workers with disabilities in most of the companies does not meet the quota established by law. The non-compliance with the law can be due to the lack of enforcement and application of administrative fines to

Table 6. Effectiveness of the law of quotas on the employment of people with disabilities for the year of 2007.

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Brazil	1,3497*	1,2388*	1,2388*	−4,9157*	−4,5511*	−4,5511*	−6,7814*	−6,2457	−6,2457	−34,987*	−34,017*	−34,017*
	(0,15,648)	(0,15,648)	(0,016232)	(1,432)	(1,32)	(1,6915)	(3,3255)	(3,3255)	(3,9685)	(4,0978)	(4,0978)	(4,7961)
Agriculture	0,38,059	0,38,059	0,38,059	1,9736	4,3053	4,3053		ND			ND	
	(0,31,449)	(0,31,449)	(0,36,455)	(4,1621)	(4,1621)	(5,9185)						
Extractive Industry	0,59,685	0,57,887	0,57,887		ND			ND			ND	
	(2,1422)	(2,1422)	(2,2453)									
Manufacturing	2,4273*	2,2453*	2,2453*	−3,018*	−2,7178*	−2,7178*	−8,3085*	−7,5834*	−7,5834*	−29,866*	−31,356*	−31,356*
	(0,54,166)	(0,54,166)	(0,56,204)	(0,98,341)	(0,98,341)	(1,1382)	(1,9881)	(1,9881)	(2,3404)	(5,2214)	(5,2214)	(6,5859)
Electricity	2,5346*	2,6302*	2,6302*		ND			ND			ND	
	(0,67,752)	(0,67,752)	(0,77,021)									
Water and Waste Management	0,48,888	0,52,599	0,52,599		ND			ND			ND	
	(0,47,913)	(0,47,913)	(0,49,051)									
Construction	0,47,307*	0,47,463*	0,47,963*	9,4774	19,584	19,584		ND			ND	
	(0,13,047)	(0,13,047)	(0,13,237)	(12,692)	(12,692)	(19,781)						
Retail	1,1899*	1,1272*	1,1272*	−3,8522*	−3,773*	−3,773*	−7,5499*	−8,4939*	−8,4939*		ND	
	(0,1401)	(0,1410)	(0,15,222)	(1,5082)	(1,5082)	(1,5759)	(3,3993)	(3,3993)	(4,0799)			
Transportation	0,8961*	0,8361*	0,8361*	−1,4714	−2,6699	−2,6699	−7,3301*	−6,2505	−6,2505	−31,000*	−28,516*	−28,516*
	(0,23,477)	(0,23,477)	(0,2488)	(3,4177)	(3,4177)	(2,5623)	(3,5136)	(3,5136)	(4,0938)	(9,4415)	(9,4415)	(11,295)
Lodging and Food	0,88,736*	0,77,649*	0,77,649*	−3,7372	−4,1213	−4,1213		ND				
	(0,21,459)	(0,21,459)	(0,2345)	(2,7605)	(2,7605)	(3,4132)					ND	
Information and Communication	0,43,746*	0,34,674*	0,34,674*	−7,2555*	−7,5095*	−7,5095*	−0,58,151	0,28,439	0,28,439			
	(0,15,458)	(0,15,458)	(0,17,301)	(1,8856)	(1,8856)	(2,4629)	(9,7533)	(9,7533)	(11,943			
Financial Services	1,9894*	1,94*	1,94*	−6,1724	−6,6008	−6,6008	−14,188	−11,989	−11,989		ND	
	(0,78,941)	(0,78,941)	(0,85,251)	(4,4962)	(4,4962)	(5,1801)	(7,8333)	(7,8333)	(8,9862)			
Real Estate		ND			ND			ND			ND	
Professional, Scientific, and Technical Activities	3,1327	2,7855	2,7855		ND			ND			ND	
	(2,0517)	(2,0517)	(2,078)									
Administrative Services	0,48,261*	0,45,279*	0,45,279*	−18,237	−22,835	−22,835	13,284	−0,33,392	−0,33,392	−38,864*	−72,58*	−72,58*
	(0,13,459)	(0,13,459)	(0,14,134)	(16,844)	(16,844)	(19,725)	(18,608)	(18,608)	(11,016)	(19,7)	(19,7)	(22,093)
Education	1,4278*	1,6215*	1,6215*	−4,1673*	−4,5497*	−4,5497*		ND			ND	
	(0,37,704)	(0,37,704)	(0,49,833)	(1,248)	(1,248)	(1,4038)						

(*Continued*)

Table 6. (Continued).

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Health	0,44,741* (0,12,165)	0,38,126* (0,12,165)	0,38,126* (0,12,923)	−21,386 (24,437)	−34,545 (24,437)	−34,545 (33,46)	−17,974* (8,1049)	−21,5* (8,1049)	−21,5* (9,8235)		ND	
Arts, Culture, Sport and Recreation		ND			ND			ND			ND	
Other Activities and Services	0,42,771 (0,29,233)	0,41,971 (0,29,233)	0,41,971 (0,30,096)		ND			ND			ND	

Own elaboration based on RAIS data (Brasil 2018). Standard error in parentheses, * p-value < 0.05.'ND' is used when the sector does not have sufficient observations around the cutoff to perform the estimation.

Table 7. Effectiveness of the law of quotas on the employment of people with disabilities for the year of 2016.

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Brazil	2,003*	1,9671*	1,9671*	−2,0731*	−2,0908*	−2,0908*	−8,2036*	−7,9869*	−7,9869*	−30,473*	−30,275*	−30,275*
	(0,08508)	(0,08508)	(0,08837)	(0,33,348)	(0,33,348)	(0,39,984)	(1,2073)	(1,2073)	(1,4167)	(2,9899)	(2,9899)	(3,5637)
Agriculture	2,6493*	2,5522*	2,5522*	6,0762	7,2316*	7,2316	−30,156	−31,547	−31,547		ND	
	(0,57,068)	(0,57,068)	(0,57,068)	(3,2666)	(3,2666)	(3,7257)	(16,804)	(16,804)	(19,075)			
Extractive Industry	2,2541*	2,152*	2,152*	−5,4001*	−6,6252*	−6,6252*		ND			ND	
	(0,52,046)	(0,52,046)	(0,59,922)	(2,317)	(2,317)	(2,7213)						
Manufacturing	1,9002*	1,8538*	1,8538*	−1,7411*	−1,768*	−1,768*	−6,8681*	−6,806*	−6,806*	−27,421*	−28,217*	−28,217*
	(0,09913)	(0,09913)	(0,1083)	(0,40,215)	(0,40,215)	(0,48,084)	(1,3175)	(1,3175)	(1,5783)	(3,9739)	(3,9739)	(4,7565)
Electricity	2,4209*	2,7961*	2,7961*	4,2994	5,006	5,006		ND		−44,918	−59,007*	−59,007
	(1,0864)	(1,0864)	(1,3125)	(2,6699)	(2,6699)	(3,1083)				(23,062)	(23,062)	(30,804)
Water and Waste Management	3,1867*	3,18,863*	3,18,863*	−1,0353	0,92,506	0,92,506		ND		−18,857*	−13,669	−13,669
	(0,81,093)	(0,81,093)	(1,0034)	(4,3164)	(4,3164)	(6,4798)				(8,4474)	(8,4474)	(12,511)
Construction	1,7243*	1,6557*	1,6557*	−2,2162	−1,9629	−1,9629	−2,9808	−3,3356	−3,3356		ND	
	(0,22,155)	(0,22,155)	(0,24,884)	(2,5768)	(2,5768)	(3,1023)	(6,1007)	(6,1007)	(6,3682)			
Retail	3,1333*	3,0935*	3,0935*	−2,9445*	−3,2664*	−3,2664*	−9,0161*	−9,1006*	−9,1006*		ND	
	(0,13,085)	(0,13,085)	(0,14,949)	(0,85,777)	(0,85,777)	(0,97,863)	(3,3131)	(3,3161)	(3,8248)			
Transportation	2,1359*	2,0801*	2,0801*	−2,8233*	−3,1075*	−3,1075*	−10,14*	−9,4765*	−9,4765*	−13,731	−13,664	−13,664
	(0,18,544)	(0,18,544)	(0,2083)	(0,78,413)	(0,78,413)	(0,93,125)	(2,3891)	(2,3891)	(2,7618)	(8,7036)	(8,7036)	(9,9843)
Lodging and Food	1,7102*	1,6306*	1,6306*	−1,9077*	−2,1404*	−2,1404	−11,122	−7,542	−7,542		ND	
	(0,23,171)	(0,23,171)	(0,25,773)	(1,1186)	(1,1186)	(1,3603)	(7,2969)	(7,2969)	(10,289)			
Information and Communication	2,2088*	2,2026*	2,2026*	−2,495*	−2,9357*	−2,9357*	−6,6682	−6,665	−6,665	−42,143*	−42,843*	−42,843*
	(0,33,897)	(0,33,897)	(0,41,086)	(1,0413)	(1,0413)	(1,2201)	(5,4429)	(5,4429)	(5,4799)	(16,154)	(16,154)	(17,443)
Financial Services	1,7897*	1,6316*	1,6316*	−2,4464	−2,6474	−2,6474	−22,181*	−19,576	−19,576	−2,4802	19,46	19,46
	(0,39,854)	(0,39,854)	(0,43,915)	(1,6744)	(1,6744)	(1,9683)	(10,274)	(10,274)	(11,753)	(28,547)	(28,547)	(36,604)
Real Estate	1,7627	1,6019	1,6019		ND			ND			ND	
	(1,0462)	(1,0462)	(1,6504)									
Professional, Scientific, and Technical Activities	2,9566*	2,9419*	2,9419*	−8,7764	−9,0491	−9,0491	16,599	20,978	20,978	−42,582*	−44,926*	−44,926*
	(0,93,254)	(0,93,254)	(1,0681)	(5,2257)	(5,2257)	(6,1087)	(22,675)	(22,675)	(27,842)	(11,364)	(11,364)	(12,794)
Administrative Services	1,2004*	1,1113*	1,1113*	−3,7855*	−4,1428*	−4,1428*	−13,041*	−12,382*	−12,382*	−46,438*	−46,726*	−46,726*
	(0,23,335)	(0,23,335)	(0,25,359)	(0,77,343)	(0,77,343)	(0,91,012)	(4,364)	(4,364)	(5,1706)	(17,503)	(17,503)	(22,81)
Education	2,1993*	2,1736*	2,1736*	−1,4135	−1,4397	−1,4397	−13,359	−14,2	−14,2		ND	
	(0,45,427)	(0,45,427)	(0,53,358)	(0,82,301)	(0,82,301)	(1,0022)	(10,404)	(10,404)	(12,997)			
Health	2,4265*	2,3327*	2,3327*	−1,8376*	−1,6253	−1,6253	−13,185*	−13,733*	−13,733*		ND	
	(0,33,983)	(0,33,983)	(0,39,025)	(0,92,219)	(0,92,219)	(1,0983)	(3,6382)	(3,6382)	(4,0846)			

(*Continued*)

Table 7. (Continued).

	100≥c1 ≤200			201≥c2 ≤500			501≥c3 ≤1000			c4 ≥1001		
Sectors	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust	Conventional	Corrected bias	Robust
Arts, Culture, Sport and Recreation	2,395* (0,61,295)	2,3591* (0,61,295)	2,3591* (0,76,708)	1,2122 (1,8756)	2,1576 (1,8756)	2,1576 (2,2172)		ND			ND	
Other Activities and Services	1,3644* (0,5505)	1,2073* (0,5505)	1,2073* (0,59,987)	−3,0862 (1,6619)	−3,2164 (1,6619)	−3,2164 (1,8443)		ND			ND	

Own elaboration based on RAIS data (Brasil 2018). Standard error in parentheses, * p-value < 0.05. 'ND' is used when the sector does not have sufficient observations around the cutoff to perform the estimation.

companies that do not comply with the law, which is probably not being effective in encouraging employers to hire and integrate workers with disabilities.

7. Policy implications

Although it has been 30 years since the Brazilian Quotas Law for people with disabilities was put in effect, the legislation still faces many challenges in its effectiveness. According to our results, we can infer that the law promoted the employment of PwD in 2016. However, many companies still ignore their duty of hiring the due proportion of workers with disabilities, opting to remain at risk of being fined for not complying with the law.

Factors such as low level of education, lack of qualifications, costs in training and lack of accessibility in the workplace are some of the existing barriers for the insertion of PwD in the labor market (Tanaka and Manzini 2005; Marcinhuk 2019; Soares 2019), which can negatively affect the employment of workers with disabilities by companies, hindering compliance with the Quotas Law.

The inspection by the public authorities aims to verify the effectiveness of the Quotas Law. According to Ribeiro and Carneiro (2009), when entrepreneurs are fined, they demand more time to look for and hire workers with disabilities. When unsuccessful, they tend to justify non-compliance using arguments such as the high-risk nature of some positions or the skills and technical expertise needed to fill some roles, making them unsuitable for PwD and restricting workers with disabilities to administrative positions.

Marcinhuk (2019) reports that the lack of public policies for habilitating and rehabilitating PwD for the labor market, and the lack of economic incentives prevent the increase in demand for workers with disabilities. According to Soares (2019), some companies choose to pay fines for non-compliance because they perceive the costs of maintaining the contract and adapting the workplace as a financial disadvantage that is not compensated by the return on their investment. Thus, we can infer that non-compliance with the law is related to the company's own decision, pointing to the need for greater inspection by public authorities, and changes in the legislation to create positive incentives for employers to follow the law.

The creation of positive incentives for companies to hire PwD was established in Law n. 8.212 of 24 July 1991; however, it was never regulated and implemented. Soares (2019) points out that the employment of workers with disabilities was then associated with negative sanctions, such as punishments for employers who do not comply with the law, and the stimulus for employing PwD has drifted away from positive incentives.

In this sense, the effective implementation of the Quotas Law and the greater participation of PwD in the Brazilian labor market does not result from the absence of a protective legal system with pecuniary fines, but from actions that encourage both the employers and the workers with disabilities. Changing the quotas policy design to include training, habilitation, and rehabilitation of workers with disabilities, and implement a certification seal and the possibility of paying a fee in cases where it is impossible to hire people with disabilities could be ways of encouraging companies to employ PwD.

8. Conclusion

This study analyzes the Brazilian affirmative policy that aims to insert people with disabilities in the labor market, evaluating the Law of Quotas' effectiveness and effects on the number of employed workers with disabilities in the Brazilian private sector firms. With that, we aim to contribute to the existing literature by exploring the causal effects of the quotas policy on the behavior of Brazilian companies.

To do so, we use information from the RAIS database on Brazilian firms in the private sector, for the years of 2007 and 2016. Our empirical strategy consists of an RD design to capture the local effects based on the number of employees, as established by the law, as well as to analyze the effect of the quotas rule on different sectors of economic activity, to verify which sectors are complying with the law.

We find that, in 2007, the Quotas Law did not have a significant effect, on any of the established cutoff points, on the employment of workers with disabilities. However, in 2016, there are significant, positive effects on the first two cutoffs (firms with over 100 and over 200 employees). Regarding the sectors of activity, we observe that there was an increase in the demand for workers with disabilities over time, especially in firms with over 1.000 employees in the Retail, Transportation, and Financial Services sectors. On the other hand, the Water and Waste Management sector, for which the law had a positive impact in 2007, had no significant effects in any of the cutoffs in 2016.

Regarding the effectiveness of the law, the results show that the law was not generally effective in 2007. For the year of 2016, however, when observing the first cutoff, we verify that the effects are closer to the established employment quota, with the employment of approximately two additional workers with disabilities.

Performing a disaggregated analysis for the first cutoff, in the year of 2007, we verified that the Electricity, and Manufacturing sectors met the established quotas, with the employment of 2,6302 and 2,2453 additional workers with disabilities, respectively.

Regarding the year of 2016, we identified positive results in all sectors, with the majority employing workers with disabilities in a higher percentage than the established quota, except for Construction, Food, Financial Services, Real Estate, Administrative Services, and Services sectors. For firms located around thresholds with no positive effects in 2016, the law had negative effects in both years, suggesting that companies above c2 (over 200 employees), c3 (over 500 employees), and c4 (over 1.000 employees) are not complying with the minimum of 3%, 4%, and 5% of workers with disabilities amongst its employees.

The limitations of this study are the unavailability of more current data and specific information regarding the application of non-compliance fines. For future research, we suggest an analysis on the effects of applying fines by type of company and sectors to verify if there is a particular type of company that prefers to pay fines for non-compliance instead of hiring people with disabilities.

We emphasize the need for greater inspection of compliance with the law by public authorities. In addition, it is also important and necessary to improve the policy design, with the inclusion of awards in the form of incentives to companies that meet the quotas, such as tax exemption or reduction; financial assistance for adaptation of the workplace; certification seals; and the possibility of paying a fee in cases where it is impossible to hire people with disabilities.

Notes

1. See: http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/decreto/d5296.htm.
2. Firms right below the cutoffs are control units, while firms above or on the cutoff point are treated units.
3. To estimate the regressions, we use optimal bandwidths that minimize the mean squared errors for the fuzzy and sharp RD regressions (Calonico, Cattaneo, and Titiunik 2014).
4. That can be verified in the following equation:

$$T_{it}^{D} = \alpha_0 + \alpha_1 D_{it} + \beta_0 \tilde{T}_{it} + \mu_{1it}$$

5. For further information, see Law no. 8112/90 and Law no. 3298/99.
6. The discontinuity was also verified by firm's sector; however, they were not presented here due to lack of space.

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References

Acemoglu, Daron, and Joshua D. Angrist. 2001. "Consequences of Employment Protection? The Case of the Americans with Disabilities Act." *Journal of Political Economy* 109 (5): 915–957. doi:10.1086/322836.

Addabbo, T., J. Krishnakumar, and E. Sarti. 2014. "Disability and Work: Empirical Evidence from Italy." In *Disadvantaged Workers: Empirical Evidence and Labour Policies*, edited by M.A. Malo and D. Sciulli, 11–29. Cham, Switzerland: Springer. AIEL Series in Labour Economics.

Agovino, M., A. Garofalo, and K. Marchesano. 2016. "The Effects of Employment Promotion Measures on Labour Market Participation of Disabled People: The Case of Italy." *Quality & Quantity* 1–21. doi:10.1007/s11135-016-0455-6:.

Agovino, M., and A. Rapposelli. 2014. "Employment of Disabled People in the Private Sector. An Analysis at the Level of Italian Provinces according to Article 13 of Law 68/1999." *Quality & Quantity* 48 (3): 1537–1552. doi:10.1007/s11135-013-9851-3.

Agovino, M., K. Marchesano, and A. Garofalo. 2019. "Policies Based on Mandatory Employment Quotas for Disabled Workers: The Case of Italy." *Modern Italy: Journal of the Association for the Study of Modern Italy* 24 (3): 295–315. doi:10.1017/mit.2019.14.

Barnay, T., E. Duguet, C. Le Clainche, and Y. Videau. 2019. "An Evaluation of the 1987 French Disabled Workers Act: Better Paying than Hiring." *The European Journal of Health Economics* 20 (4): 597–610. doi:10.1007/s10198-018-1020-0.

Beegle, K., and W. A. Stock. 2003. "The Labor Market Effects of Disability Discrimination Laws." *Journal of Human Resources* 38 (4): 806–859. doi:10.2307/1558781.

Bell, D., and A. Heitmueller. 2009. "The Disability Discrimination Act in the UK: Helping or Hindering Employment among the Disabled?" *Journal of Health Economics* 28 (2): 465–480. doi:10.1016/j.jhealeco.2008.10.006.

Brasil. 1988. "Constituição da República Federativa do Brasil, de 05 de out. de 1988." Brasília, DF: Presidência da República. http://www.planalto.gov.br/ccivil_03/Constituicao/Constituicao.htm

Brasil. 2003. "Ordinance No. 1.199, of 28 October 2003. Approves Rules for the Imposition of the Variable Administrative Fine Provided for in Art. 133 of Law No. 8.213, of 24 July 1991, for the Violation of Art. 93 of the Same Law, Which Determines that Companies Must Fulfill Positions with People with Disabilities or Rehabilitated Beneficiaries." http://www.trtsp.jus.br/geral/tribunal2/ORGAOS/MTE/Portaria/P1199_03.htm

Brasil. 2012. Ministry of Labor and Employment. *SIT (Secretaria de Inspeção do Trabalho)*. "Normative Ordinance no. 98, of 15 August 2012". https://sit.trabalho.gov.br

Brasil. 2018. Ministry of Economy. *Relação Anual de Informações Sociais (RAIS)*. Brasília, DF. http://www.rais.gov.br/.

Brasil. 1999. "Presidência da República. Decree No. 3.298, of 20 December 1999. Regulates the Law No. 7.853, of 24 October 1989, Provides for the National Policy for the Integration of People with Disabilities, and Consolidates the Norms of Protection, among Other Measures." http://www.planalto.gov.br/ccivil_03/decreto/D3298.htm

Brasil. 1989. "Presidência da República. Law No. 7.853, of 24 October 1989. Provides for the Support of People with Disabilities and Their Social Integration, under the National Coordination for the Integration of People with Disabilities (CORDE), Institutes Jurisdictional Protection of Collective or Diffuse Interests of PwD, Disciplines the Action of the Public Ministry, Defines Crimes, among Other Measures." http://www.planalto.gov.br/ccivil_03/leis/l7853.htm

Brasil. 1991. "Presidência da República. Law No. 8.213, of 24 July 1991. Provides for the Social Security Benefits Plan, among Other Measures." http://www.planalto.gov.br/ccivil_03/leis/l8213cons.htm

Brasil. 2015. "Presidência da República. Law No. 13.146, of 6 July 2015. Institutes the Brazilian Law for the Inclusion of Persons with Disability (Estatuto da Pessoa com Deficiência)." http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13146.htm

Brasil. 2020. "Ministry of Economy. Ordinance No. 914, of 13 January 2020. Provides for the Readjustment of the Benefits Paid by the National Social Security Institute - INSS and the Other Amounts Contained in the Social Security Regulation - RPS." Diário Oficial da União. https://www.in.gov.br/en/web/dou/-/portaria-n-914-de-13-de-janeiro-de-2020-237937443

Brasil. 2004. "Presidência da República Decree No. 5296, of 2 December 2004. Regulates Laws No. 10.048, of 8 November 2000, Which Gives Priority to the Service of the People Specified by the Law, and No. 10.098, of 19 December 2000, that Establishes General Norms and Basic Criteria for the Promotion of Accessibility for People with Disabilities or with Reduced Mobility, among Other Measures." http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/decreto/d5296.htm

Calonico, S., M. Cattaneo, and R. Titiunik. 2014. "Robust Data-driven Inference in the Regression-discontinuity Design." *The Stata Journal* 14 (4): 909–946. doi:10.1177/1536867X1401400413.

Cattaneo, Matias D., Michael Jansson, and Ma. Xinwei. 2016. "Rddensity: Manipulation Testing Based on Density Discontinuity." *The Stata Journal (Ii)* 18 (1): 1–18.

Deleire, T. 2000. "The Wage and Employment Effects of the Americans with Disabilities Act." *Journal of Human Resources* 35 (4): 693–715. doi:10.2307/146368.

Humer, B., J. Wuellrich, and J. Zweimüller. 2007. "Integrating Severely Disabled Individuals into the Labour Market: The Austrian Case." IZA Discussion Papers 2649. Institute for the Study of Labor (IZA).

ILO (International Labour Organization). 1983. *Convenção n° 159 sobre Reabilitação Profissional e Emprego de Pessoas Deficientes*. Genebra: International Labour Office. https://www.ilo.org/brasilia/convencoes/WCMS_236165/lang–pt/index.htm

Lalive, R., J. P. Wuellrich, and J. Zweimüller. 2013. "Do Financial Incentives Affect Firms' Demand for Disabled Workers?" *Journal of the European Economic Association* 11 (1): 25–58. doi:10.1111/j.1542-4774.2012.01109.x.

Lechner, M., and R. Vazquez-Alvarez. 2011. "The Effect of Disability on Labour Market Outcomes in Germany." *Applied Economics* 43 (4): 389–412. doi:10.1080/00036840802599974.

Lee, D. S., and T. Lemieux. 2010. "Regression Discontinuity Designs in Economics." *Journal of Economics Literature* 48 (2): 281–355. doi:10.1257/jel.48.2.281.
Malo, M. Á., and R. Pagán. 2014. "Hiring Workers with Disabilities When a Quota Requirement Exists: The Relevance of Firm's Size." In *Disadvantaged Workers*, Springer, Cham, 49–63.
Marcinhuk, M. A. 2019. "O preenchimento das cotas para pessoas com deficiência: desafios do empregador." *Revista Aporia Jurídica* 1 (12): 1–13.
Mori, Y, and N. Sakamoto. 2018. "Economic Consequences of Employment Quota System for Disabled People: Evidence from a Regression Discontinuity Design in Japan." *Journal of the Japaneseand International Economies* 48: 1–14.
Mussida, C., and D. Sciulli. 2015. "Direct and Indirect Effects of Disability on Employment Probabilities: A Comparative Analysis'." In *DISCE – Quaderni del Dipartimento di Scienze Economiche e Sociali dises1507*. Milan: Università Cattolica del Sacro Cuore, Dipartimenti e Istituti di Scienze Economiche (DISCE). Vita e Pensiero: 1–52.
Neri, M., A. Pinto, W. Soares, and H. Costilla. 2003. *Retratos da deficiência no Brasil*. Rio de Janeiro: FGV/IBRE, CPS.
Neri, M., A. P. Carvalho, and H. G. Costilla. 2002. "Políticas de cotas e inclusão trabalhista de pessoas com deficiência." *Ensaios Econômicos da EPGE/FGV* 462: 1–67.
Parodi, G, and D. Sciulli. 2012. "Disability and Low Income Persistence in Italian Households." *International Journal of Manpower* 33 (1): 9–26. doi:10.1108/01437721211212501.
Ribeiro, M. A., and R. Carneiro. 2009. "A inclusão indesejada: as empresas brasileiras face à lei de cotas para pessoas com deficiência no mercado de trabalho." *Organizações & Sociedade* 16 (50): 545–564. doi:10.1590/S1984-92302009000300008.
Soares, R. C. F. 2019. "Novo olhar sobre a obrigatoriedade de contratar pessoas com deficiência na iniciativa privada." *Homa Publica – Revista Internacional de Direitos Humanos e Empresas* 3 (2): 195–2085.
Tanaka, E. D. O., and E. J. Manzini. 2005. "O que os empregadores pensam sobre o trabalho da pessoa com deficiência." *Revista Brasileira de Educação Especial* 11 (2): 273–294. doi:10.1590/S1413-65382005000200008.
Thistlethwaite, D., and D. Campbell. 1960. "Regression–Discontinuity Analysis: An Alternative to the Ex Post Facto Experiment." *Journal of Educational Psychology* 51 (6): 309–317. doi:10.1037/h0044319.
Thomasi, K., G. da Silva Teixeira, G. Ribeiro, and M. N. Barbosa. 2018. "Empregabilidade das pessoas com deficiência: uma análise para o mercado de trabalho brasileiro a partir dos Censos 2000 e 2010." *Ensaios FEE* 38 (4): 823–852.
Trochim, W. MK. 1984. *Research Design for Program Evaluation: The Regression-discontinuity Approach*. Beverly Hills, CA: SAGE Publications.
Verick, S. 2004. "Do Financial Incentives Promote the Employment of the Disabled?" IZA Discussion Papers 1256. Institute for the Study of Labor (IZA).
Wagner, J., C. Schnabel, and A. Kölling. 2001. "Threshold Values in German Labor Law and Job Dynamics in Small Firms: The Case of the Disability Law." IZA Discussion Papers 386. Institute for the Study of Labor (IZA).
World Health Organization (WHO), The World Bank. 2011. *World Report on Disability*, 350. Genebra: WHO.
Wuellrich, J.P. 2010. "The Effects of Increasing Financial Incentives for Firms to Promote Employment of Disabled Workers." *Economics Letters* 107 (2): 173–176. doi:10.1016/j.econlet.2010.01.016.

Appendix. Robustness tests

The fundamental premise of an RDD is that the observable and non-observable characteristics do not vary discontinuously around the cutoff point. In that sense, we expect that companies declare their true number of work ties.

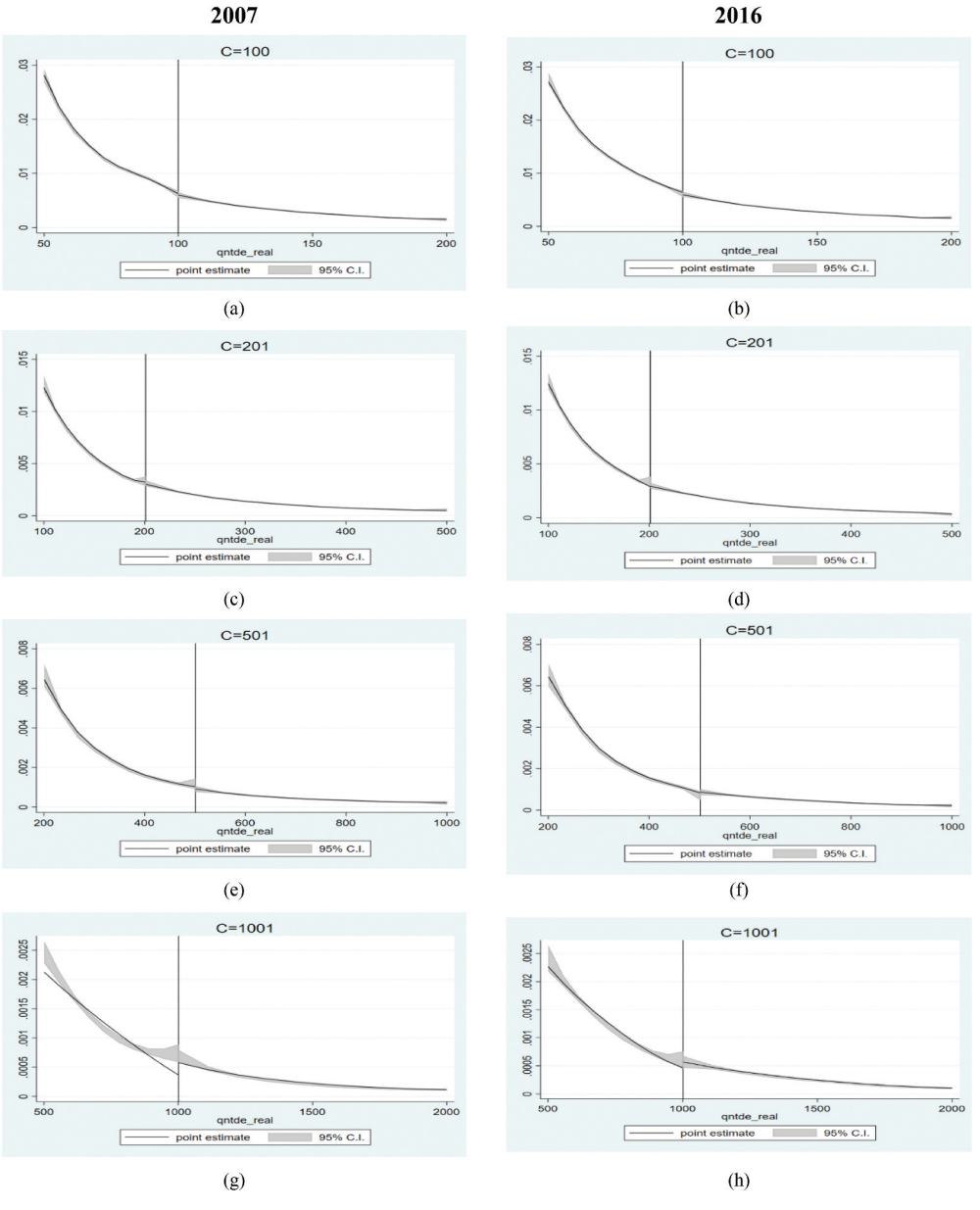

Figure 2. Density test of the eligibility variable. Own elaboration based on RAIS data (Brasil 2018).

The density test proposed by Cattaneo, Jansson, and Xinwei (2016) aims to discard the possibility of manipulation of the eligibility variable around the cutoff. We can infer, based on the test statistics, that there is no evidence of manipulation in our study. That is, the empirical evidence of the law's effect and effectiveness formerly presented is valid. That can be seen graphically in Figure 2, in which there is no evidence of manipulation of the eligibility variable.

We use a Placebo Test to test for robustness. To do so, alternative cutoff points were chosen in ad hoc manner, to evaluate the validity of the discontinuity design and test if the Quotas Law for workers with disabilities has any effects. In other words, we can say that this test verifies the existence of

discontinuities (as an effect of the treatment) around cutoffs that are not established by the law (here, 25, 50,125, 150, 600, and 900). Since these are not the employment quota's cutoff points, we expect that there will be no statistical differences between firms below and above these thresholds.

Table A1. Placebo tests to capture the effect of the law on the number of employed workers with disabilities, in 2007 and 2016.

Year	2007		2016	
Cutoffs	25	50	25	50
Quotas Law	−0,01624	0,10,613	−0,00016	0,03653
	(0,01897)	(0,10,208)	(0,01109)	(0,02415)
	125	**150**	**125**	**150**
	0,20,843	0,54,887	0,23,435	0,07502
	(0,23,347)	(0,38,412)	(0,1663)	(0,20,502)
	250	**300**	**250**	**300**
	0,43,972	1,1455	0,32,356	0,226
	(0,81,294)	(1,6581)	(0,3921)	(0,49,459)
	600	**900**	**600**	**900**
	3,433	−3,1544	1,0101	−3,6634
	(3,3694)	(3,0331)	(2,0408)	(3,7451)

Own elaboration based on RAIS data (Brasil 2018). Standard errors are in parenthesis.

From the results presented in Table A1, we can infer that the estimated effects of the affirmative policy for the employment of workers with disabilities in Brazil, according to the firm's size, are robust, since we do not reject the null hypothesis of the placebo tests.