The effect of labor inspections on reducing child labor in Brazil

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As part of broader efforts towards durable solutions to child labor, the International Labour Organization (ILO), the United Nations Children’s Fund (UNICEF), and the World Bank initiated the interagency Understanding Children’s Work (UCW) Programme in December 2000. The Programme is guided by the Oslo Agenda for Action, which laid out the priorities for the international community in the fight against child labor. Through a variety of data collection, research, and assessment activities, the UCW Programme is broadly directed toward improving understanding of child labor, its causes and effects, how it can be measured, and effective policies for addressing it. For further information, see the project website at www.ucw-project.org.

This study is part of the research carried out in collaboration with the Escola Superior de Agricultura “Luiz de Queiroz” of the University of Sao Paolo. The collaboration is aimed at promoting and building the capacity to undertake child labour research and will contribute creating a sustainable research capacity for policy-relevant research on child labour and related issues.

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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. 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. For the year 2010, a 1% increase in inspections reduced the percentage of working children and adolescents by 0.26%, 0.66%, 0.41%, and 0.08% for the 10-17, 10-13, 14-15 age brackets, respectively.
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1. **INTRODUCTION**

1. According to the International Labor Organization - ILO (2010a), in the 1980s there was a large increase in child labor. However, child labor has been on the decline since the mid-1990s. In Brazil, data from the National Household Sample Surveys show that approximately 23% of all children and adolescents between 10 and 15 years old were working in 1992. This percentage dropped to 7% in 2014, 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 2014, the figure hit the mark of 0.4%.

2. There is no consensus in the literature on 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 governmental and non-governmental agencies to fight child labor were stepped up in the late 1980s.

3. 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. He 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 number of changes began to be implemented.

4. The ILO (2010a) discusses other facts that marked this change, the following ones deserve special attention: (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).

5. We can then say that the more recent process of fighting child labor began in the 1980s and was intensified in the 1990s. It was also in the 1990s that labor inspection in Brazil started to focus more on fighting child labor [ILO (2010a)]. 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.

6. After this new ally in the fight against child labor was established, it became essential to understand the effect of labor inspections in reducing child labor in Brazil, which is the objective of this paper.

7. There are few papers addressing the impact of inspections on labor outcomes and they all focused on adults’ labor market. It is not of our knowledge any study analyzing the effects of labor inspection on child labor. Corseuil, Almeida and Carneiro (2012) analyzed how variations in the intensity of labor inspections in both temporal and regional terms affected the creation and destruction of jobs in municipalities in Brazil. A tendency
to create jobs was observed in municipalities in which labor inspections became more frequent.

8. Almeida and Carneiro (2009) analyzed the effects of enforcing employment regulations on employment, production, sales and capital stock in Brazil. The study considers the fact that labor regulations are not enforced uniformly in Brazil and that the number of inspectors is very small compared to the geographical size of the country. 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. In some municipalities inspections could be more frequent simply because they are known for violating labor laws or because they are more developed. Therefore, the authors used the costs incurred in carrying out inspections as an instrument for the number of inspected companies. To measure this cost they used the distance in hours between a municipality where a company is located and the regional labor office closest to the municipality in question. Larger distances are likely to reduce the number of inspections in a municipality because the costs are higher. They found negative effects of inspections on employment, production and sales by 0.46%.

9. In a subsequent study, Almeida and Carneiro (2012) analyzed the impact of labor inspections on formal and informal employment. Similarly, the empirical strategy adopted by the authors was to compare the differential impact of the distance between a municipality and the nearest Regional Labor and Employment Offices (GRT) on the variables related to the municipality’s labor market through states with different number of labor inspectors available. They found that increased labor inspections in a municipality, increased formal employment and reduced informal employment.

10. Trying to feel the gap in the literature our paper analyzes the impact of labor inspections on child labor based on 2000 and 2010 census data.
2. FRAMEWORK OF THE LABOR INSPECTION SYSTEM IN BRAZIL

11. 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 this role is delegated to one of its executive secretariats: the Labor Inspection Secretariat (SIT) (CARDOSO and LAGE, 2005; ILO, 2010b).

12. The role of the SIT is to define and propose 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).

13. In addition to these departments, the MTE has agencies in all of 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 to implement 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).

14. According to the MTE, there were 27 SRTEs and 109 GRTEs in operation in 2013 or 136 units around the country.¹ Figure 1 shows the distribution of these superintendences and regional offices in the 26 states and in the Federal District.

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¹ This information was provided by a labor inspector.
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15. The SRTEs are located in state capitals. Thus, in figure 1, states whose figures are equal to one only have SRTEs. These states are: Acre, Amapa, Rondonia, Roraima, Tocantins and the Federal 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 that these two states are located in the 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. Each Regional Office is in charge of supervising municipalities around it, and consequently, states with a large number of municipalities also have many Regional Offices.

16. 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 for administrative matters (ILO, 2010b).

17. Figure 2 shows the distribution of inspectors by states in 2001 and 2010. It can be seen that of a total of 3,052 active inspectors in 2001, more than one-third were concentrated in the southeast region (639 in Sao Paulo, 359 in Rio de Janeiro and 249 in Minas Gerais). Similarly, in 2010 a little more than one-third of the 2,983 inspectors were active in the southeast region. 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 (RR) is the state with the lowest number of inspectors, only five in 2001 and 15 in 2010. 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 2. Total number of Labor Inspectors by Unit of the Federation in 2001 and 2010.

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 were supposed 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 the 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) 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).
3. METHODOLOGY

20. This article uses the study by Almeida and Carneiro (2012), which was presented in the introduction, as the base for the creation of the instrumental variables. However, contrary to Almeida and Carneiro (2012) we use Two-stage Least Squares Method to measure the impact of inspections on labor.

3.1 Data

21. We 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 is 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 of Geography and Statistics (SIDRA)².

22. The data on labor inspection were obtained from the Ministry of Labor through the Labor Inspection Secretariat (SIT), which contain: i) the number of labor inspectors (AFTs) by state in 2001 and 2010; ii) the location of Regional Labor Offices and Superintendencies; and iii) the number of inspected establishments in the municipality in 2002 and 2010³. The labor inspectors work at Regional Labor Offices (GRTs) and at Regional Labor Superintendencies (SRTs).

23. Another variable related to labor inspection is the distance (as measured in hours by car) between each municipality and the closest Regional Labor Office or Superintendency in the state. This variable was calculated using the Google Maps tool⁴.

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

25. The control variables are municipal-level data available in the Ipeadata database⁵. 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 Família Program⁶, 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) 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.

² 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/
³ 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.
⁴ Its website address is: http://maps.google.com.br/.
⁵ Its website address is: http://www.ipeadata.gov.br/.
⁶ Conditional Cash Transfer Program. For 2000, we used the number of beneficiaries in 2004.
Moreover, we use data on the institutional development of municipalities, as published by the Brazilian Institute of Geography and Statistics (IBGE). 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. Similarly, 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 the Agricultural Census data. 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, we used the Municipal Human Development Index (IDHM) calculated by the United Nations Development Program (UNDP). 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. However, this is not an exogenous variable, and we will use econometric techniques in order to fix the endogeneity problem.

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) argue that in municipalities that are more developed institutionally the number of inspections are higher.

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 section 2 we saw that labor inspections are carried out by

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

32. 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.

33. 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 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. We then estimate the parameters of our model using the Two-stage Least Squares Method (2SLS).

3.3 The model

34. Our goal is to analyze the effect of labor inspections on child labor in 2000 and 2010. For each year, we estimated four models according to the age range of a child or adolescent, being 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 aged 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 in 16 and 17 years old in 2010.

35. As measure of labor inspections we have three variables. The first variable (\(ln_{Fisc}\)) is the logarithm of the number of inspected companies in a municipality divided by the total number of companies in the municipality. The second variable (\(ln_{aft}\)) is the logarithm of the total number of labor inspectors (AFTs) available in a state divided by the total number of companies in the state. The third variable (distance) is the travel time (in

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8 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.
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hours) by car between a municipality where a company to be inspected is located and the closest Regional Labor Superintendence or Office.

36. Since inspection is possibly an endogenous variable, we use the variables \( \ln_{aft} \) and \( distance \) as instruments for \( \ln_{Fisc} \). We thus use the two-stage least squares method (2SLS).

37. In the first stage, we estimated the following model:

\[
\ln_{Fisc_{ms}} = \alpha_0 + \alpha_1 distance_{ms} + \alpha_2 \ln_{aft_{ms}} + \alpha_3 (distance_{ms} \times \ln_{aft_{ms}}) + \delta X_{ms} + v_{ms}
\]

38. where \( m \) represents the municipality, \( s \) represents states and the Federal District, \( v \) is the error term and \( X \) is a matrix of 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 Família Program, current transfers of state taxes to municipalities, transfers to municipalities related to the value-added (ICMS) tax, municipal expenses by function\(^9\), 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).

39. In the second stage, we estimated the following model:

\[
\ln_{Y_{ms}} = \beta_0 + \beta_1 \ln_{Fisc_{ms}} + \delta X_{ms} + u_{ms}
\]

40. where \( u \) is the error term, \( X \) is the matrix composed of the control variables\(^10\), \( \ln_{Fisc} \) is the inspection estimated from the first stage and \( \ln_{Y} \) represents the logarithm of the proportion of working children and adolescents. As stated before, the variable \( \ln_{Y} \) actually represents eight different dependent variables.

41. 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 available\(^11\), we believe that these discrepancies are not relevant.

\(^9\) Section 3.1 has all the expenses included.
\(^10\) These are the same variables of the first stage.
\(^11\) The number of inspectors available by state in 2001 and 2010 can be seen in section 2.
4. RESULTS

42. Tables 1 and 2 show the coefficients estimated by two-stage least squares method in 2000 and 2010 respectively. The instrumental variables used in the first stage are: i) distance; ii) ln_aft; iii) distance × ln_aft. The first two variables were defined in section 3.3 and the third variable represents the interaction between the first two variables\(^{12}\). The dependent variable in the first stage is ln_Fisc, which is our measure of inspection. The estimated value of this variable is then used to estimate the effect of inspection on child labor in the second stage.

43. The coefficient of the distance variable in table 1 has a negative sign, showing 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 the 5% level. The coefficient of the ln_aft_2000 variable has a positive sign in all age groups, indicating 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 at 10% level in any of the age groups.

12 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 our exogenous variables, and also to capture all the possible effects of the variables.

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>10-17</th>
<th>10-14</th>
<th>15</th>
<th>16 and 17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td>ln_Fisc_2000</td>
<td>ln_Fisc_2000</td>
<td>ln_Fisc_2000</td>
<td>ln_Fisc_2000</td>
</tr>
<tr>
<td>distance</td>
<td>-0.10383**</td>
<td>-0.10434**</td>
<td>-0.10379**</td>
<td>-0.10494**</td>
</tr>
<tr>
<td></td>
<td>(0.04367)</td>
<td>(0.04380)</td>
<td>(0.04371)</td>
<td>(0.04367)</td>
</tr>
<tr>
<td>ln_aft_2000</td>
<td>1.44656***</td>
<td>1.44491***</td>
<td>1.30637***</td>
<td>1.44629***</td>
</tr>
<tr>
<td></td>
<td>(0.21337)</td>
<td>(0.21353)</td>
<td>(0.22922)</td>
<td>(0.21333)</td>
</tr>
<tr>
<td>distance × ln_aft_2000</td>
<td>0.01017</td>
<td>0.00988</td>
<td>0.00995</td>
<td>0.01065</td>
</tr>
<tr>
<td></td>
<td>(0.02064)</td>
<td>(0.02069)</td>
<td>(0.02065)</td>
<td>(0.02064)</td>
</tr>
<tr>
<td><strong>Number of observations</strong></td>
<td>4567</td>
<td>4532</td>
<td>4515</td>
<td>4567</td>
</tr>
<tr>
<td><strong>(R^2)</strong></td>
<td>0.3447</td>
<td>0.3445</td>
<td>0.3461</td>
<td>0.3448</td>
</tr>
</tbody>
</table>
### Table 1. Cont’d

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SECOND STAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Log of the proportion of working children and adolescents in the 10-17 age bracket in 2000</td>
</tr>
<tr>
<td>ln_Fisc_2000</td>
<td>-0.22478***</td>
</tr>
<tr>
<td></td>
<td>(0.06033)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>4567</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.21</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>FIRST STAGE</th>
<th>10-17</th>
<th>10-13</th>
<th>15 and 15</th>
<th>16 and 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>ln_Fisc_2010</td>
<td>ln_Fisc_2010</td>
<td>ln_Fisc_2010</td>
<td>ln_Fisc_2010</td>
</tr>
<tr>
<td>distance</td>
<td>-0.18165***</td>
<td>-0.17827***</td>
<td>-0.18218***</td>
<td>-0.18166***</td>
</tr>
<tr>
<td>ln_aft_2000</td>
<td>(0.03777)</td>
<td>(0.03788)</td>
<td>(0.03782)</td>
<td>(0.03777)</td>
</tr>
<tr>
<td>distance × ln_aft_2000</td>
<td>0.46853***</td>
<td>0.47601***</td>
<td>0.46739***</td>
<td>0.4685***</td>
</tr>
<tr>
<td></td>
<td>(0.12565)</td>
<td>(0.12503)</td>
<td>(0.12574)</td>
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<th>16 and 17</th>
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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%.
44. Table 1 also shows the second stage estimates. Second column reveals that a 1% increase in inspections reduces the number of working kids from 10 to 17 years old by 0.22% in 2000. There are 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.

45. For the 10 - 14 years old group, shown in the third column of Table 1, a 1% increase in inspections reduced the number of working children and adolescents by 0.45%. There are 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.

46. For 15-year-old adolescents, presented in the fourth column of Table 1 the result suggests that a 1% increase in inspections reduced the number of adolescents by 0.19%. So, a 1% increase in inspections indicates that 1,233 adolescents were removed from work, since there were 649,042 working adolescents in 2000 in Brazil.

47. Finally, for adolescents in the 16-17 age range, a 1% increase in inspections reduced the number of working adolescents by approximately 0.09% or 1,929.

48. From these results we can conclude that the effect of inspections in 2000 was higher in reducing child labor for the 10-14 age range. In addition, this effect decreases as the children and adolescents grow older.

49. 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 it was expected.

50. The economic status of municipalities can influence the number of companies operating in each city. We expect that wealthier municipalities would 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.

51. High human development in a municipality is accompanied by low child labor. 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 at 10% level.
52. 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.

53. Some municipal expenditures, such as 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. Finally, dummies were used for the states and Federal District.

54. Table 2 shows the results for the year 2010. For the first stage, the coefficient of the distance variable has a negative sign and is statistically significant at 1% level 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.

55. The coefficient of the variable ln_aft_2010 is positive and statistically significant at 1% level 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 that state. Similarly, the coefficient of the interaction variable distance × ln_aft_2010 is positive and statistically significant at 1% in all age groups.

56. Table 2 also presents the second stage estimates 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 by 0.26%, which means removing 8,856 children and adolescents from irregular working conditions.

57. For the 10-13 age range the coefficient shows that a 1% increase in inspections reduced the number of working children by 0.66% or 4,686 would be removed from irregular working conditions as a result of inspections.

58. 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.

59. For the 16-17 age brackets, the coefficient was not statistically significant at a 10% level.

60. 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 they grow older.

61. 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.
5. CONCLUSIONS

62. This study analyzes 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 Superintendencies or Offices and the number of labor inspectors available in the state as instrumental variables. Analyses for both years 2000 and 2010 showed that more inspections reduce child labor.

63. 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 for younger children and that this effect diminishes as these children grow older.

64. 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.

65. 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.

66. Similarly, in 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.

67. 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.

68. 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.

69. 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.
REFERENCES


