

THE EFFECT OF LABOR INSPECTIONS ON REDUCING CHILD LABOR IN BRAZIL¹

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Resumo

O trabalho infantil vem diminuindo desde meados da década de 1990. Foi também nesse período que a inspeção do trabalho no Brasil começou a dar maior importância ao combate ao trabalho infantil. Assim, o presente estudo teve por objetivo analisar o efeito da inspeção do trabalho sobre a queda no trabalho infantil, em 2000 e 2010. As análises foram realizadas utilizando o método de mínimos quadrados em dois estágios. Os resultados encontrados para o ano 2000 mostram que o aumento de 1% na inspeção reduziu a porcentagem de crianças e adolescentes que trabalham em todas as faixas analisadas. A redução foi de 0,22% para a faixa de 10 a 17 anos, de 0,45% para a faixa de 10 a 14 anos, de 0,19% para aqueles com 15 anos e de aproximadamente 0,09% para a faixa de 16 a 17 anos. Os resultados foram estatisticamente significativos. Para o ano de 2010 os resultados mostraram que o aumento de 1% na inspeção reduziu a porcentagem de crianças e adolescentes que trabalham em todas as faixas analisadas. A redução foi de 0,26% para a faixa de 10 a 17 anos, de 0,66% para a faixa de 10 a 13 anos, de 0,41% para a faixa de 14 a 15 anos e de 0,08% para a faixa de 16 a 17 anos. Todos esses resultados foram estatisticamente significativos a 1%, com exceção da última faixa etária.

Palavras-chave: Trabalho Infantil; Inspeção do Trabalho; Variáveis Instrumentais

JEL: C26; H59; J29

Área Anpec: Área 13 – Economia do Trabalho

Abstract

Child labor has been on the decline in Brazil since the mid-1990s. It was also during this period that labor inspections in the country began to attach more importance to fighting child labor. Thus, this study aimed to analyze the effect of labor inspections on the drop observed in child labor rates in Brazil in 2000 and 2010 using the two-stage least squares method. According to the results for 2000, a 1% increase in inspections reduced the percentage of working children and adolescents in all the analyzed age brackets. There were reductions of 0.22%, 0.45%, 0.19%, and approximately 0.09% for the 10-17, 10-14, 15, and 16-17 age brackets, respectively. The results were statistically significant. For the year 2010, they showed that a 1% increase in inspections reduced the percentage of working children and adolescents in all the age brackets that were analyzed. There were reductions of 0.26%, 0.66%, 0.41%, and 0.08% for the 10-17, 10-13, 14-15, and 16-17 age brackets, respectively. All these results were statistically significant at 1% level, except for the last age group.

Keywords: Child Labor; Labor Inspection; Instrumental Variables

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1. Introduction

Child labor is still a problem in Brazil and one that is deeply rooted in Brazilian society. Since the sixteenth century, children of indigenous origin were forced to perform various tasks. From the moment that Brazil started to use slave labor brought from Africa, the children of these slaves were also forced to work like their parents. The problem persisted during Brazil's industrialization period, which began in the late nineteenth century, when there was a large increase in the number of children working in both the secondary sector and in new activities created in the tertiary sector. There were reports of child labor during that period and measures were taken to try to remedy the situation². However, despite all efforts, child labor persists to this day (BRASIL report, 2011).

According to the International Labor Organization - ILO (2010a), in the 1980s there was a large increase in child labor. Di Giovanni (2004) shows that child labor continued to increase during part of the 1990s, when a peak was reached, but after that the number of working children and adolescents began to decline. According to the author, data from the National Household Sampling Survey (PNAD) show that the peak was recorded in 1992, when 21.8% of all children and adolescents from 5 to 17 years old were working. However, that figure dropped to 12.6% in 2002.

According to the ILO (2010a), the large increase recorded in child labor in the 1980s can be attributed to the simultaneous occurrence of at least three events: i) a population explosion that began in the 1960s; ii) an increase in income concentration³; and iii) the prevalence of a culture that favored child labor⁴.

The good news is that child labor has been on the decline since the mid-1990s. By analyzing PNAD data, Barros and Mendonça (2011) saw that child labor rates have dropped between 1992 and 2009. This shows that Brazil has been successful in implementing policies designed to eradicate child labor.

Kassouf (2015) also uses PNAD data⁵ to analyze the evolution of child labor. In Figure 1, the author shows the evolution observed in the percentage of working children and adolescents in Brazil between 1992 and 2011 for three age groups: i) children between 5 and 9 years old; ii) children and adolescents aged between 10 and 15; and iii) adolescents in the 16-17 age bracket⁶. It can be observed that child labor rates decreased in the three age ranges during the period.

The data show that the highest incidence of child labor throughout the period was recorded among adolescents between 16 and 17 years old. However, this was also the group for which the sharpest drop in child and adolescent labor was recorded in percentage points. Early in the period, about 45% of them were working, while later that figure dropped to about 23%, i.e. there was a drop of 22 percentage points in this incidence.

² On January 17, 1891, Decree No. 1,313 was published. It set out measures designed to legalize the work of children and adolescent employed in factories in the Federal Capital.

³ According to the ILO (2010a) the income concentration became more intense in the 1970s and 1980s but according to Hoffman (1973) this is not correct. Hoffman (1973) argues that the income concentration became more intense in the 1960s and 1970s.

⁴ The ILO (2010a) pointed out the existence of a culture that favors child labor, although it is not as strong today as it was then. That thought stems from the idea that child labor could solve the problems faced by poor children, who could work instead of attending school. This is because, in this case, studying was seen as a waste of time, based on the notion that poor children wouldn't have a better life even if they had studied. So people thought that working was better for them, or else they could become delinquents.

⁵ The figure does not show data for 2000 and 2010 because the census was carried out in those years. The National Household Sample Survey is not carried out in censuses year. Moreover, the PNADs carried out in 1996 and 1997 didn't include information of working children under the age of 10.

⁶ According to Kassouf (2015, pp. 17), "a worker was defined as a child or adolescent who had worked in the week preceding the interview, who has produced food for his or her own consumption, who had worked in construction for his or her own use or who had not worked in the week preceding the interview because he or she was on vacation or had a health problem. Thus, paid or unpaid work for one hour or more in the week preceding the survey was included, while children and adolescents looking for work or engaged in domestic work in the household were not included. In Figure 1, adolescents 16-17 years old falling under the category of 'registered worker' were excluded, but registered domestic workers were included. Adolescents 14-15 years old working as apprentices with a formal contract were also excluded".

Approximately 23% of all children and adolescents between 10 and 15 years old were working in 1992. This percentage dropped to 7% in 2011, i.e. there was a decrease of about 16 percentage points. For children between 5 and 9 years old, the incidence of child labor was already lower than 4% in 1992. In 2011, the figure hit the mark of 0.4%.

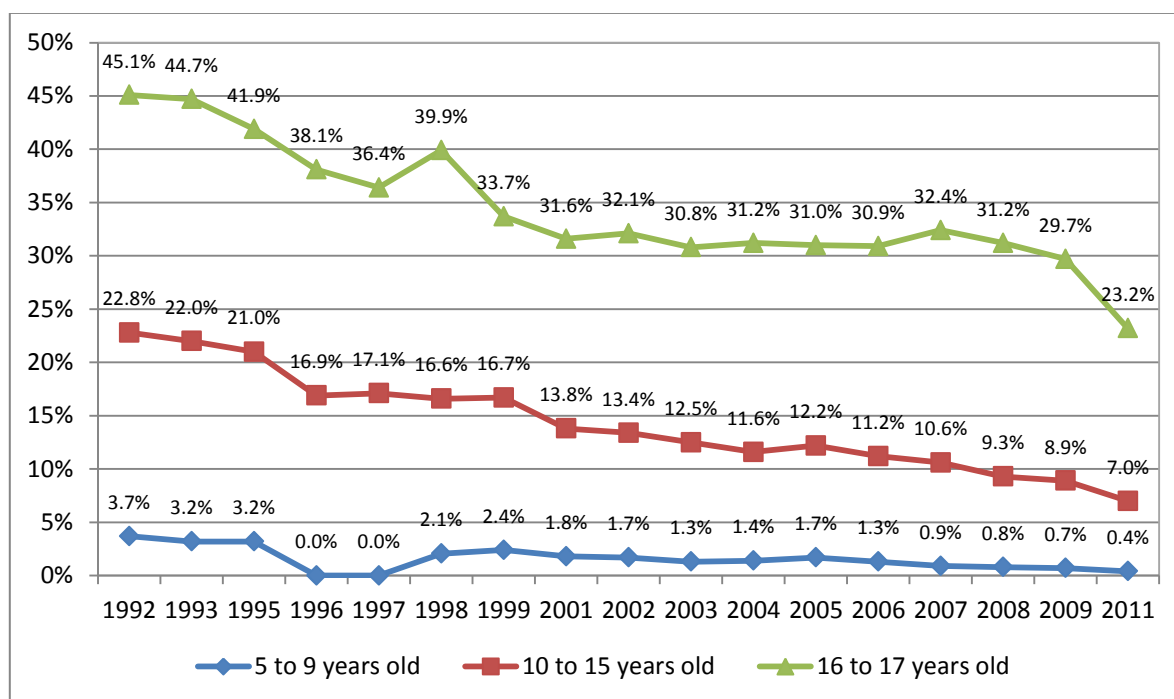


Figure 1 - Evolution of child and adolescent labor in the 1992-2011 period

Source: PNADs apud Kassouf (2015, pp. 18).

Note: the data don't include adolescents aged from 13 to 17 formally registered as workers and neither rural areas of the north region.

Data from population censuses also show that child labor has dropped. Table 1 shows the evolution of child labor in Brazil using data from the population censuses of 1991, 2000 and 2010. These data confirm the downward trend in child labor, showing that there was a decrease in the number of working children and adolescents from 5,493,538 to 3,406,514 between 1991 and 2010. However, it should be emphasized that the data collected by the National Household Sample Survey differ from those collected by the Census. Despite the differences in the figures, data from the two sources suggest that child labor rates have declined since the 1990s.

Table 1 - Evolution of child labor in Brazil, 1991, 2000 and 2010 censuses (10 -17 age bracket)

Year	Child labor
1991*	5,493,538
2000**	3,935,494
2010**	3,406,514

*Economically active.

**Occupied during the reference week.

Source: Prepared by the authors based on the 1991, 2000 and 2010 censuses.

There is no consensus in the literature around the factors that led to this sharp drop in child labor in Brazil. But what can be said is that the efforts made by both government and non-governmental agencies to fight child labor were stepped up in the late 1980s.

According to Di Giovanni (2004), the fight against child labor took new directions in the 1980s both from the legal and institutional points of view. The author argues that the Ministry of Labor and Employment (MTE) was already carrying out some actions to fight child labor at that time, but these were insufficient, given the size of the problem. However, from that moment on, a series of changes began to be implemented.

Contributions from national institutions, such as from the Ministry of Labor and Employment, and from international institutions, such as from the United Nations Children's Fund (UNICEF) and the ILO, were instrumental in bringing about those changes. Among other facts that marked this change, the following ones deserve special mention: (i) the promulgation of the new Constitution of 1988, which ensures protection to all children and adolescents; (ii) the approval of the Statute on Children and Adolescents (ECA) in 1990; and (iii) the implementation, in 1992, of the International Program on the Elimination of Child Labor (IPEC) (Di GIOVANNI, 2004; ILO, 2010a).

Based on this information, it can be seen that the more recent process of fighting child labor began in the 1980s and was intensified in the 1990s. According to the ILO (2010a), it was also in the 1990s that labor inspection in Brazil started to focus more on fighting child labor. In 1995, the MTE set up State Committees Against Child Labor, which were groups of labor inspectors specialized in fighting child labor. That was when child labor was included in the agenda of the MTE, more precisely of the Labor Inspection Secretariat, the agency in charge of labor inspection in Brazil.

After this new ally in the fight against child labor was established, the following question arose: did labor inspections have any effect in reducing child labor in Brazil? With the aim of answering this question, our paper analyzes the impact of labor inspections on child labor based on 2000 and 2010 data. Its importance lies in the fact that this issue had not been addressed by the literature so far. Almeida and Carneiro (2012) analyzed the effects of labor inspection, but for working adults only. This paper is based on the study developed by Almeida and Carneiro (2012), but our goal is to analyze the issue taking into account child labor.

2. Labor inspection in Brazil

According to the ILO (2010b), labor inspections began to be carried out in Brazil in the late nineteenth century and they were mainly focused on inspecting child and adolescent labor in factories set up in the federal capital, which at that time was Rio de Janeiro. They began to be carried out after Decree No. 1,313 of January 17, 1891 was issued. That decree stated that factories could not hire children under the age of 12. However, from 8 to 12 they could work as apprentices in textile mills. Girls aged from 12 to 15 and boys in the 12-14 age range were allowed to work for up to seven non-consecutive hours a day, as continuous work could never exceed four consecutive hours. In addition, male adolescents from 14 to 15 years old were allowed to work for up to nine hours a day under the same conditions.

According to Werneck Vianna (apud Oliveira, 2002 apud Miguel, 2004), that decree established that children and adolescents should not be engaged in dangerous and unhealthy occupations. To make sure that this decree was complied with, factories should be inspected every month by an inspector general from the Ministry of Interior, who should present a report in January describing the most notable events occurred in the previous year and suggesting measures to be taken to improve the situation of those minors. In addition, the decree impose pecuniary penalty for violators. However, according to the author, even though the decree was published in the Official Diary, it was never actually enforced.

According to the ILO (2010b), the pillars of what is now known as labor inspection in Brazil began to be erected in the mid-twentieth century. Several measures marked that period, including the establishment of the Ministry of Labor, Industry and Commerce in 1930. That Ministry was created by Decree No. 9,433 of November 26, 1930. According to Miguel (2004), the creation of the Ministry of

Labor made it possible to set up, in 1931, the National Labor Department, the agency in charge of the internal organization of the Ministry of Labor.

Another important measure was that of establishing the Regional Labor Inspectorates (*Inspetorias Regionais*) in the states in 1932. These inspectorates were charged with monitoring the enforcement of laws designed to protect workers. In 1940, they became the Regional Labor Offices (*Delegacias Regionais do Trabalho* - DRTEs). Another important measure was that of creating the career of labor inspector in 1944.

Internationally, workers gained a strong ally in 1919, when the International Labor Organization was created. ILO was not only concerned with making and implementing international labor standards, but also with strengthening labor inspections, since this is an instrument that can be used to ensure worker's rights. Thus, in 1947 the ILO adopted Convention No. 81, which states that labor inspections are mandatory for countries that ratify the convention (ILO, 2010b).

The ILO Convention No. 81 was passed by the Brazilian Congress in 1956 through Legislative Decree No. 24 and promulgated by Decree No. 41,721 of June 25, 1957. However, Brazil denounced the Convention in 1971, reinvigorating in December 1987.

According to Miguel (2004), despite having denounced Convention No. 81 in 1971, the military government took measures that are now part of the Brazilian labor inspection system. These included the creation of the Federal Labor Inspection System (SFIT). The SFIT was established at the end of the military regime as part of the National Labor Protection System, which was created by Decree No. 3,194 of December 14, 1981. Still according to the author, two other measures taken after the end of the military dictatorship contributed to consolidating the labor inspection system in Brazil: i) the establishment of the Labor Prosecution Office (after the Constitution of 1988 was promulgated); and ii) the creation of the Federal Labor Inspection System Development Program in 1989.

According to Cardoso and Lage (2005), in the 1990s the MTE adopted innovative ways to settle labor-related disputes detected in labor inspection operations by trying to implement channels for negotiations between the parties to the disputes. Corseuil, Almeida and Carneiro (2012) highlight two new measures: i) the publication of a *Manual do Mediador* (mediator's manual) in 1996 as a primer with instructions on how to settle disputes between employers and employees; and ii) the establishment of "negotiation round tables," where it was possible to negotiate with employers new ways to remedy violations of labor laws detected by labor inspectors.

In their analysis of the labor inspection system in Brazil between 1995 and 2006, Corseuil, Almeida and Carneiro (2012) argue that there was a change in the way labor inspectors acted during that period. Initially, labor inspectors in Brazil acted in response to reports of violations of labor laws or based on a random selection of sites for inspection. The way that inspectors were paid was an integral part of this inspection model. Auditors were given bonuses based on their performance, which was related to the number of inspected facilities, the amount collected in fines, and other measures. This bonus system was a means used by the SFIT to stimulate the inspectors to do a good job. However, many changes were made in recent years with the aim of enhancing the efficiency of inspection activities (CARDOSO and LAGE, 2005; CORSEUIL, ALMEIDA & CARNEIRO, 2012; ILO, 2010b).

In 2008, Law 11,890 was passed with the aim of eliminating the bonuses given to several categories of civil service professionals, including to labor inspectors, turning them into subsidies. This was a major change, as it was meant to make sure that the only purpose of inspections was that of fighting violations of labor laws and to prevent them from being used as a way to increase the wages of inspectors (ILO, 2010b).

Since then, inspectors began to carry out their actions based on clear-cut plans and not in response to reports of violations of labor laws any longer. Such reports still lead to inspection actions, but since then inspectors began to play a more active role in planning those actions. This made their work more efficient (Corseuil, Almeida and Carneiro, 2012).

2.1 Framework of the labor inspection system in Brazil

According to the 1988 Federal Constitution, it is up to the Federal Administration to organize, maintain and carry out inspection actions in Brazil. The MTE is the agency in charge of ensuring compliance with that provision, and it delegated this role to one of its executive secretariats: the Labor Inspection Secretariat (SIT) (CARDOSO and LAGE, 2005; ILO, 2010b).

Article 14 of Decree No. 5,063 of May 3, 2004 provides that the powers of the SIT include that of “defining and proposing guidelines for labor inspection, including of labor in ports, giving priority to establishing a policy designed to fight forced and child labor, as well as all forms of degrading work.” It is divided into two departments: i) the Labor Inspection Department (DEFIT); and ii) the Safety and Health at Work Department (DSST). Both the DEFIT and the DSST are responsible for planning and defining guidelines to be followed in inspection actions. However, the former guides its actions toward enforcing labor laws, while the latter focuses its actions on monitoring standards related to safety and health at work (CARDOSO and LAGE, 2005; ILO, 2010b).

In addition to these departments, the MTE has agencies in all the Brazilian states, which are divided into three categories: i) Regional Labor and Employment Superintendences (SRTEs); ii) Regional Labor and Employment Offices (GRTEs); and iii) Regional MTE Agencies (ARTEs). The SRTEs operate in 26 states and in the Federal District and their main role is that of implementing the administrative and labor policies defined by the MTE. The GRTEs report to the SRTEs and assist the Superintendences in providing services to workers. The Regional Agencies also operate in all states, but they exceed the others in number (in 2010, there were 480 of these agencies). Their primary role is that of providing services and information to citizens (ILO, 2010b).

According to information provided by the MTE, there were 27 SRTEs and 109 GRTEs in operation in 2013, totaling 136 units around the country.⁷ Figure 2 shows the distribution of these superintendences and regional offices in the 26 states and in the Federal District.

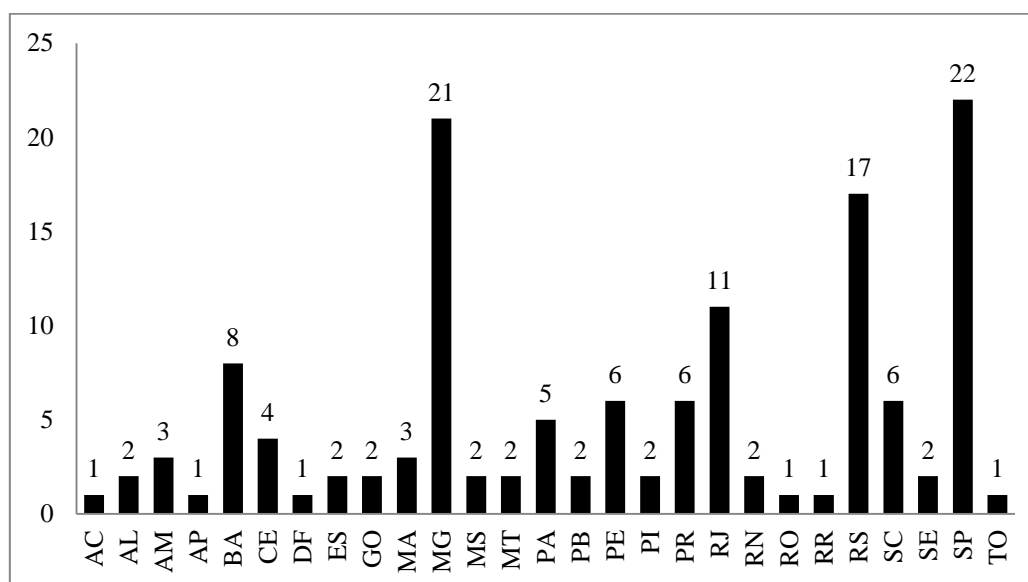


Figure 2 - Regional Labor Superintendences and Offices, by Unit of the Federation, in 2013
Source: Ministry of Labor and Employment.

The SRTEs are located in state capitals. Thus, in figure 2 above, states whose figures are equal to one only have SRTEs. These states are: Acre, Amapa, Rondonia, Roraima, Tocantins and the Federal

⁷ This information was provided by a labor inspector.

District. States whose figures are equal to two have one SRTE and one GRTE (Alagoas, Espirito Santo, Goias, Mato Grosso do Sul, Mato Grosso, Paraiba, Piaui, Rio Grande do Norte and Sergipe). Sao Paulo is the state with more Regional Offices than any other, as it has 21 Offices and one Superintendence. Minas Gerais ranks second in this regard, with 20 Offices and one Superintendence. One could think that this disparity in the number of Regional Offices is due to the fact these two states are located in the southeast region, Brazil's wealthiest region. However, one should take into consideration that these are the states with the largest number of municipalities in Brazil. According to the 2010 Census, while the states of Minas Gerais and Sao Paulo have 853 and 645 municipalities, respectively, the states of Acre, Amapa, Rondonia and Roraima have 22, 16, 52 and 15 municipalities, respectively. Because each Regional Office is in charge of supervising municipalities around it, the fact that states with a large number of municipalities also have many Regional Offices is only natural.

Labor inspections are carried out by labor inspectors (AFTs). Labor inspectors are hired after being approved in a public competitive examination. After being hired, these inspectors report to the MTE for technical matters and to the SRTE to which they are assigned for administrative matters (ILO, 2010b).

Figure 3 shows the distribution of inspectors by state in 2001. It can be seen that of a total of 3,052 active inspectors in that year, more than one-third were concentrated in the southeast region (639 in Sao Paulo, 359 in Rio de Janeiro and 249 in Minas Gerais). As stated above, the states of Sao Paulo and Minas Gerais concentrate a large number of SRTEs and GRTEs, which may explain the large number of inspectors working in those states. Roraima is the state with the lowest number of inspectors, only five.

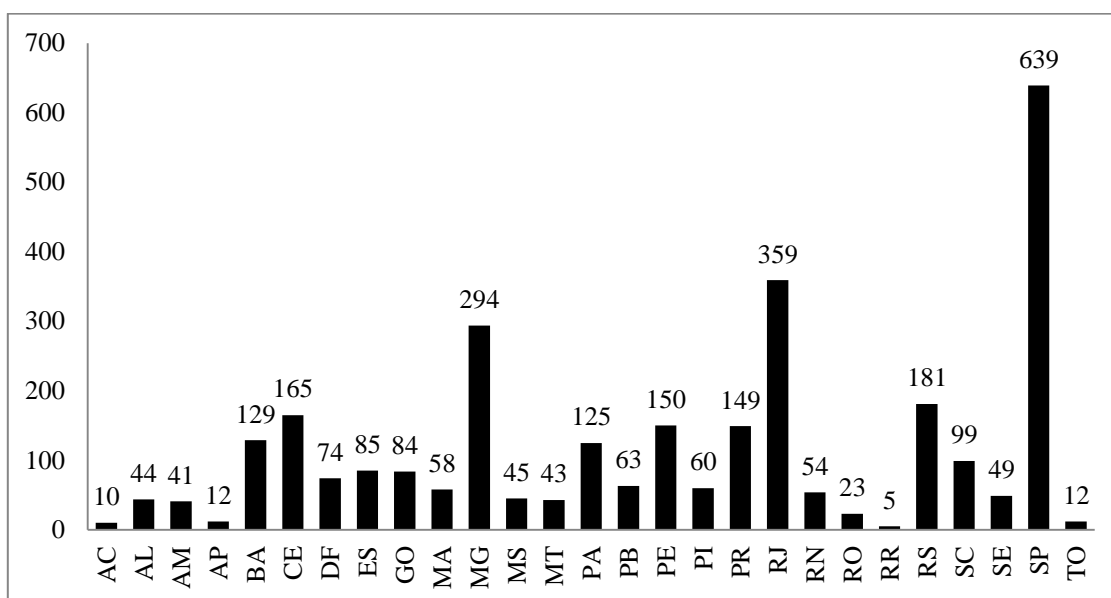


Figure 3 - Total number of Labor Inspectors by Unit of the Federation in 2001

Source: Ministry of Labor and Employment.

Figure 4 shows the distribution of inspectors by state in 2010. Again, the southeast region concentrates a little more than one-third of the 2,983 inspectors who were active in that year. There was a slight drop in the number of inspectors in 2010 as compared to 2001. The states that lost most inspectors were the following ones: Sao Paulo (in 2001 it had 639 labor inspectors and in 2010 that figure dropped to 525), Rio de Janeiro (in 2001 it had 359 labor inspectors and in 2010 that figure decreased to 274) and Ceara (in 2001 it had 165 labor inspectors and in 2010 that figure dropped to 131). The states in which the number of inspectors increased sharply in relation to 2001 were the following ones: Acre, Tocantins, Roraima, Amapa and Amazonas.

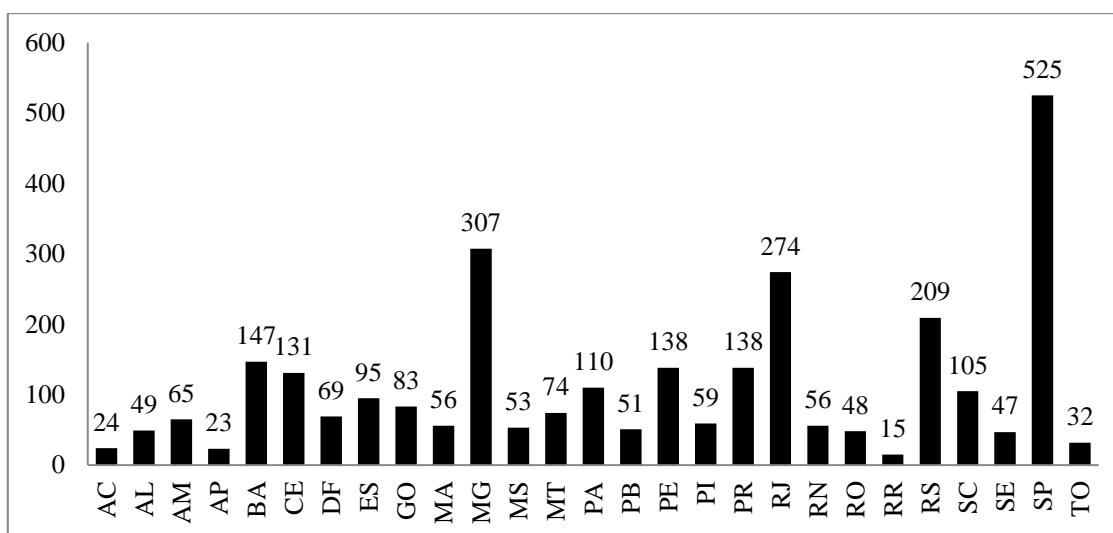


Figure 4 - Total number of Labor Inspectors by Unit of the Federation in 2010⁸

Source: Ministry of Labor and Employment.

According to the ILO (2010b), a new methodology to guide the planning of inspections was implemented in April 2010. From that moment on, the planning of inspections was to be organized according to three basic guidelines: i) the Multi-Year Plan (PPA); ii) the Labor Inspection Secretariat (SIT); and iii) the capacity of the local labor market and of SRTEs to actually implement the proposed projects. The PPA is the planning instrument of the federal government that sets out objectives, strategies and actions to be carried out over a four-year period. For example, one of the goals of the 2008-2011 PPA was to eradicate child labor.

After setting goals and establishing compulsory topics, the SIT: i) lists topics to be included in the mandatory projects of all SRTEs; ii) stimulates the SRTEs to draw up mandatory projects of regional interest both in relevant sectors for the region's economy and in sectors facing greater difficulties; and iii) defines national targets for every Superintendence. This is done using different information, such as information about resources available in each SRTE (e.g. number of inspectors available in them) and about the labor market in the region. This new methodology made it possible for the SRTEs to enjoy greater autonomy to define projects to be implemented. Despite this new methodology based on the planning of inspection actions, reports of violations of labor laws continue to guide the work of labor inspectors (ILO, 2010b).

2.2 Effects of inspections on the labor market

Studies suggest that the increasing planning of inspection actions has enhanced the effectiveness of labor inspections in Brazil (CARDOSO and LAGE, 2005; CORSEUIL, ALMEIDA & CARNEIRO, 2012; PIRES, 2013). Therefore, what are the effects, if any, of this phenomenon on the labor market? In this section, we will present some studies that address this issue.

Corseuil, Almeida and Carneiro (2012) observed a significant increase in the growth rate of formal employment throughout the 2000s. In their study, the authors set out to analyze to what extent labor inspections contributed to that increase. For this purpose, they used municipal data for the 1996-2006 period. They obtained the data from the Annual Social Information List (RAIS), from the Federal Labor Inspection System (SFIT) and from the IPEADATA database. Their idea was to analyze how variations in the intensity of labor inspections in both temporal and regional terms affected the creation and destruction of jobs in municipalities. The results were presented based on the frequency and efficiency of labor inspections. A tendency to create jobs was observed in municipalities in which labor

⁸ The reference is the number of active labor inspectors in December.

inspections became more frequent. However, the authors found no evidence that the increased frequency of inspections had any impact on the aggregate job destruction rate. The efficiency of labor inspections led to a downward trend in the job creation rate, but no effect of such efficiency on the aggregate job destruction rate was observed.

Almeida and Carneiro (2009) analyzed the effect of enforcing employment regulations on company size in Brazil. Company size was measured according to the following variables: employment, production, sales and capital stock. The study considers the fact that labor regulations are not enforced uniformly in Brazil. The authors argue that despite the efforts made by the Ministry of Labor to make sure labor regulations are complied with uniformly throughout the country, this hardly happens because Brazil is a continental country and the area that inspectors must cover to ensure that labor laws are strictly enforced is huge. Furthermore, the number of inspectors is very small in relation to the geographical size of the country.

According to the authors, there are two channels through which the enforcement of labor regulations may reduce the size of companies: i) they increase costs for companies, which could lead them to hire less workers and probably reduce their output; and ii) the larger a company, the greater its visibility, which increases its likelihood of being inspected. Thus, reducing the size of companies could reduce the number of inspections (ALMEIDA and CARNEIRO, 2009).

The variable used to measure the enforcement of labor regulations is the number of companies inspected by labor inspectors in a given municipality in 2002. However, the authors argue that it is not possible to assume that every variation in the measure that was used to check the enforcement of labor regulations is exogenous. This is due to the fact that in some municipalities inspections could be more frequent simply because they are known for violating labor laws or because they are more developed municipalities. To solve this problem, the authors used the costs incurred in carrying out inspections as an instrument for the number of inspected companies. The variable that was used to measure this cost was the distance in hours between a municipality where a company is located and the regional labor office closest to the municipality in question. The greater the distance, the higher the cost of inspections. Therefore, larger distances are likely to reduce the number of inspections in a municipality (ALMEIDA and CARNEIRO, 2009).

The results indicate that increased labor inspections reduce the size of companies. It was found that a 1% increase in inspections reduced employment by 0.47%, reduced production by 0.48%, reduced sales by 0.46%, and reduced capital stock by 0.52%, although the coefficient for capital stock was not statistically significant (ALMEIDA and CARNEIRO, 2009).

In a subsequent study, Almeida and Carneiro (2012) analyzed the impact of labor inspections on some variables related to the Brazilian labor market. More specifically, the authors analyzed how increased labor inspections affect formal and informal employment. The authors argue that in the early 1990s labor inspectors began to step up inspections with the aim of checking whether labor rights and compulsory benefits of workers were being ensured, such as, for example, their right to the Severance Indemnity Fund for Employees (FGTS).

The authors set out to measure the impact of inspections on the labor market using variations in their frequency in the municipalities based on a set of data for 2000. The problem with this strategy is that inspections are not determined randomly. Inspections can be more intense in municipalities with reports of violations of labor laws or because these municipalities are more developed institutionally (ALMEIDA and CARNEIRO, 2012).

In order to solve this problem, the authors argue that it is necessary to determine the necessary “inputs” to define the “inspection technology.” According to them, two inputs are necessary: i) the number of labor inspectors available in each regional labor office (GRT); and ii) the distance between the municipality where an inspection will be carried out and the nearest GRT. Thus, the greater the distance between a municipality and a GRT, the less likely that companies in that municipality will be inspected. However, the availability of a larger number of labor inspectors in municipalities reduces the importance of the distance between them and a GRT. Thus, the empirical strategy adopted by the authors was that of comparing the differential impact of the distance between a municipality and the nearest GRT on the

variables related to the municipality's labor market through states with different numbers of labor inspectors available (ALMEIDA and CARNEIRO, 2012).

Almeida and Carneiro (2012) found that increased labor inspections in a municipality, which was measured as the interaction between the distance to the nearest GRT and the number of inspectors per firm in the state, have the following effects on its labor market: i) increase in formal employment; ii) reduction in informal employment; iii) increase in unemployment; iv) decrease in self-employment; v) reduction in the wages of formal workers; and vi) increase in the income of self-employed workers (the vast majority of whom are informal workers).

3. Methodology

This article uses the study by Almeida and Carneiro (2012), which was presented in the previous section, as the base for the creation of the instrumental variables. However, the methodology is different because we believe that the most appropriate method to be used is the Two-stage Least Squares Method (2SLS).

3.1 Data

We will use data from the 2000 and 2010 censuses to create the variable '*proportion of working children and adolescents in the 10-17 age range*,' which will be our main dependent variable. To create this variable, we calculated the total number of children and adolescents from 10 to 17 years old engaged in any activity for one hour or more during the reference week and divided by the total number of children and adolescents in that age bracket. These data were obtained from the Automatic Recovery System of the Brazilian Institute for Geography and Statistics (SIDRA)⁹. To calculate the number of working children and adolescents in 2000, we used data from table 2954, which contains the variable "People aged 10 or above who were occupied in the reference week by education, sex and age brackets." For 2010, we used data from table 3907, which contains the variable "Total number of people from 10 to 17 years old who were either occupied or unoccupied during the reference week, by age and literacy status."

The data on labor inspection were obtained from the Ministry of Labor through the Labor Inspection Secretariat (SIT). Those data contain: i) the number of labor inspectors (AFTs) by state in 2001 and 2010; ii) the location of Regional Labor Offices and Superintendences; and iii) the number of inspected establishments in the municipality in 2002 and 2010¹⁰. The labor inspectors work at Regional Labor Offices (GRTs) and at Regional Labor Superintendences (SRTs).

Another variable that was used, which is related to labor inspection, is the distance (as measured in hours by car) between each municipality and the closest Regional Labor Office or Superintendencia in the state. This variable was calculated using the Google Maps tool¹¹.

The total number of companies in 2000 and 2010 by municipality and state was obtained from the Central Register of Enterprises.

The control variables were obtained from municipal-level data available in the Ipeadata database¹². These variables include per capita GDP, share of agriculture in the GDP, share of industry in the GDP, share of services in the GDP, geographic area as measured in square kilometers, number of beneficiaries of the *Bolsa Familia* Program¹³, current transfers of state taxes to municipalities, transfers to municipalities related to the value-added tax (ICMS) and the municipal expenses by function in: i)

⁹ Through SIDRA, one can access data available in several different databases and create tables according to the variables requested. Its website address is: <http://www.sidra.ibge.gov.br/>

¹⁰ The data for 2002 were obtained from the study by Almeida and Carneiro (2012), who provided them through the Ministry of Labor. For 2010, the data were exclusively collected for this study.

¹¹ Its website address is: <http://maps.google.com.br/>.

¹² Its website address is: <http://www.ipeadata.gov.br/>.

¹³ Conditional Cash Transfer Program. For 2000, we used the number of beneficiaries in 2004.

management and planning; ii) care and welfare; iii) communications; iv) education and culture; v) legal spending; vi) municipal spending; vii) health care and sanitation; and viii) transportation.

Moreover, we used data on the institutional development of municipalities, as published by the Brazilian Institute for Geography and Statistics (IBGE)¹⁴. These data include an index of access to justice in a municipality, an index of the managing capacity of a municipality, and an index of political concentration in a municipality.

According to Naritomi, Soares and Assunção (2012), the index of access to justice was created based on a definition of access to justice proposed by the IBGE. The index ranges from 0 to 3 and was calculated based on the sum of three binary variables representing the existence, in a municipality, of Small Claims Courts, Guardianship Councils for children and adolescents and a Consumer Protection Committee. The index was calculated based on 2001 data.

According to Naritomi, Soares and Assunção (2012), the index of the managing capacity of a municipality is calculated by the IBGE and its purpose is measuring the quality of the municipal administration. It is also used by the Ministry of Planning as a tool to monitor the administrative performance of municipalities. Still according to these authors, the index of political concentration in a municipality is the Gini coefficient for land distribution in Brazil, which was calculated in 1996 based on data from the Agricultural Census. The Gini coefficient for land can be used as a measure of political concentration because, as argued by Acemoglu and Robinson (apud Naritomi, Soares and Assunção, 2012), individuals don't need to belong to political institutions to exercise political power. The concentration of economic resources in the hands of an elite is also a source of political power.

Finally, the Municipal Human Development Index (IDHM) calculated by the United Nations Development Program (UNDP) was also used. This index includes three human development indicators: longevity, education and income.

3.2 Empirical Strategy

To analyze how labor inspections at municipal level affect child labor, initially we wanted to use the number of companies inspected in a municipality as a measure of labor inspection. The problem is that this variable cannot be defined at random. Therefore, since it is not an exogenous variable, we will use econometric techniques in order to fix the problem.

How labor inspectors define the companies they will inspect has already been discussed in section 2. We have seen that despite the fact that inspection actions are carried out based on plans, reports of violations of labor laws continue to guide the work of inspectors (ALMEIDA and CARNEIRO, 2012; CORSEUIL, ALMEIDA & CARNEIRO, 2012; ILO, 2010b). Almeida and Carneiro (2012) also argue that in municipalities that are more developed institutionally the number of inspections may be higher.

To solve this problem, we need to find a variable that is related to the number of inspected companies but is not conditioned to the number of reports of violations of labor laws. For this purpose, we must understand how inspections are carried out in Brazil. In the section 2, we saw that labor inspections are carried out by labor inspectors (AFTs) working at SRTEs and GRTEs. A labor inspector travels by car from the SRTE or GRTE where he or she works to where an inspection is to be carried out. Most municipalities don't have a SRTE or GRTE, meaning that labor inspectors must travel from the municipality in which they work to the one where a company to be inspected is located.

This shows that two important factors must be taken into account when analyzing how inspections are carried out: (i) the number of labor inspectors by state; and (ii) the distance between an SRTE or GRTE and the municipality where a company to be inspected is located. Municipalities located at a greater distance from an SRTE or GRTE are less likely to be visited by labor inspectors as compared to municipalities that are closer to them. Furthermore, this restriction is more important in areas where less labor inspectors are available.

Thus, the hypothesis of this study is that the number of labor inspectors by state is positively correlated with the number of inspected companies and that the distance is negatively correlated with the

¹⁴ These data are used in Naritomi, Soares and Assunção (2012) and were provided by Rodrigo Soares.

number of inspected companies, but the number of labor inspectors by state and the distance factor are uncorrelated with reports of child labor. If this is the case, we can use the number of inspectors by state and the distance factor as instrumental variables for the number of inspected companies.

Thus, the best method to estimate the parameters of our model is the Two-stage Least Squares Method (2SLS).

3.3 The Model

Our goal is to analyze the effect of labor inspections on child labor in 2000 and 2010. For each year, four models were created that differ among them according to the dependent variable. Our primary dependent variable is the logarithm of the proportion of working children and adolescents from 10 to 17 in each year. However, the analysis was also performed for other age groups. We thus have the following dependent variables: i) logarithm of the proportion of working children and adolescents 10 to 17 years old in 2000; ii) logarithm of the proportion of working children and adolescents 10-14 in 2000; iii) logarithm of the proportion of 15-year-old working adolescents in 2000; iv) logarithm of the proportion of working adolescents aged 16 and 17 years old in 2000; v) logarithm of the proportion of working children and adolescents 10-17 years old in 2010; vi) logarithm of the proportion of working children and adolescents between 10 and 13 in 2010; vii) logarithm of the proportion of working adolescents 14 and 15 years old in 2010; and viii) logarithm of the proportion of working adolescents 16 and 17 years old in 2010¹⁵.

To measure labor inspections, three variables were created. To calculate the first variable (which in the model we refer to as ln_Fisc), we multiplied the number of inspected companies in a municipality by 100 and divided the result by the total number of companies in the municipality. We added a unit to this result and then calculated its logarithm. To calculate the second variable (which in the model we refer to as ln_aft), we multiplied the total number of labor inspectors (AFTs) available in a state by 10,000 and divided the result by the total number of companies in the state. We then calculated the logarithm of this result. To create the third variable (which we refer to as $distance$), we calculated the travel time (in hours) by car between a municipality where a company to be inspected is located and the closest Regional Labor Superintendence or Office.

As shown in section 3.2, inspection is possibly an endogenous variable. To solve this problem, we use the variables ln_aft and $distance$ as instruments for ln_Fisc . We thus use the two-stage least squares method (2SLS).

In the first stage, we estimated the following model:

$$(1) \quad ln_Fisc_{ms} = \alpha_0 + \alpha_1 distance_{ms} + \alpha_2 ln_aft_{ms} + \alpha_3 (distance_{ms} \times ln_aft_{ms}) + \delta \mathbf{X}_{ms} + v_{ms}$$

where m represents the municipality, s represents states and the Federal District, v is the error term and \mathbf{X} is a matrix composed of the model's control variables, namely: per capita GDP, share of agriculture in the GDP, share of industry in the GDP, share of services in the GDP, geographic area as measured in square kilometers, number of beneficiaries of the *Bolsa Familia* Program, current transfers of state taxes to municipalities, transfers to municipalities related to the value-added (ICMS) tax, municipal expenses by function¹⁶, an index of access to justice in the municipality, an index of the managing capacity of the municipality, an index of political concentration in the municipality, the Human Development Index of the municipality and dummies for the states and the Federal District (UF).

¹⁵ As already stated in section 3.1, these data were obtained from the SIDRA system. In this system, age brackets were not defined in the same way for 2000 and 2010. So while we have an age bracket with children and adolescents aged between 10 and 14 years old and another one with adolescents aged 15 in 2000, we have an age group with children and adolescents aged between 10 and 13 years old and another one with adolescents aged 14 and 15 in 2010.

¹⁶ Section 3.1 has all the expenses included.

In the second stage, we estimated the following model:

$$\ln_Y_{ms} = \beta_0 + \beta_1 \ln_Fisc_{ms} + \delta \mathbf{X}_{ms} + u_{ms} \quad (2)$$

where m represents the municipality, s is the unit of the federation, u is the error term, \mathbf{X} is the matrix composed of the control variables¹⁷, \ln_Fisc is the inspection estimated from the first stage and \ln_Y represents the logarithm of the proportion of working children and adolescents. As stated at the beginning of this section, the variable \ln_Y actually represents eight different dependent variables. For each one of them we estimate the model's parameters using the 2SLS method.

Unfortunately, there is a discrepancy in the data that were used to create the variables \ln_Fisc and \ln_aft for the year 2000. The data for the number of inspected companies are from 2002 and those for the number of inspectors available by state are from 2001. However, because our empirical study is intended to estimate the effect of inspections on child labor considering variations in the distance between each municipality and the nearest Regional Labor Superintendence or Office in states with a varying number of labor inspectors available¹⁸, we believe that these discrepancies are not relevant.

4. Results

In this section, we present the results of applying the two-stage least squares method to estimate the effect of labor inspections on child labor. Altogether, we have eight results that differ among them according to the dependent variable that was used. The dependent variables can be differentiated from each other according to the year (2000 or 2010) and to the age group of the working children and adolescents.

The two tables presented in this section contain the coefficients of the main variables of the estimated model. In the first stage, we have the following exogenous variables: i) *distance*; ii) *ln_aft*; iii) *distance* \times *ln_aft*. The first two variables were defined in section 3.3 and the third variable represents the interaction between the first two variables¹⁹. These are the instrumental variables that were used in the first stage. The dependent variable in the first stage is *ln_Fisc*, which is our measure of inspection. The estimated value of this variable in the first stage is used to estimate the effect of inspection on child labor in the second stage.

Table 2 presents the results of applying the two-stage least squares method to four age ranges using data for 2000. The coefficient of the *distance* variable has a negative sign, which is in line with the expected result, namely, that the greater the distance between a municipality and a Regional Labor Superintendence or Office, the smaller the number of inspected companies in a municipality. All these results are statistically significant at a probability of 5%. The coefficient of the *ln_aft_2000* variable has a positive sign in all age groups, which is also in line with the expected result, namely, that the higher the number of inspectors available in a state, the higher the number of inspected companies located in municipalities in that state. These results are statistically significant at 1%. The coefficient of the interaction variable is not statistically significant in any of the age groups, not even at a probability level of 10%.

¹⁷ These are the same variables of the first stage.

¹⁸ The number of inspectors available by state in 2001 and 2010 can be seen in section 2.1.

¹⁹ We put the interaction between the two variables because it was used in the study by Almeida and Carneiro (2012), which we used as the base for the creation of ours exogenous variables, and also to capture all the possible effects of the variables.

Table 2 - Results of applying the two-stage least squares method to child labor by age bracket in 2000

FIRST STAGE				
Age bracket	10-17	10-14	15	16 and 17
Dependent variable	ln_Fisc_2000	ln_Fisc_2000	ln_Fisc_2000	ln_Fisc_2000
distance	-0.10383** (0.04367)	-0.10434** (0.04380)	-0.10379** (0.04371)	-0.10494** (0.04367)
ln_aft_2000	1.44656*** (0.21337)	1.44491*** (0.21353)	1.30637*** (0.22922)	1.44629*** (0.21333)
distance × ln_aft_2000	0.01017 (0.02064)	0.00988 (0.02069)	0.00995 (0.02065)	0.01065 (0.02064)
Number of observations	4567	4532	4515	4567
R²	0.3447	0.3445	0.3461	0.3448
SECOND STAGE				
Dependent variable	Log of the proportion of working children and adolescents in the 10-17 age bracket in 2000	Log of the proportion of working children and adolescents in the 10-14 age bracket in 2000	Log of the proportion of working adolescents aged 15 years old in 2000	Log of the proportion of working adolescents aged 16 and 17 in 2000
ln_Fisc_2000	-0.22478*** (0.06033)	-0.45315*** (0.09696)	-0.19517*** (0.07419)	-0.08941* (0.04927)
Number of observations	4567	4532	4515	4567
R²	0.21	0.2075	0.1715	0.2709

Source: Prepared by the authors.

i) The control variables for all age brackets are the following ones: dummies for Unit of the Federation (the state of Sao Paulo was left out); institutional variables (index of access to justice, index of managing capacity of the municipality, and index of political concentration in the municipality); Per capita GDP; share of agriculture, industry and services in the municipal GDP; number of beneficiaries of the *Bolsa Familia* Program; Human Development Index of the municipality; area of the municipality; spending of the municipality by function (administration and planning, care and welfare, communications, education and culture, legal spending, health care and sanitation, transportation); current transfers of state tax revenues to municipalities; transfers to municipalities related to the value-added (ICMS) tax.

ii) Standard error in parentheses.

*** significant at 1%; ** significant at 5%; * significant at 10%.

Table 2 also shows the results for the second stage. The result for children and adolescents from 10 to 17 years old, which is shown in the second column of the table, reveals that a 1% increase in inspections reduced the number of working children and adolescents by 0.22% in 2000. This result is statistically significant at 1%. According to the Census, there were 3,935,495 working children and adolescents in this age range in 2000. Thus, this result indicates that a 1% increase in inspections would remove approximately 8,658 children and adolescents from work.

For the 10 - 14 years old group, shown in the third column of Table 2, a 1% increase in inspections reduced the number of working children and adolescents by 0.45%. Data from the 2000 Census show that there were 1,142,438 working children and adolescents in this age range in Brazil in that year. Thus, a 1% increase in inspections suggests that approximately 5,140 children and adolescents would be removed from work.

For 15-year-old adolescents, the result for the second stage shown in the fourth column of Table 3 suggests that a 1% increase in inspections reduced the number of these adolescents by 0.19% in 2000. For this age group, the 2000 Census data show that there were 649,042 working adolescents in Brazil. So, a 1% increase in inspections indicates that 1,233 adolescents were removed from work.

Finally, for adolescents in the 16-17 age range, a 1% increase in inspections reduced the number of working adolescents in this age group by approximately 0.09%. According to Census data, there were 2,144,014 working adolescents in this age group in Brazil in 2000. Thus, a 1% increase in inspections results in the removal of approximately 1,929 adolescents aged 16 and 17 years old from irregular working conditions.

The results for the year 2000 show that the effect of inspections was higher in reducing child labor for the 10-14 age range. In addition, this effect decreases as the children and adolescents grow older.

It is to be expected that more inspections are carried out in municipalities that are more developed institutionally. However, this greater institutional development can also be an incentive for companies to comply with the law and thus use less child labor. To control for this effect, some indexes of the institutional development of municipalities were used, including an index of access to justice. It is expected that the higher this index, the more intense the inspections. Analyzing the first stage for all age brackets in 2000, it was observed that the signs are consistent with what was to be expected and is statistically significant at 1%. As for the second stage, it could be expected that the greater the access to justice, the less child labor. However, for the age groups where the signs is in line with what was to be expected, the coefficients are not statistically significant.

The economic status of municipalities can influence the number of companies operating in each city. It is to be expected that wealthier municipalities will have more companies operating as compared to less wealthy ones. The fact that more companies are operating in a municipality can lead to more inspections being carried out. To control for this effect, we used the share of each of the sectors of the economy in the GDP. However, results for the first stage are not in line with what would be expected.

Human development in a municipality can affect child labor. It is to be expected that the more a municipality is developed in this area, the less child labor. To control for this effect, we used the Human Development Index of the municipality. For the first two age ranges, the results are in line with what we expected, but in none of the cases the coefficients are statistically significant.

It is believed that child labor rates are lower in municipalities with more beneficiaries of the *Bolsa Familia* program. However, the coefficient only has a negative sign and is statistically significant for the last age range.

Some municipal expenditures, such as spending on education, culture, communications, judiciary costs, health care, among others, were also used as control variables. However, most of these variables were not statistically significant for any of the age ranges. Finally, dummies were used for the states and Federal District.

Table 3 shows the results for 2010. For the first stage, the coefficient of the *distance* variable has a negative sign and is statistically significant at 1% in all the age range analyzed. The negative sign of the coefficient shows that the greater the distance between a municipality and the nearest Regional Labor Superintendence or Office, the lower the number of inspected companies in the municipality.

The coefficient of the variable *ln_aft_2010* has a positive sign and is also statistically significant at 1% in all the age ranges analyzed. The positive sign shows that the higher the number of inspectors in a state, the higher the number of inspected companies located in municipalities in the state. The coefficient of the variable *distance* \times *ln_aft_2010* has a positive sign and is statistically significant at 1% in all age groups.

Table 3 also presents the results for the second stage estimation in 2010. For children and adolescents in the 10-17 age range, the result shows that a 1% increase in inspections reduced the number of working children and adolescents in this age group by 0.26%, which means removing 8,856 children and adolescents from irregular working conditions.

For the 10-13 age range the coefficient shows that a 1% increase in inspections reduced the number of working children and adolescents by 0.66%. The 2010 Census indicated that there were 710,139 working children and adolescents in that age bracket and so 4,686 children and adolescents 10 to 13 years old were removed from irregular working conditions as a result of inspections.

The result for adolescents between 14 and 15 years old shows that a 1% increase in inspections reduced the number of working adolescents by 0.41%, representing a reduction of 3,642 adolescents from irregular working conditions in 2010.

For the 16-17 age bracket, a 1% increase in inspections reduced the number of working adolescents by 0.08% in 2010. However, this result is not statistically significant at a 10% level.

The results show that the effect of inspections on reducing child labor in 2010 is higher for younger children and adolescents (10-13 years old) and that their impact decreases as these children and adolescents grow older.

In summary, the results show that more inspections reduced child labor in all the age ranges that were analyzed in 2000 and 2010. All these results were statistically significant, except for adolescents from 16 to 17 years old in 2010.

Table 3 - Results of applying the two-stage least squares method to child labor by age bracket in 2010

FIRST STAGE				
Age bracket	10-17	10-13	14 and 15	16 and 17
Dependent variable	ln_Fisc_2010	ln_Fisc_2010	ln_Fisc_2010	ln_Fisc_2010
distance	-0.18165*** (0.03777)	-0.17827*** (0.03788)	-0.18218*** (0.03782)	-0.181667*** (0.0377)
ln_aft_2010	0.46853*** (0.12565)	0.47601*** (0.12503)	0.46739*** (0.12574)	0.4685*** (0.12566)
distance × ln_aft_2010	0.05815*** (0.01774)	0.05696*** (0.01777)	0.05805*** (0.01777)	0.05816*** (0.01774)
Number of observations	4468	4374	4449	4467
R²	0.2678	0.272	0.2679	0.2678
SECOND STAGE				
Dependent variable	Log of the proportion of working children and adolescents in the 10-17 age bracket in 2010	Log of the proportion of working children and adolescents in the 10-13 age bracket in 2010	Log of the proportion of working adolescents aged 14 and 15 in 2010	Log of the proportion of working adolescents aged 16 and 17 in 2010
ln_Fisc_2010	-0.26121*** (0.0752)	-0.6674*** (0.13689)	-0.41483*** (0.09657)	-0.08106 (0.0649)
Number of observations	4468	4374	4449	4467
R²	0.2956	0.1376	0.1761	0.3721

Source: Prepared by the authors.

i) The control variables for all age brackets are the following ones: dummies for Unit of the Federation (the state of Sao Paulo was left out); institutional variables (index of access to justice, index of managing capacity of the municipality, and index of political concentration in the municipality); Per capita GDP; share of agriculture, industry and services in the municipal GDP; number of beneficiaries of the *Bolsa Familia* Program; Human Development Index of the municipality; area of the municipality; spending of the municipality by function (administration and planning, care and welfare, communications, education and culture, legal spending, health care and sanitation, transportation); current transfers of state tax revenues to municipalities; transfers to municipalities related to the value-added (ICMS) tax.

ii) Standard error in parentheses.

*** significant at 1%; ** significant at 5%; * significant at 10%.

5. Conclusion

The objective of this study was to analyze the impact of labor inspection in reducing child labor using data from population censuses of 2000 and 2010 by municipality. We ran the two-stage least squares method, using the distance between each municipality and the nearest Regional Labor Superintendences or Offices and the number of labor inspectors available in the state as instrumental variables. Analyses for both 2000 and 2010 showed that more inspections reduce child labor.

The analyses were carried out by age ranges. In the two years that were analyzed, it was seen that the effect of inspections was greater in the age range of younger children and adolescents and that this effect diminishes as these children grow older.

Thus, in 2000 it was found that a 1% increase in inspections decreased child labor among children and adolescents in the 10-14 age bracket by 0.45%, while reductions of 0.19% and of approximately 0.09% were observed among 15-year-old adolescents and adolescents aged from 16 to 17 years old, respectively. Analyzing the 10-17 age bracket, a 1% increase in inspections led to a decrease of 0.22% in child labor.

Based on these results, it was estimated that approximately 8,658 children and adolescents from 10 to 17 years old, 5,140 children and adolescents from 10 to 14 years old, 1,233 fifteen-year-old adolescents and 1,929 adolescents aged 16 and 17 were removed from work in 2000.

In relation to 2010, it was found that a 1% increase in inspections reduced the number of working children and adolescents in the 10-13, 14-15 and 16-17 age ranges by 0.66%, 0.41% and 0.08%, respectively. For the 10-17 age group, the reduction was 0.26%. These results were statistically significant at 1%, except for the 16-17 years old.

Based on these results, it was estimated that approximately 8,856 children and adolescents aged from 10 to 17 years old, 4,686 children and adolescents in the 10-13 age bracket and 3,642 adolescents aged from 14 to 15 years old were removed from work in 2010.

These results show that labor inspections are an important mechanism for fighting child labor. Therefore, intensifying them can be a good strategy to speed up reductions in child labor.

One of the limitations of this study was that it was not possible to obtain robust results by creating a Panel with data from the two years that were analyzed, namely, 2000 and 2010. This is so because there is no sufficient variability in the data that were used to define the instrumental variables. The distance between municipalities does not change over time and changes in the number of labor inspectors by state were not sufficient to capture any effect. We therefore hope that further research on the subject will be carried out and that a way to overcome this difficulty will be found.

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