

Do labor inspections make a difference? An analysis of establishments in Brazil*

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Abstract

This paper estimates the effect of labor inspections on firms' outcomes in Brazil. We combine the universe of firms that were inspected in the period between 2007-2017 with detailed matched employer-employee administrative data. Using a staggered difference-in-differences approach and exploiting the fact that the timing of each inspection is unknown for establishments, our results indicate that firms inspected experience a decline in employment, hire, separation and wages in formal sector. The most affected are medium-sized companies (50-100 workers), companies in the industry sector, and young establishments. We also show that a negative reaction is not correlated with being notified for committing a labor violation.

KEYWORDS: Enforcement, Labor inspections, Firms' dynamic.

Código JEL: D22, K20, K42

1 Introduction

Brazil has one of the strictest labor laws in the world, which the main goal is to ensure employees' rights and minimum working conditions (Cardoso and Lage, 2007). However, the employment protection legislation implies costs to the companies, leading them to decide whether or not to comply with the regulations¹. Despite having laws on paper,

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¹Cardoso and Lage (2007) estimate that for a worker to receive a net wage of R\$100, the employer must disburse approximately R\$165.

enforcement is not guaranteed, creating incentives for evasion due to the combination of costly regulations and weak monitoring (Ronconi, 2010).

In this context, labor inspections are the government's main instrument capable of enforcing laws/regulations. In Brazil, for example, in 2016, 168,974 establishments were inspected, 65,636 were notified, and 232,319 irregularities were founded². Without inspection, it is possible that the workers reached would continue to face labor irregularities for years.

Although labor inspections are a well-intentioned policy, designed to ensure good working conditions, little is known about their effectiveness and their direct effects on firms in the Brazilian context. Focusing on the firm-level data, this paper sheds light on how inspections can have impacts on establishments.

Estimating the causal effect is challenging because, possibly, enforcement is not randomly allocated across cities (Almeida and Carneiro, 2012). We explore the fact that companies selected for inspection are not informed about the action, which makes the action's timing is unknown by the firm. Corroborating our argument, we did not observe anticipation in our estimations.

To conduct our analysis we use two data sources. The first is a novel dataset of inspection that identifies all firms inspected between 2007 and 2017 and all firms notified for some irregularity found during inspection for years 2013 to 2016. This data had provided by *Secretaria de Inspeção do Trabalho* (SIT) and were made available through the *Lei de Acesso à Informação* (LAI). The second data source is *Relação Anual de Informações Sociais* (RAIS), a Brazilian matched employer-employee data. From labor market we have information about all establishments in the formal sector, including size, hiring and separation levels, workers' characteristics, contracts' characteristics, and other variables. We employ a staggered difference-in-differences approach, following Callaway and Sant'Anna (2021), focusing on companies with a size between 10 and 500 workers that were inspected only once during the period from 2007 to 2017. The control group consists of units not yet treated.

In the first part of the paper, we analyze the effect of inspections on size, hiring, separations, and average wages at a firm level. Restricted to the balanced panel to avoid a composite effect on the sample, i.e. keeping only companies active in all years. The results show that inspected establishments experienced a reduction of about -14% in employment, -15% in hiring, -13% in separations, and -2% in wages, considering the average treatment effect. We also find that medium-sized companies and firms in the industrial sector are the most affected.

²Statistics generated from data made available by the *Secretaria de Inspeção do Trabalho* (SIT). Consolidated information on notifications can be accessed at <https://sit.trabalho.gov.br/radar/>

In the second part of the paper we distinguish whether the effect is caused by the inspection per se or by the fact that the company can be punished based on an inspection. Using notification information from 2013 to 2016, the results show that there is no differential effect of being inspected and notified (compared to being inspected and not notified or not yet treated) when we look at size, hiring, separation and wages.

An inspection may represent an increase in costs for the company and an increase in the perceived probability of being inspected in the future. Firms can then choose to anticipate future punishments by adjusting in the present (similar to the deterrence effect). This can be done by strictly following the regulations, which may incur greater costs that may lead to the choice for a lower level of activity, or deciding to downsize so that they are not the focus of inspections (Almeida and Carneiro, 2009).

We contribute to the literature by examining the effects of labor inspections on firms' outcomes using firm-level data. Most common in previous researchers is the use of regional variation in the intensity of labor enforcement to analyze aggregate variables such as employment, wages, and turnover. Specifically for Brazil, Almeida and Carneiro (2012) looking to complete labor market, find that locations with more frequent inspections experience a rise in formal employment followed by a fall in formal wages. On the other hand, employment and wages in the informal sector move in the opposite direction. The authors argue that greater compliance with regulations makes formal positions more attractive than informal ones. The increase in labor supply decreases wages in the formal sector, while the opposite occurs in the informal sector.

Focus only on the effects in the formal sector, there is evidence that a positive variation in inspection at the geographic level decreases firm size (Almeida and Carneiro, 2009; Almeida and Susanlı, 2012), rise hiring (Almeida and Carneiro, 2009; Abras et al., 2018), and also increases separations (Abras et al., 2018). Although the estimates in these works consider the total effect, that is, the effect on inspected and non-inspected companies (but which react to a greater perceived probability of inspection), our results are very similar.

Closer to our work, Samaniego de la Parra and Fernández Bujanda (2023) using firm-level data from Mexico find that an increase in labor inspections leads to lower formal employment, lower formal job creation, and a temporary increase of formal and informal job destruction.

Our work differs from previous literature analyzing the Brazilian context in several aspects. First, we use inspection information at the company level, allowing us to identify the direct effect of receiving an inspection. Second, our inspection data covers the entire universe of inspection actions in Brazil from 2007 to 2017, rather than being limited to a specific program or policy. Third, we utilize novel data on labor notifications, providing

preliminary evidence of the relationship between punishment and companies' reactions.

This paper is organized as follows. Section 2 describes the institutional context of labor inspections in Brazil. Section 3 outlines the data and descriptive statistics of our estimation sample. Section 4 delineates the empirical strategies and Section 5 presents the results and robustness check. Finally, in Section 6, we present some concluding remarks.

2 Labor Inspections in Brazil

The labor inspections in Brazil are the responsibility of the Ministry of Labor³. There is a specific department to treat inspection issues named *Secretaria de Inspeção do Trabalho* (SIT). Strategies and action plans are formulated at the national level based on identified needs and goals. While the SIT operates nationwide, its presence is established through decentralized units, such as *Superintendências Regionais do Trabalho e Emprego* (SRTE), *subdelegacias* or *gerências*.

The selection of the firm to inspect occurs at the local level (*subdelegacias/gerências*) but follows the guidelines of national planning. In theory, inspections can be triggered either by random selection or in response to reports (Cardoso and Lage, 2005; Almeida and Carneiro, 2012). However, the number of labor inspectors has been insufficient to address the demand from reports and conduct entirely random visits⁴. Consequently, a set of information about firms and the local labor market is utilized to optimize the selection process. It is important to emphasize that the agents involved in the selection will not be the same ones that will effectively conduct the inspection.

Another key aspect to highlight is that companies are not informed in advance of an impending inspection. While the selection may not be random, the timing of action is unknown and potentially exogenous. This characteristic allows us to explore the variation in timing to analyze the reaction of the inspected establishments.

During the inspection visit, the labor inspector is responsible for verifying compliance with all legal provisions pertaining to employment relations, providing guidance to workers and employers, and investigating potential risk situations (OIT, 2010). If any irregularity is found, such as informal workers, non-payment of FGTS, or violations related to workers' health and safety, the company is notified for violations of the labor code (BRASIL, 2002).

In case of a notification, the company has ten days to contest it (counted from the date

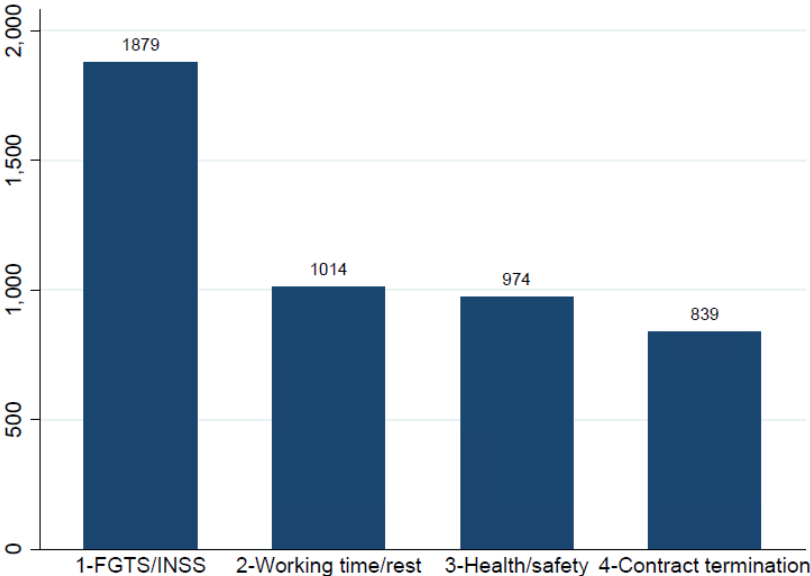
³Or Ministry of Labor and Employment or Ministry of Economics, depending of the government in activity.

⁴In 2016, there were about 2.400 inspectors in operation, a reduction of more than 20% from 2011. This means that the number of auditors for 10,000 formal workers was 0.66 in 2011 and dropped to 0.52 in 2016. In developing countries like South Africa and Mexico, the number of inspectors per 10,000 workers in 2016 was 0.8 and 0.2, respectively (ILO, 2020).

of receipt of the notification). The process is then reviewed by a different authority. If the violation is confirmed, a fine is applied with a ten-day period for payment⁵. The company also has the option to present a new appeal, which will be analyzed by the responsible tax auditor and referred to the superior department for a final decision⁶. Failure to file an appeal within the stipulated period results in the imposition of the fine.

For companies with up to 10 employees and newly opened establishments, inspections are conducted following the double visit criterion⁷. This criterion is also applicable when new laws are enacted within 90 days of coming into force (BRASIL, 2002). The double visit principle aims to guide employers on irregularities, allowing them to rectify the situation without facing immediate punishment.

Figure 1: The main irregularities found by the inspection



Note: The figure shows the four most common irregularities found by inspectors during the inspection. We consider our estimation sample, that is firms from 10 to 500 inspected only once between 2007 and 2017 that are active in the RAIS in all years. Notification information was obtained from SIT.

In our estimation sample⁸, there were 51,806 establishments inspected only once during the period, with 26,370 inspected between 2013 and 2017. Out of these 26,370, approximately 3,624 were notified, indicating that 13.7% of the inspected companies had

⁵The amount of fines applied depends on the seriousness of the offense committed and injured workers. They can vary from R\$ 1,000 to R\$ 100,000.

⁶*Coordenação Geral de Recursos da SIT.*

⁷Except when an infraction is found due to lack of registration.

⁸That is, companies with 10 to 500 workers that were inspected only once in the period from 2007 to 2017

committed some labor irregularities during the inspection⁹. Among these 3,624 notified companies, the average number of notifications was 2.39 per establishment, implying that multiple irregularities were often identified.

In Figure 1 we present the four most frequent causes of notification in our estimation sample. Despite the focus on addressing informality among workers during inspections, other irregularities are reported more frequently. These include non-payment of FGTS/INSS, workers' health and safety concerns, issues related to working hours and rest periods, and contract termination matters¹⁰.

3 Data

3.1 Data Sources and Sample Selection

The principal source of firm-level data is obtained from RAIS (*Relação Anual de Informações Sociais*) for the period between 2007 and 2017. This matched employee-employer dataset covers the entire universe of formal workers in Brazil and is made available by the Ministry of Labor. The data includes worker-level information (e.g. age, education, gender), contract-level details (e.g. hiring and separation date, hours contracted, wage) and establishments-level information (e.g. size, municipality, industry). Each worker and establishment had a unique identifier¹¹ which is useful to follow individuals and companies over the years. Using hiring and separation date information we were able to aggregate the data in a semester panel at firm level. This enables us to analyze the number of workers hired, fired, and the average wage in specific semesters, for example.

The data on labor inspections were collected and made available by SIT (accessed via *Lei de Acesso à Informação*). We have detailed information about all inspections that occurred between 2007 to 2017, including establishment ID (CNPJ) and the date of each inspection (in the MM/YYYY format).

As explained in the section 2, if any labor irregularity is found during the inspection, the company will be notified. We also had access to notification data from 2013 to 2016. This means that for each caught establishment, we know the exact reason for the notification¹². This rich data makes it possible to differentiate inspected-notified companies from those inspected without notification.

⁹It is important to highlight that an inspection could generate a notification but it is not mandatory.

¹⁰There are many other reasons that can generate a notification. Basically any behavior by the company that is not in accordance with current laws and regulations. For each irregularity, a notification is created.

¹¹PIS for workers and CNPJ for firms.

¹²A firm could be notified for more than one reason. We just not be able to identify how many workers were affected, e.g. how many informal workers were found.

To merge both datasets and generate a firm-level panel from 2007 to 2017 we use CNPJ identifier. Initially, we had approximately 7,3 million establishments (including 6,025,896 never inspected in the period, 793,052 inspected once and 538,735 inspected more than once).

We apply two restrictions to make the comparison between control and treatment more feasible. First, we excluded establishments inspected more than once between 2007 and 2017. Frequent inspections could result in overlapping pre and post-periods, making it unclear when these intervals begin or end. Second, we dropped firms with up to 10 workers in the baseline¹³ because this group is eligible for double visit inspection (as cited in Section 2). We also drop large firms (500 or more) and never inspected establishments, as they may differ significantly in observable and unobservable characteristics.

In the end, we obtained a semester panel of firms with 10 to 500 workers that were inspected only once between 2007 and 2017. For our main analysis, effects of inspections in size, hiring, separation, and wages, we use the balanced panel (with only establishments existing every year between 2007 and 2017), which we will refer to as the estimation sample¹⁴.

3.2 Descriptive Statistics

Table 1 presents summary statistics for the estimation sample. On average, establishments have approximately 30 workers, hiring and firing about 6 employees per semester. The average wage is close to 1,300 *reais*. In terms of composition, around 90% of the sample is formed by small companies (with 10 to 50 employees), while larger companies (100 to 500) represent 3%. About 46% of the companies operate in the service sector, 31 % in trade, and 23% in industry. There is notable heterogeneity in the age of the companies, with 35% of firms being between 4 and 10 years old at the baseline, 28% between 10 and 20 years old, 24% older than 20 years, and only 13% up to 3 years old.

¹³First year in the sample.

¹⁴Keep a balanced panel is a way to avoid composition effects in the sample.

Table 1: Descriptive Statistics - estimation sample

	Mean (1)	SD (2)
Main variables		
# Workers	30.11	51.10
# Hiring	6.28	18.11
# Separation	5.83	293.75
Real average wage (in <i>reais</i>)	1,333.85	1,212.32
Ln real average wage (in <i>reais</i>)	6.99	0.68
Size		
10-50 employees	0.91	0.29
50-100 employees	0.06	0.06
100-500 employees	0.03	0.03
Sector		
Trade	0.31	0.21
Industry	0.23	0.18
Services	0.46	0.25
Firm's age		
Up to 3 years	0.13	0.12
4-10 years	0.35	0.23
11-20 years	0.28	0.20
More than 20 years	0.24	0.18
Number of establishments	51,806	
Number of observations	1,139,732	

Note: This table reports descriptive statistics for establishment using RAIS and SIT data. The balanced panel represents the sample composed of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years. Statistics were computed using the entire available time period. The variables are: the number of workers, number of hiring, number of separations, the real average wage in the establishment (expressed in Brazilian *reais*), indicator variables for whether the establishment is small (10-50 employees), medium (50-100 employees) and large (100-500 employees), indicator variables for economic sector the establishment belong to (trade, industry or services), and indicator variables for whether the establishment has up to 3 year of age in baseline, 4-10 years, 11-20 years and more than 20 years of age. Both size and firm age are measured in the baseline (first year in the sample).

4 Empirical Strategy

To identify the causal effect of labor law enforcement on firms' dynamics, we use a staggered difference-in-differences framework. Our main argument is that the timing of the establishment's inspection is possibly exogenous or a surprise since they do not know when it will take place. Given the complexities in our context with multiple periods, treatment timing variation, and dynamic heterogeneous effects, we opt for recent methodologies (De Chaisemartin and d'Haultfoeuille, 2020).

Following Callaway and Sant'Anna (2021) we estimate average treatment effects on the treated, $ATT(G, T)$, for each cohort g and time t by comparing the outcome evolution between inspected and not-yet inspected firms. We assume that, in the absence of treatment, the trends would be parallel.

Let $i \in \{1, 2, \dots, N\}$ be firms, $t \in \{2007h1, 2007h2, 2008h1, \dots, 2017h2\}$ be semesters, $g \in \{2008h1, 2008h2, \dots, 2017h2\}$ treatments cohorts, $C_i = 1$ for the control group, and $\Delta Y_{i,g-1,t} \equiv Y_{i,t} - Y_{i,g-1}$ the evolution of outcome Y in a given time t relative to the year before treatment $g - 1$. The average effect of inspections for unit in the group g at time period $t \geq g$ is given by:

$$ATT\hat{(g, t)} = \frac{\sum_i \Delta Y_{i,g-1,t} 1\{G_i = g\}}{\sum_i 1\{G_i = g\}} - \frac{\sum_i \Delta Y_{i,g-1,t} C_i}{\sum_i C_i} \quad (1)$$

Our main outcomes of interest are ln total workers, ln hiring, ln separation, and ln average real wage.

After estimating each $ATT\hat{(g, t)}$ we have a lot of parameters to summarize. We first present the main results in an event study aggregation, which combines the estimates by relative time since the treatment semester ($e = t - g \in \{-6 : +6\}$). Then, we consolidate the post-treatment estimates into a single measure to evaluate magnitudes.

5 Results

In this section, we begin by examining the responses of employment, hiring, separation, and real average wage to labor inspections, while also considering the heterogeneity by size, sector of activity, and firm age. For this analysis, we utilized the balanced panel of establishments with 10 to 500 employees that underwent inspection only once between 2007 and 2017. Next, we conduct an exercise to disentangle the effect of being inspected from the impact of receiving a notification. This allows us to distinguish the direct effect of inspections from the potential behavioral changes triggered by the expectation of being punished. Finally, to validate our estimations, we present some robustness checks that

assess the reliability and consistency of our results. These checks help ensure the robustness of our findings and enhance the credibility of the conclusions drawn from the analysis.

5.1 The effects on size, hiring, separation and wages

Figure 2 shows the average treatment effects aggregated by the relative time since the inspection date. The control group consists of establishments that have not yet been treated. For all four outcomes studies in this section, the pre-event coefficients are statistically not different from zero, providing support for the parallel trends assumption. Table 2 presents the average treatment effects aggregate for all periods post-inspection.

In Panel (a), we observe the point estimates for ln employment. There is a sharp and significant decline starting in $t = +1$, which represents one semester after inspection. The effect reaches 3.8% in magnitude at $t = +1$ and increases to 13% at $t = +6$. The average impact across all periods post-inspection is a significant -0.1407, indicating a 13.12% drop in employment, as shown in Column 1 of Table 2¹⁵.

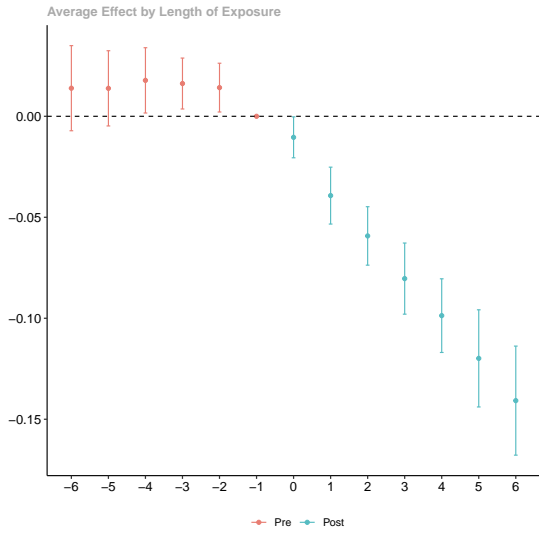
Panel (b) presents the results for ln hiring. Similarly, there is a decline from one semester after inspection (6.58%), persisting until at least $t = +6$. The average effect, as shown in Column 2 of Table 2 indicates a drop of 15.86%. Looking at separations in Panel (c), the dynamic is different. Although there is a downward trend from $t = 0$, it is only from $t = +3$ that the coefficient becomes significant (-0.0556), resulting in an average impact of 12.5%.

Estimates for ln wage are documented in Panel (d). Similar to ln separation, there is a clear trend after inspections. However, the coefficient only becomes significant at $t = +5$ and $t = +6$. The average effect considering all periods post-inspection is relatively small in magnitude (-2.46%), as shown in Column 4 of Table 2.

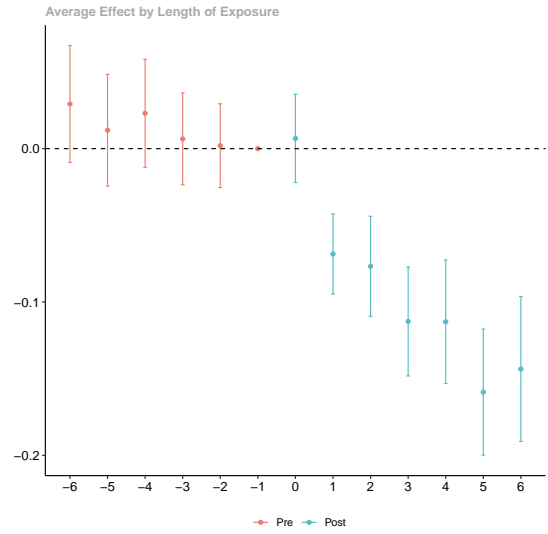
¹⁵We use the approximation $(100 * [exp(\gamma) - 1])$ when interpreting the estimated coefficients as a percentage.

Figure 2: The effects of inspection on Establishments' outcomes

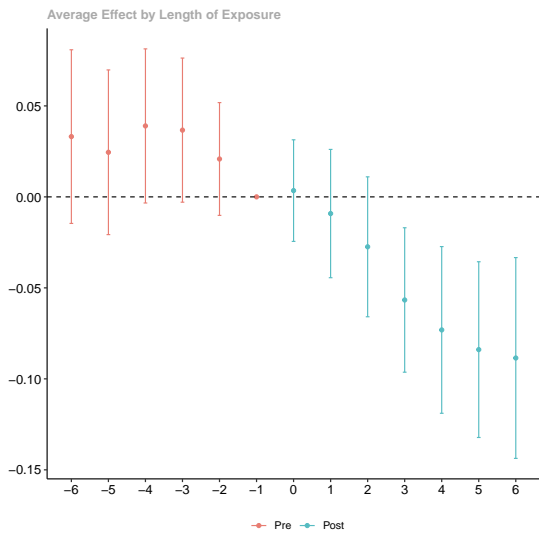
(a) Ln employment



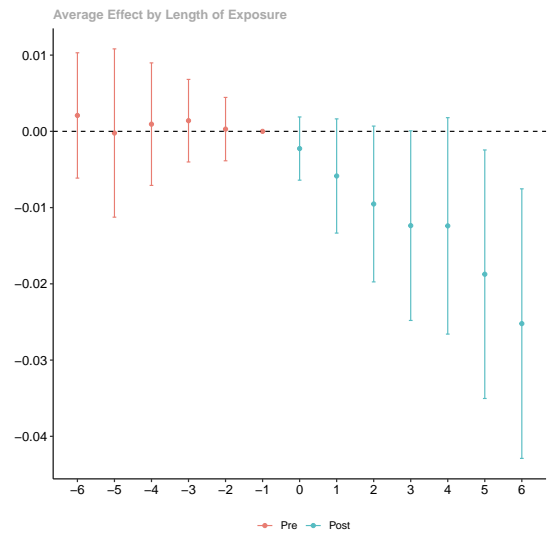
(b) Ln hiring



(c) Ln separation



(d) Ln real average wage



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Table 2: The average effects of inspection on Establishments' outcomes

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Post_inspection	-0.1407*** (0.009)	-0.1586*** (0.0132)	-0.1337*** (0.0164)	-0.0246** (0.0053)
Mean of the variable in the pre-treatment	30.11	6.28	5.83	1,333.85
N ^o of observations	1.139.732	1.139.732	1.139.732	1.139.732

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on ln employment, ln hiring, ln separation and ln real average wage. The estimation sample consists of a semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

Next, we investigate heterogeneous effects based on firms' characteristics, examining whether some establishment groups are affected differently by inspections. We find that firms with 50 to 100 workers, establishments in the industrial sector, and younger firms are the most affected by inspections¹⁶ (Tables 4-6 and Figures 4-15 in Appendix A).

In the theoretical framework, we suppose that a conventional profit-maximizing firm chooses between complying with regulations or evading labor laws (Ashenfelter and Smith, 1979). Complying with rules incurs labor obligations while evading them carries the risk of fines if caught, but it also offers the benefit of lower labor costs and increased labor flexibility. In this context, increasing inspections or the probability of being inspected would heighten the probability of punishment (Viollaz, 2018).

We are estimating the effect of being inspected, which could include the effect of being punished¹⁷. Based on our previous results (Figure 2), showing that inspected firms are shrinking, we can assume that firms are reacting due to at least two possible behaviors.

First, companies change because they have been notified and will be more likely to pay fines. In this case, the inspection may represent a temporary increase in costs. Companies would then be responding to higher costs by reducing the number of workers and turnover¹⁸. We will explore this further in Section 5.2, where it appears that there is no significant difference between notified companies and those inspected but not notified, indicating that the punishment component may not be the primary factor driving changes in firms'

¹⁶We divided our sample into three groups according to size (10 to 50, 50 to 100 and 100 to 500 workers) and in three sectors (trade, industry and services). In terms of age, we divided it into four categories - up to 3 years old, from 4 to 10 years old, from 11 to 20 years old and over 20 years old.

¹⁷Only for the period between 2013 to 2016 we can separate firms inspected without punishment from firms inspected and notified.

¹⁸Both hiring and firing are costly processes for companies, so the decrease in these events may represent a decrease in "variable" costs.

behavior.

Second, inspected companies, even if not notified, can update their perceptions about the likelihood of inspection and become more concerned about compliance with regulations. In other words, the company may already "react" even before being caught committing any infraction (deterrence mechanism). This argument seems to support the results presented in this work and in the literature for Brazil. Previous studies such as Almeida and Carneiro (2009), Almeida and Carneiro (2012) and Abras et al. (2018), which utilize city-level data and explore local variation in inspection frequencies, provide evidence of significant effects on the labor market. With this approach and data format, the authors are likely able to estimate a combined effect, incorporating the impact of both punishment and deterrence.

5.2 Inspections *versus* Notification

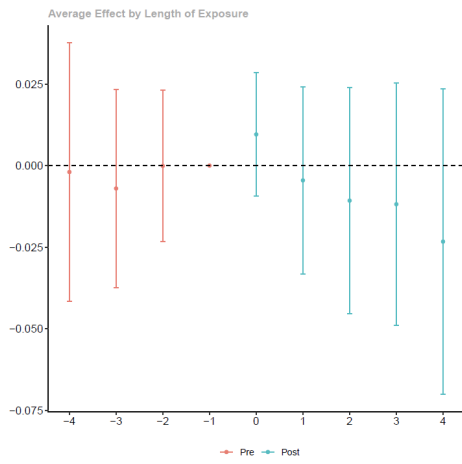
As discussed in section 3.1, we also have information on companies that have been notified (i.e., that were caught committing an infringement during an inspection). This data provides a measure of the intensity of inspections based on the number of labor irregularities detected. However, there is a limitation in this analysis since the notification data is available only for the period from 2013 to 2016, while the inspection data covers the period from 2007 to 2017. Consequently, any estimates derived from this analysis are confined to this specific period¹⁹.

Following Colonnelli and Prem (2022), we use the "intensity" variable to report the heterogeneous effects. In this context, notified companies are our treatment group, while the control group is formed of companies that have not yet been notified and companies that were inspected but not notified.

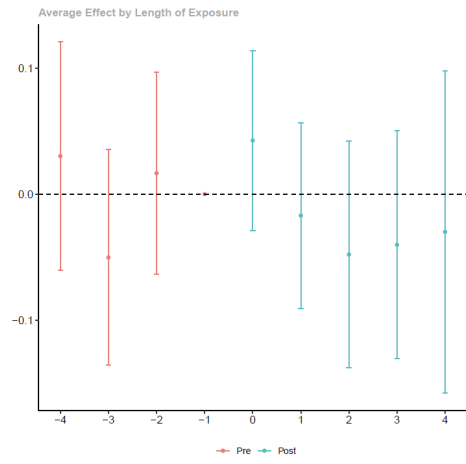
¹⁹In Appendix C, Figure 19 and Table 10, we show the estimation of the effect of inspection on the main outcomes considering only the period from 2013 to 2017.

Figure 3: The effects of notification on Establishments' outcomes

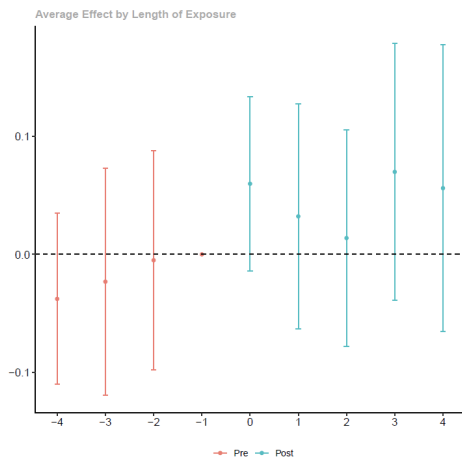
(a) Ln employment



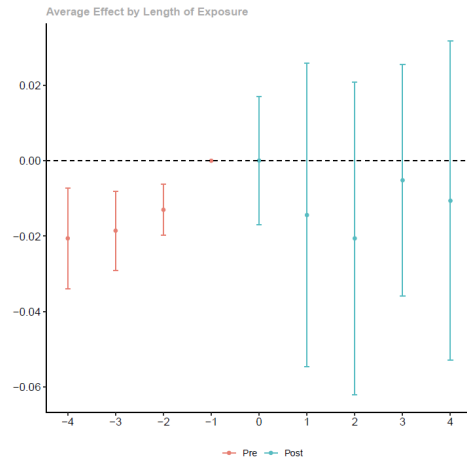
(b) Ln hiring



(c) Ln separation



(d) Ln real average wage



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Table 3: The average effects of notification on Establishments' outcomes

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Post_inspection	-0.018 (0.0133)	-0.0197 (0.0259)	0.0605* (0.0346)	-0.0165 (0.0113)
Mean of the variable in the pre-treatment	30.82	5.81	5.97	1,434.24
N ^o of observations	518,060	518,060	518,060	518,060

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on exit, ln employment, ln hiring, ln separation and ln real average wage. The estimation sample is the semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

Figure 3 and Table 3 present the results that there does not seem to be a statistical difference between inspected and notified companies and those not notified or not yet inspected when we look at employment, hiring, and wages. That is, being notified (and possibly punished) has no effect beyond the effect of being inspected.

It is important to highlight while inspections may be considered exogenous, the number of infractions detected in establishments is endogenous. Therefore, the estimates presented in this section should be interpreted as correlations rather than causal effects.

5.3 Robustness Check

In Appendix B we show three additional estimations to verify the robustness of our main results. First, we use alternative variable definitions by applying inverse hyperbolic sine transformation to our four main outcomes. Table 7 and Figure 16 demonstrate that the conclusions remain largely consistent.

Second, we relax the restriction of the balanced panel and estimate using a panel with stayers, which includes establishments that were active in the $[-6,6]$ window around the inspection date. This approach introduces more flexibility, but the panel size reduces significantly, from 51,806 establishments in the balanced panel to 25,103 establishments (a 51% reduction). Nonetheless, the results remain very similar to our main estimates, as indicated in 8 and Figure 17).

Finally, we adopt the method proposed by Sun and Abraham (2021) as an alternative to the approach used by Callaway and Sant'Anna (2021), which also accounts for possible heterogeneous effects over time. For this estimation, we use the last treatment cohort as the control group. The results are present in Table 9 and in Figure 18 in Appendix B.

These alternative estimates reinforce the robustness of our main findings.

6 Conclusion

In this paper, we focus on studying how firms are affected by labor inspections in Brazil. We use novel data on inspection combined with matched employer-employee data (RAIS) and adopt staggered differences-in-differences following the new methodological literature.

Our results show that inspected establishments are negatively affected by labor inspection when we are looking at employment, hiring, separation and wages. The average treatment effect estimate are, respectively, 13%, 14.7%, 15.5%, and 2.4%. Furthermore, we explore potential heterogeneities in the effects and discover that medium-sized firms (with 50-100 employees), establishments in the industrial sector, and younger companies (up to 3 years old) are the most impacted by inspections. We also show that the results are robust to variable definition, sample restriction, and alternative methods.

In the second part of our study, we investigated whether the observed effects can be generated by punishment. By examining data on notifications, we find no significant correlation between being notified and labor market outcomes, suggesting that the negative impacts are not solely driven by fines or penalties. Instead, it appears that companies respond to inspections by updating their perceptions of the likelihood of future punishment, possibly indicating a deterrence mechanism at play. Further research is needed to fully understand why inspections themselves, even without leading to punishment, have adverse effects on inspected companies.

Overall, our study contributes to the literature by providing insights into the direct effects on firms of a government instrument aimed at ensuring minimum working conditions in Brazil. Understanding these effects is essential for policymakers and researchers seeking to enhance labor market regulations and enforcement mechanisms.

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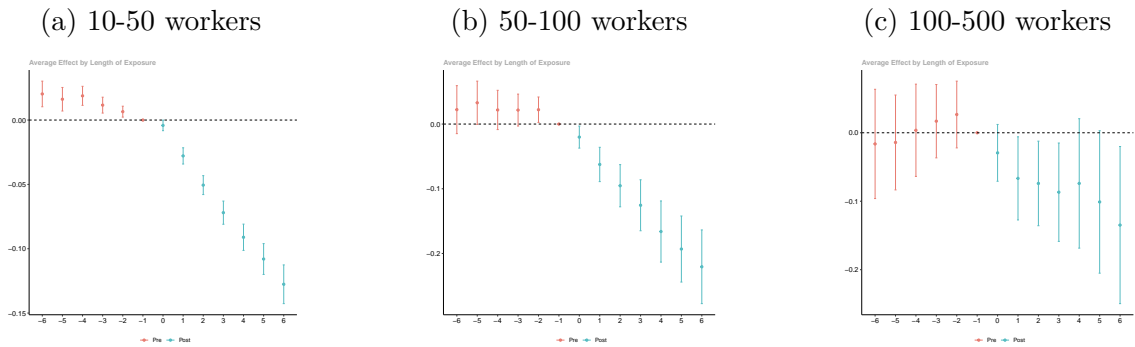
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A Heterogeneous effects

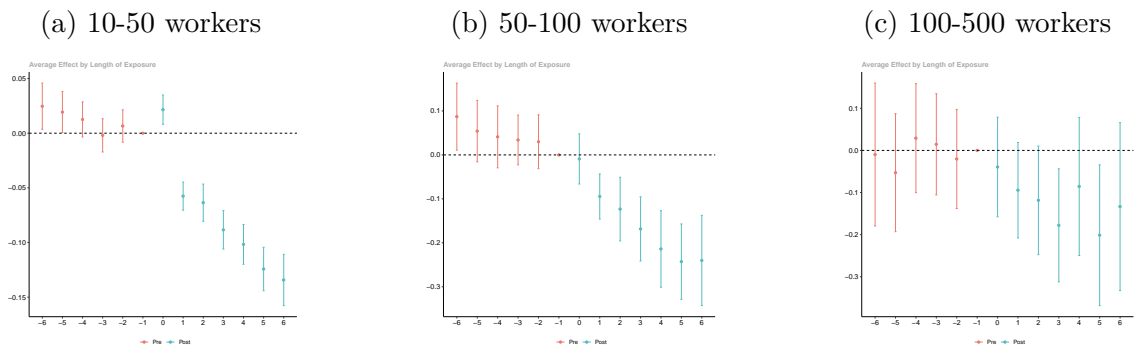
A.1 Size

Figure 4: The effect of inspection on size by size



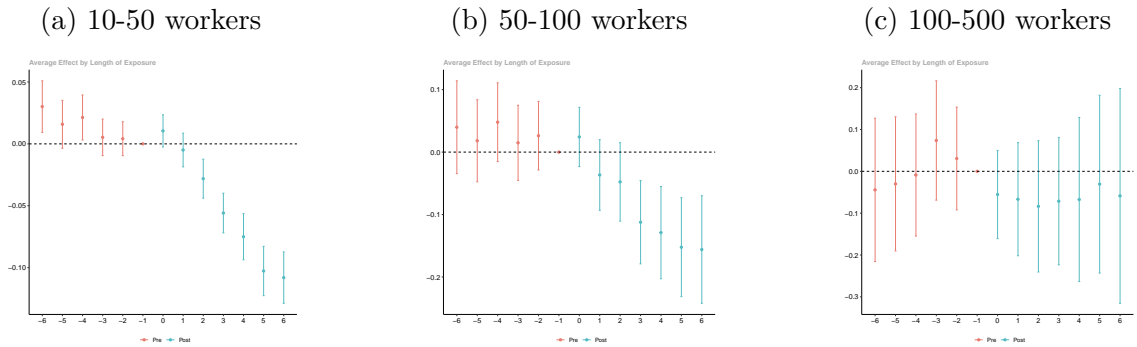
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 5: The effect of inspection on hiring by size



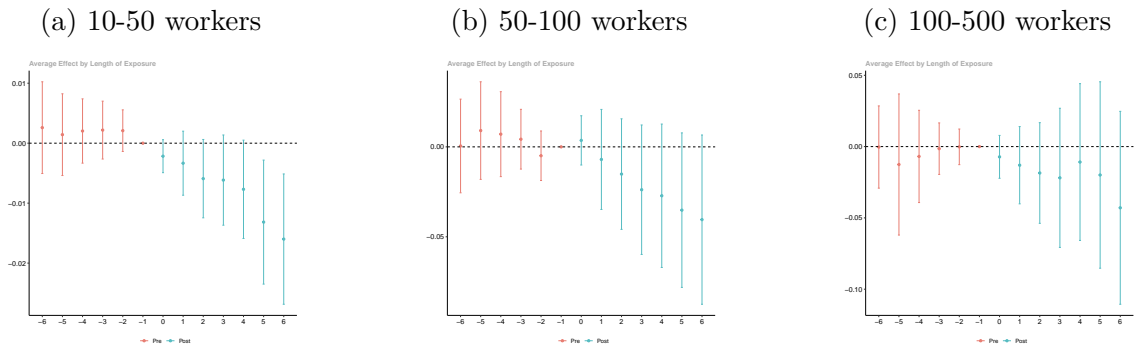
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 6: The effect of inspection on separation by size



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 7: The effect of inspection on wage by size



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

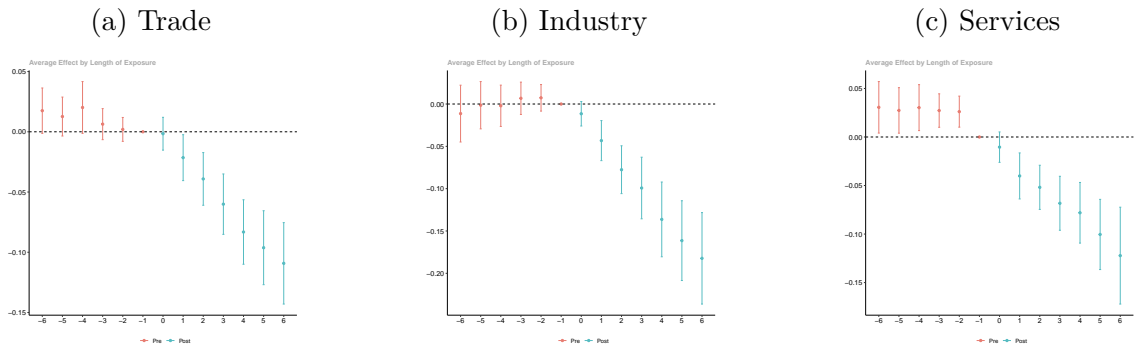
Table 4: The average effects on firms outcome by size

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
10 a 50				
Post_inspection	-0.1298*** (0.0053)	-0.138*** (0.0069)	-0.1194*** (0.0061)	-0.0199*** (0.0035)
Mean of the variable in the pre-treatment	21.49	4.78	4.47	1,289.38
N ^o of observations	1.031.756	1.031.756	1.031.756	1.031.756
50 a 100				
Post_inspection	-0.2434*** (0.0203)	-0.2943*** (0.0297)	-0.2384*** (0.026)	-0.0505*** (0.0149)
Mean of the variable in the pre-treatment	63.98	13.03	12.55	1,634.83
N ^o of observations	74.800	74.800	74.800	74.800
100 a 500				
Post_inspection	-0.1252*** (0.038)	-0.1645*** (0.0549)	-0.1822** (0.0771)	-0.0282 (0.0211)
Mean of the variable in the pre-treatment	215.34	36.45	32.21	2,022.60
N ^o of observations	34.562	34.562	34.562	34.562

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on exit, ln employment, ln hiring, ln separation and ln real average wage. The estimation sample is the semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

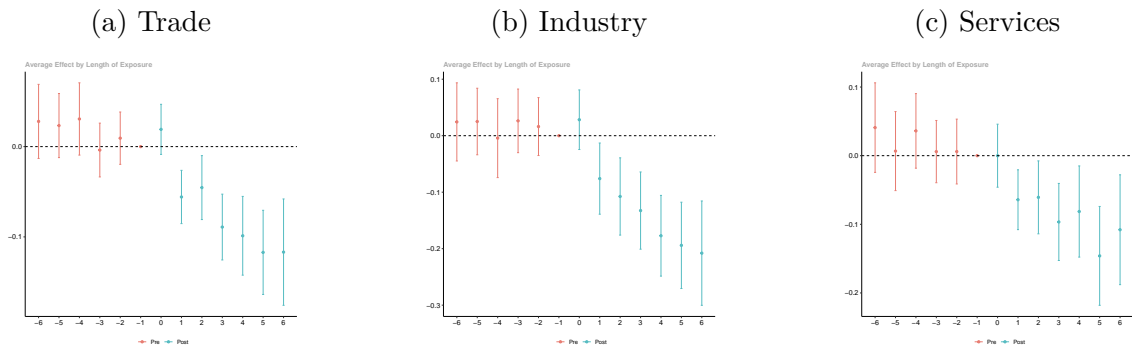
A.2 Sector of activity

Figure 8: The effect of inspection on size by sector



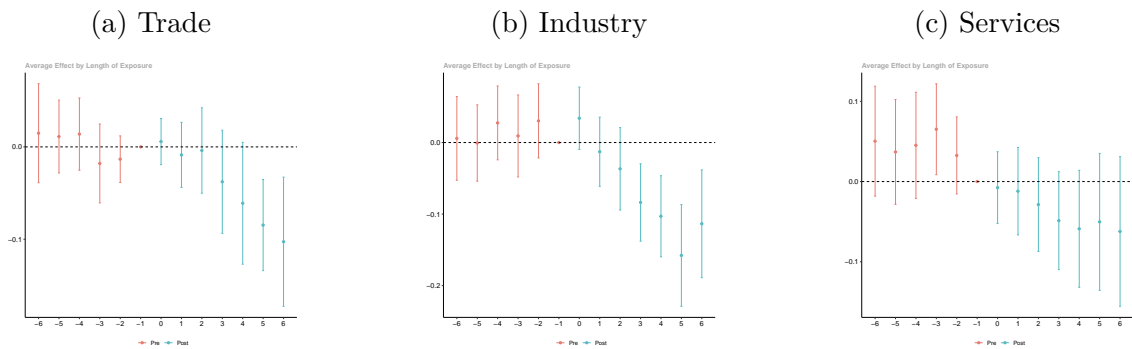
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 9: The effect of inspection on hiring by sector



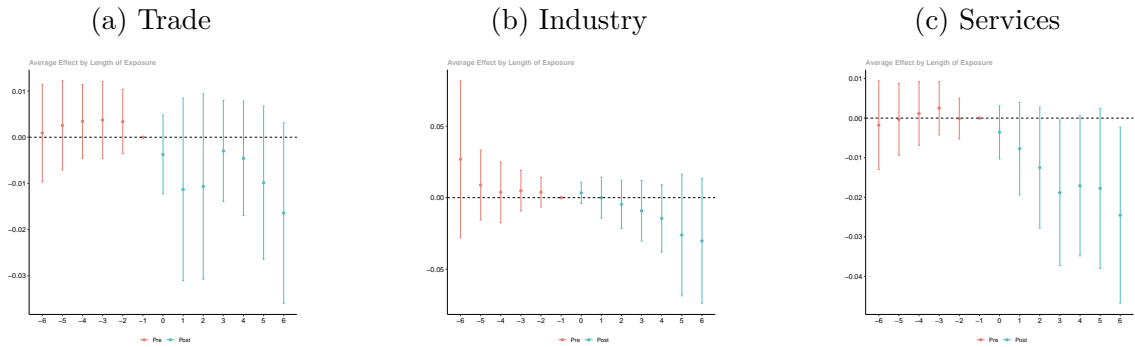
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 10: The effect of inspection on separation by sector



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 11: The effect of inspection on wage by sector



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

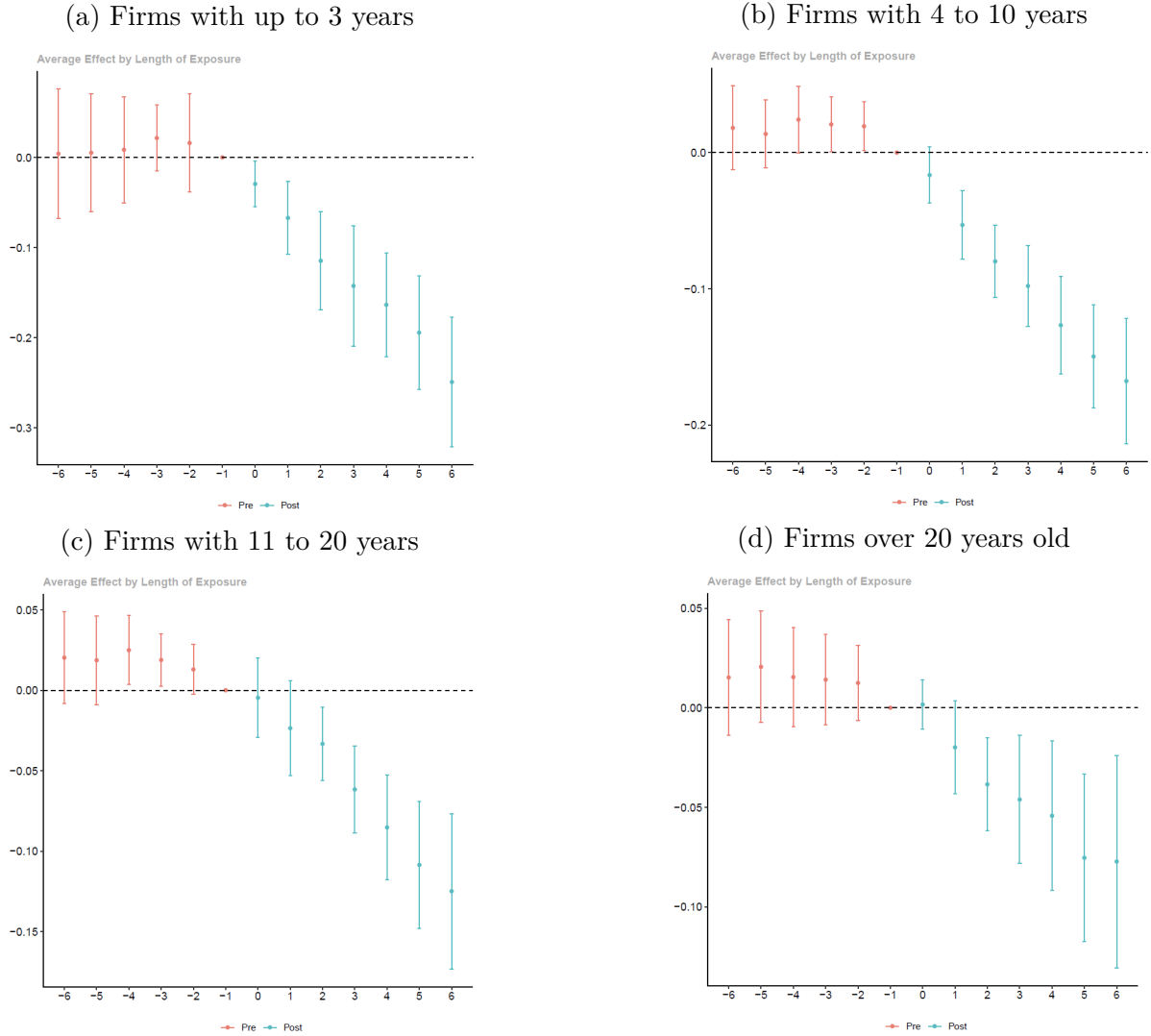
Table 5: The average effects on firms outcome by sector

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Trade				
Post_inspection	-0.16*** (0.0169)	-0.1681*** (0.025)	-0.1631*** (0.0227)	-0.0328*** (0.0102)
Mean of the variable in the pre-treatment	20.43	4.92	4.64	1,122.91
N ^o observations	351.330	351.330	351.330	351.330
Industry				
Post_inspection	-0.2479*** (0.0285)	-0.309*** (0.0431)	-0.2602*** (0.0371)	-0.0432*** (0.0158)
Mean of the variable in the pre-treatment	27.11	6.32	6.10	1,148.33
N ^o observations	263.878	263.878	263.878	263.878
Services				
Post_inspection	-0.1485*** (0.0209)	-0.151*** (0.0315)	-0.1779*** (0.0487)	-0.0202** (0.0101)
Mean of the variable in the pre-treatment	38.11	7.16	6.49	1,568.47
N ^o observations	524.524	524.524	524.524	524.524

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on exit, ln employment, ln hiring, ln separation and ln real average wage. The estimation sample is the semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

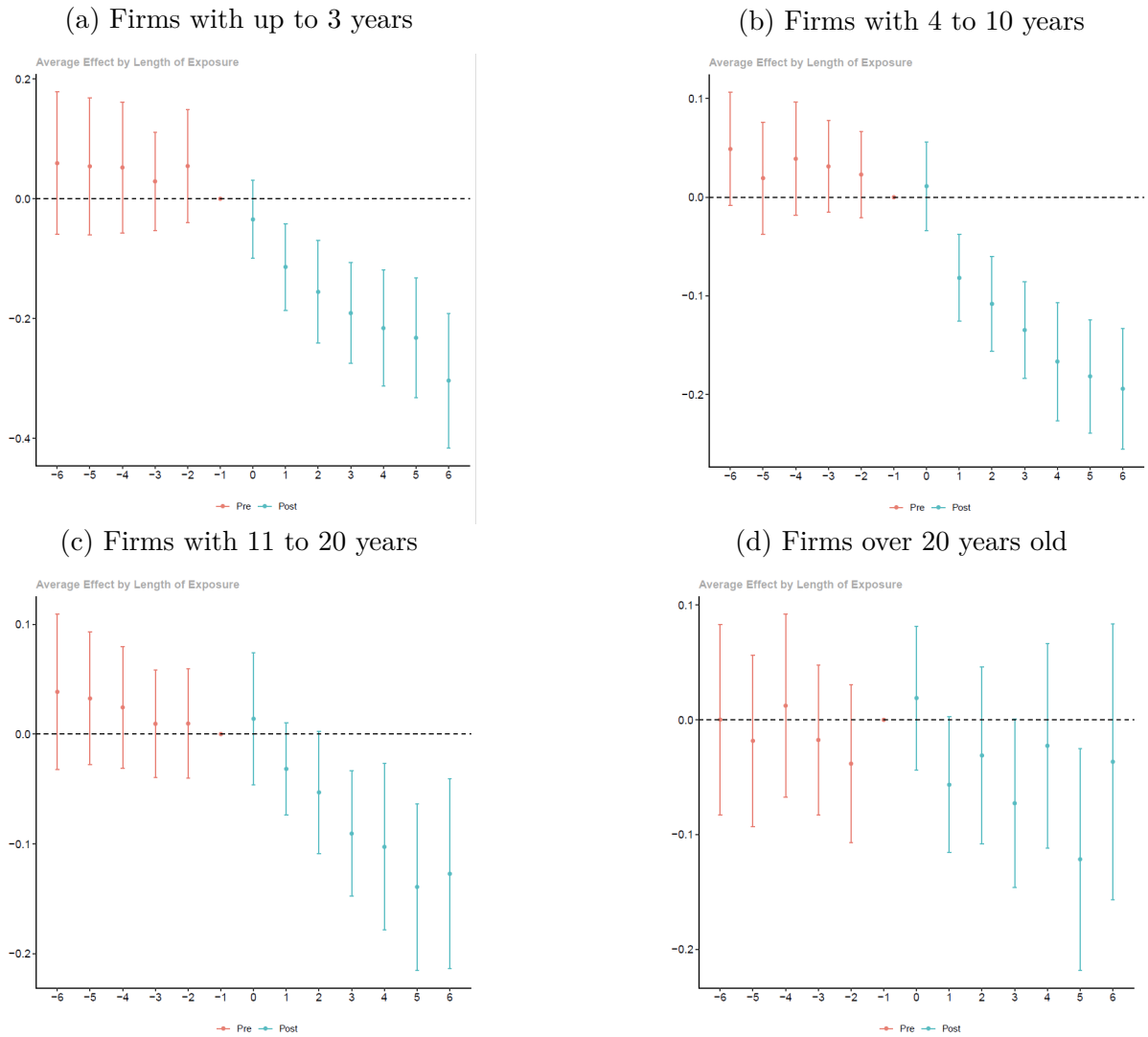
A.3 Firm's age

Figure 12: The effect of inspection on size by firm's age



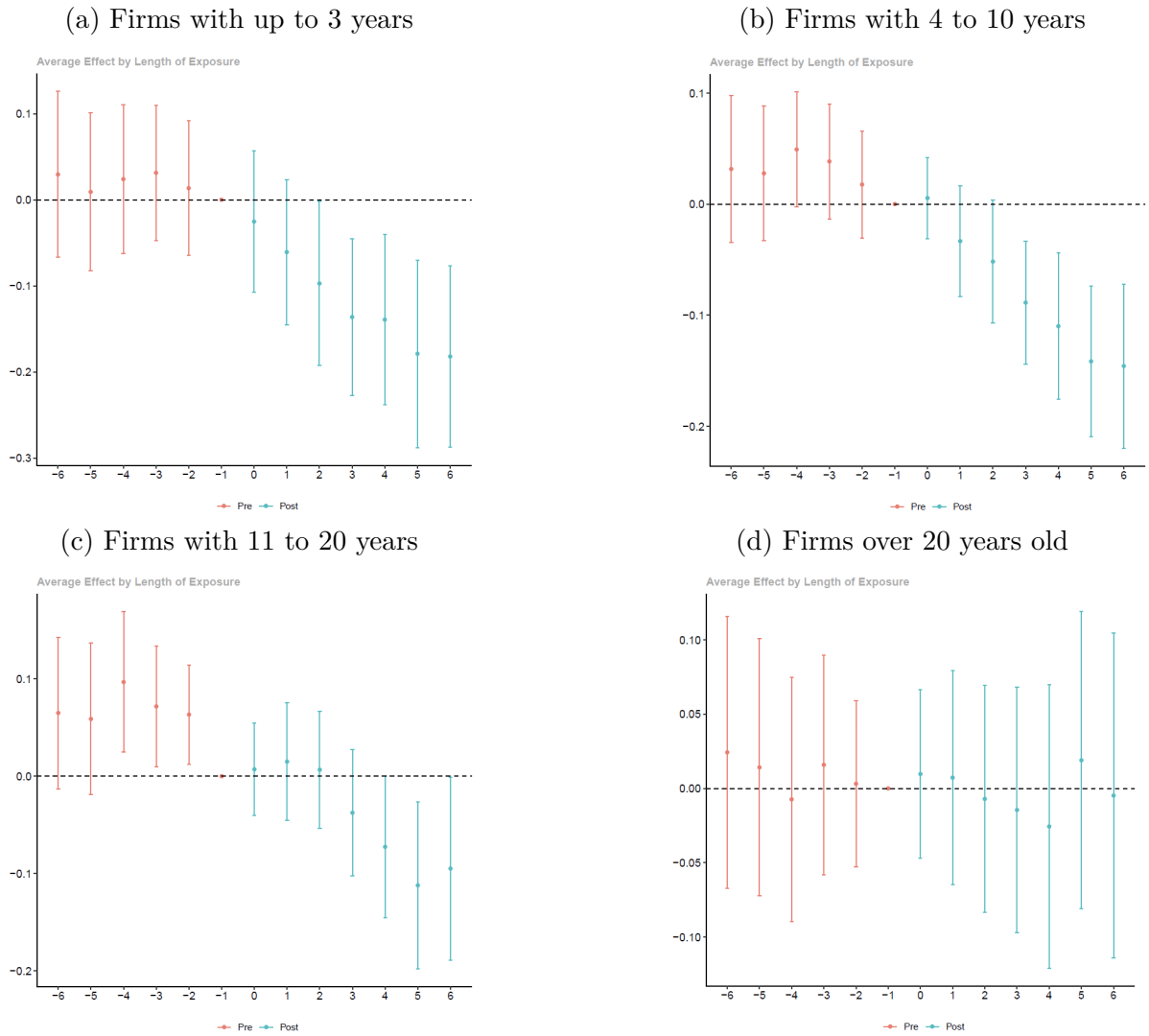
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 13: The effect of inspection on hiring by firm's age



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

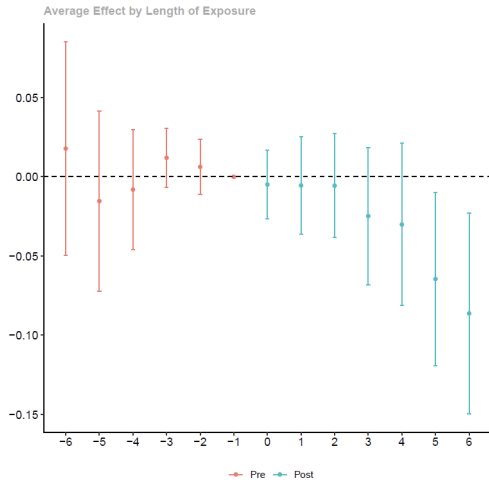
Figure 14: The effect of inspection on separation by firm's age



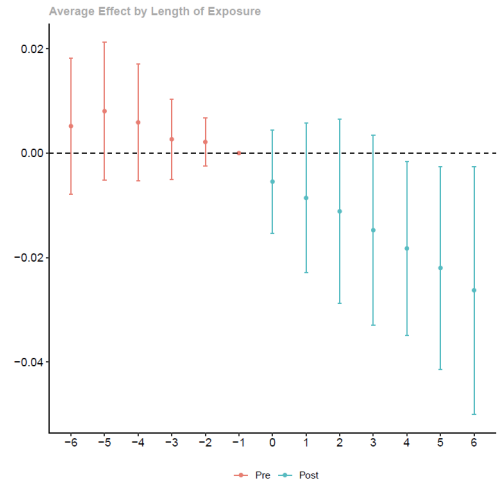
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Figure 15: The effect of inspection on wages by firm's age

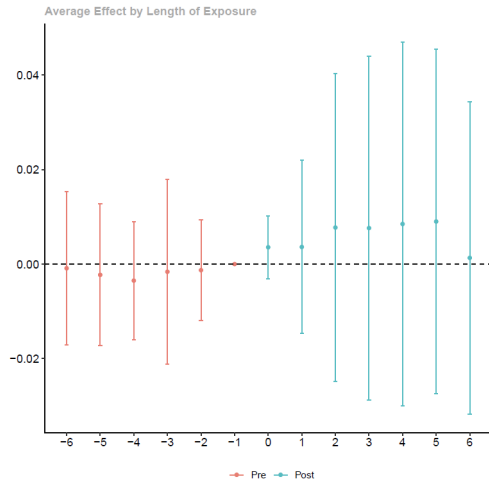
(a) Firms with up to 3 years



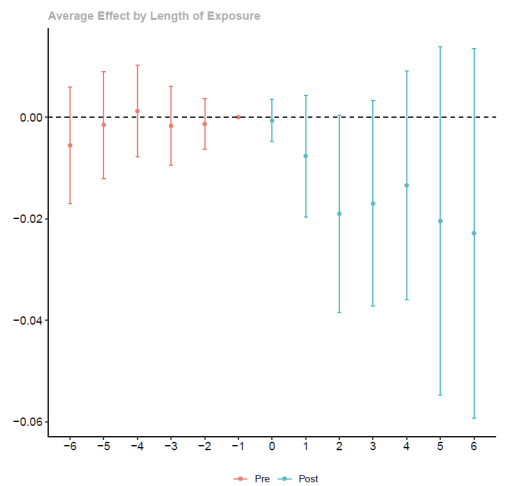
(b) Firms with 4 to 10 years



(c) Firms with 11 to 20 years



(d) Firms over 20 years old



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

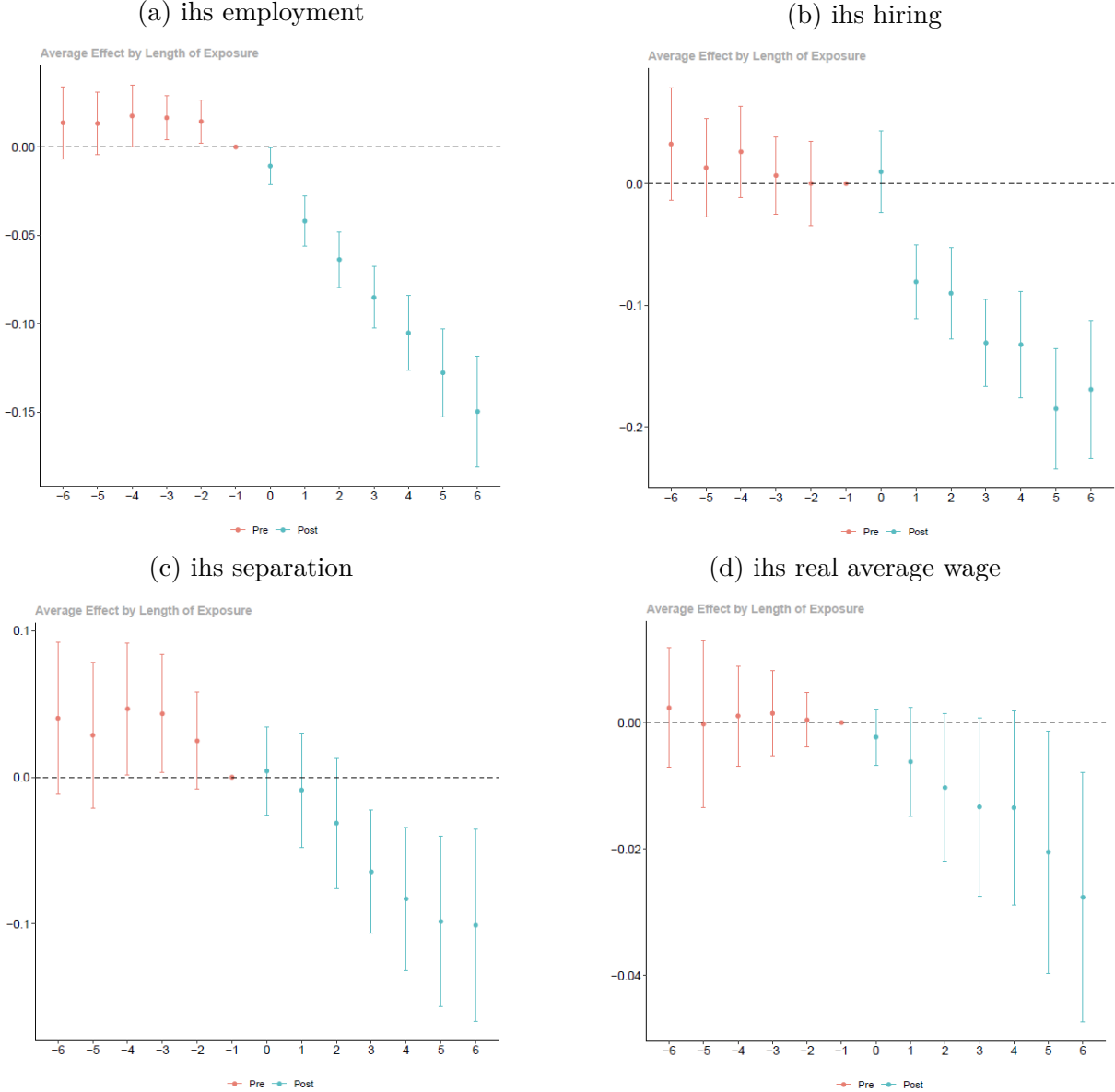
Table 6: The average effects on firms outcome by firm's age

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Firms with up to 3 years				
Post_inspection	-0.2481*** (0.0288)	-0.2915*** (0.0438)	-0.2595*** (0.0475)	-0.0549*** (0.0186)
Mean of the variable in the pre-treatment	27.64	7.41	16.65	1,167.15
N ^o observations	154,748	154,748	154,748	154,748
Firms with 4 to 10 years				
Post_inspection	-0.1844*** (0.015)	-0.2144*** (0.0186)	-0.1833*** (0.0201)	-0.0367*** (0.0079)
Mean of the variable in the pre-treatment	26.44	6.46	6.07	1,228.41
N ^o observations	397,364	397,364	397,364	397,364
Firms with 11 to 20 years				
Post_inspection	-0.108*** (0.019)	-0.1259*** (0.0242)	-0.1003*** (0.0271)	-0.0018 (0.015)
Mean of the variable in the pre-treatment	27,65	5,95	5,59	1,238.11
N ^o observations	316,382	316,382	316,382	316,382
Firms over 20 years old				
Post_inspection	-0.0779*** (0.0144)	-0.078** (0.0344)	-0.0803*** (0.0275)	-0.0181* (0.0096)
Mean of the variable in the pre-treatment	39.78	5.75	5.17	1,617.24
N ^o observations	271,238	271,238	271,238	271,238

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on exit, ln employment, ln hiring, ln separation and ln real average wage. The estimation sample is the semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

B Robustness

Figure 16: The effects of inspection on Establishments' outcomes - ihs transformation



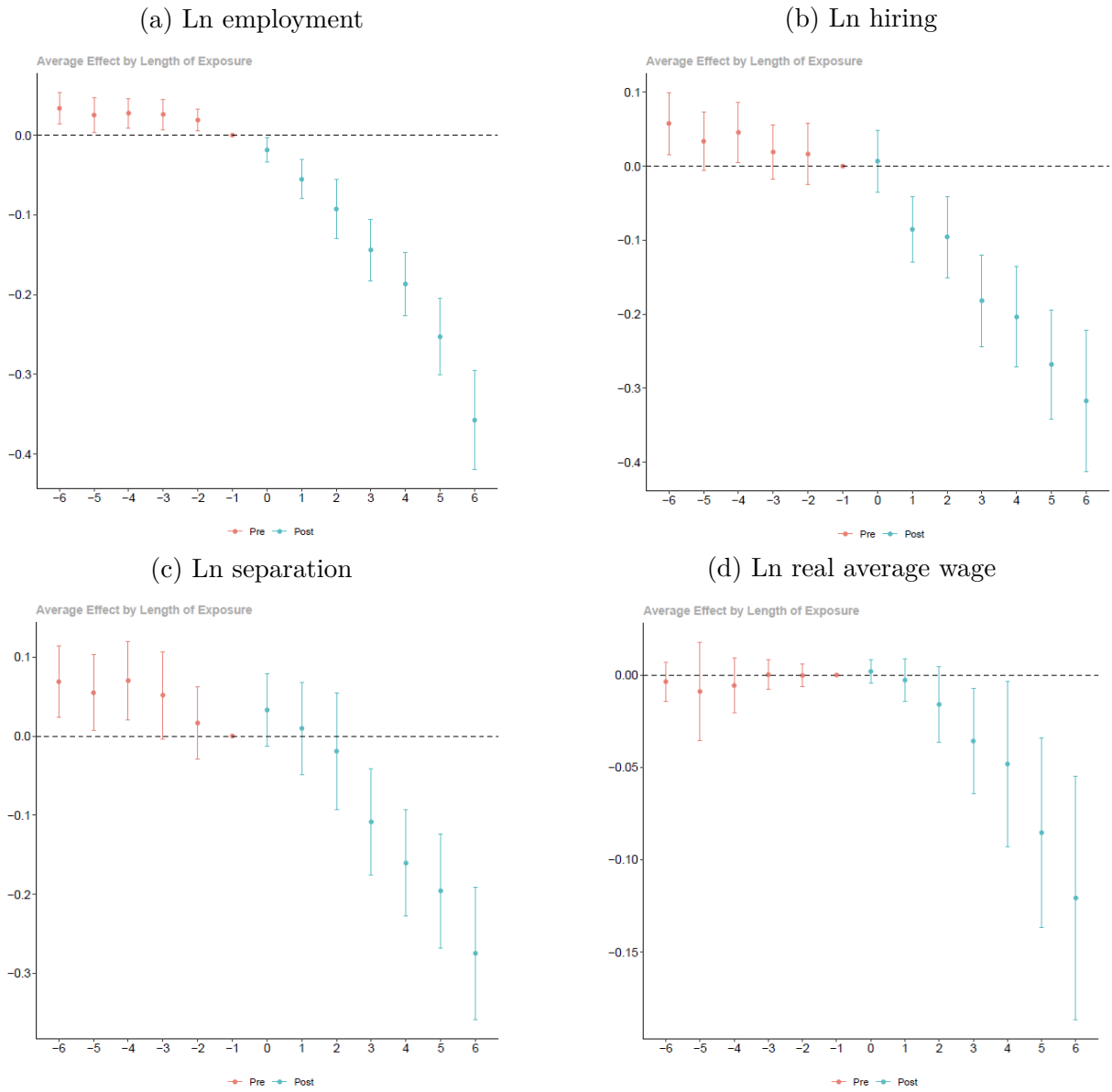
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Table 7: The average effects of inspection on Establishments' outcomes - ihs transformation

	(1)	(2)	(3)	(4)
	ihs employment	ihs hiring	ihs separation	ihs real average wage
Post_inspection	-0.1517*** (0.0091)	-0.1879*** (0.0157)	-0.157** (0.019)	-0.0276** (0.0058)
Mean of the variable in the pre-treatment	30.11	6.28	5.83	1,333.85
N ^o of observations	1.139.732	1.139.732	1.139.732	1.139.732

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection ihs employment, ihs hiring, ihs separation and ihs real average wage. The estimation sample consists of a semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level. Ihs means inverse hyperbolic sine transformation.

Figure 17: The effects of inspection on Establishments' outcomes - stayers



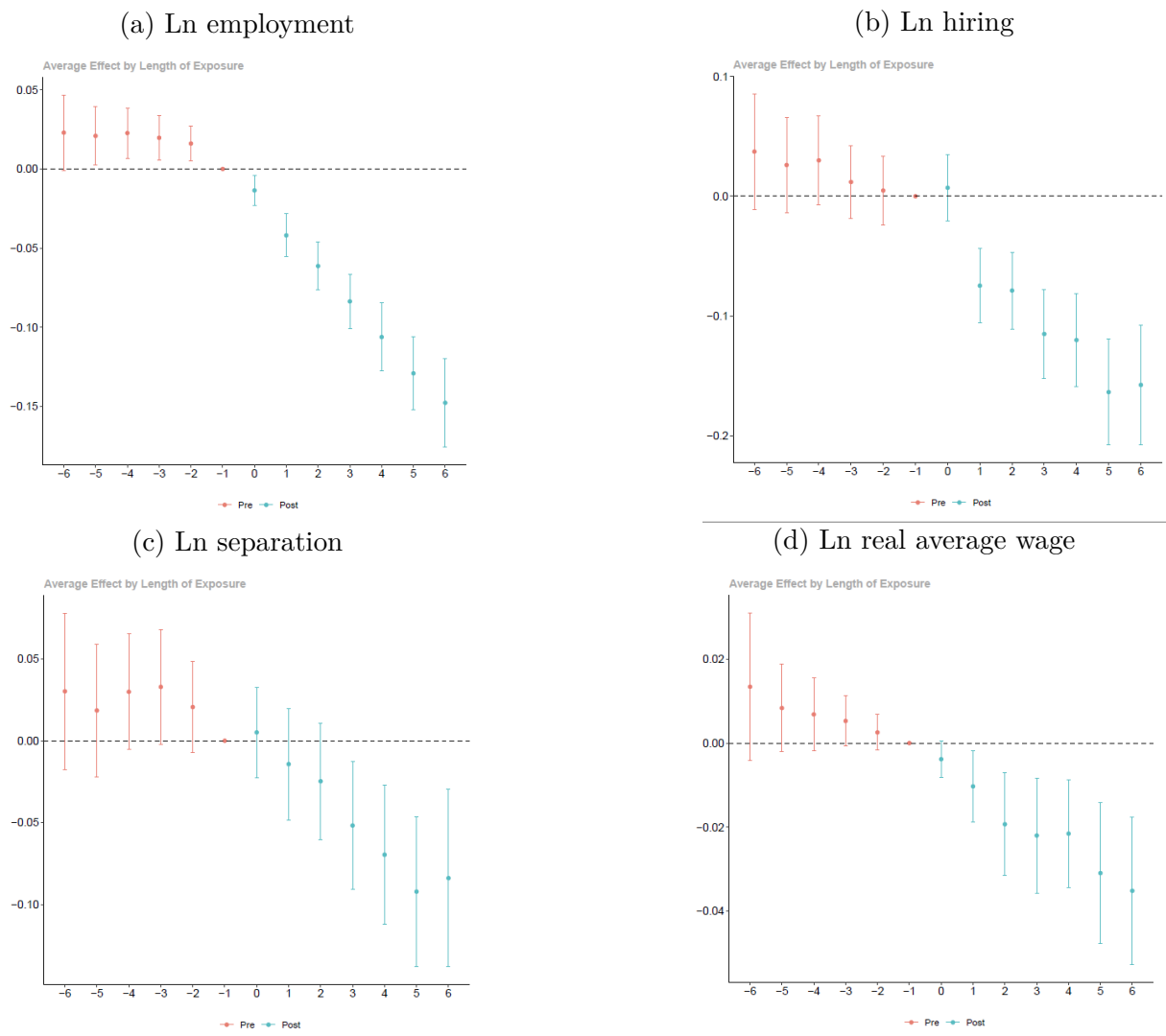
Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Table 8: The average effects of inspection on Establishments' outcomes - stayers

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Post_inspection	-0.1397*** (0.0114)	-0.1453*** (0.017)	-0.0841*** (0.0182)	-0.0393*** (0.0106)
Mean of the variable in the pre-treatment	31.86	6.97	6.53	1,393.25
N° of observations	536,932	536,932	536,932	536,932

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection ln employment, ln hiring, ln separation and ln real average wage. The estimation sample consists of a semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in the window $[-6,+6]$ around the inspection date (stayers). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

Figure 18: The effects of inspection on Establishments' outcomes - Sun and Abraham (2021)



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

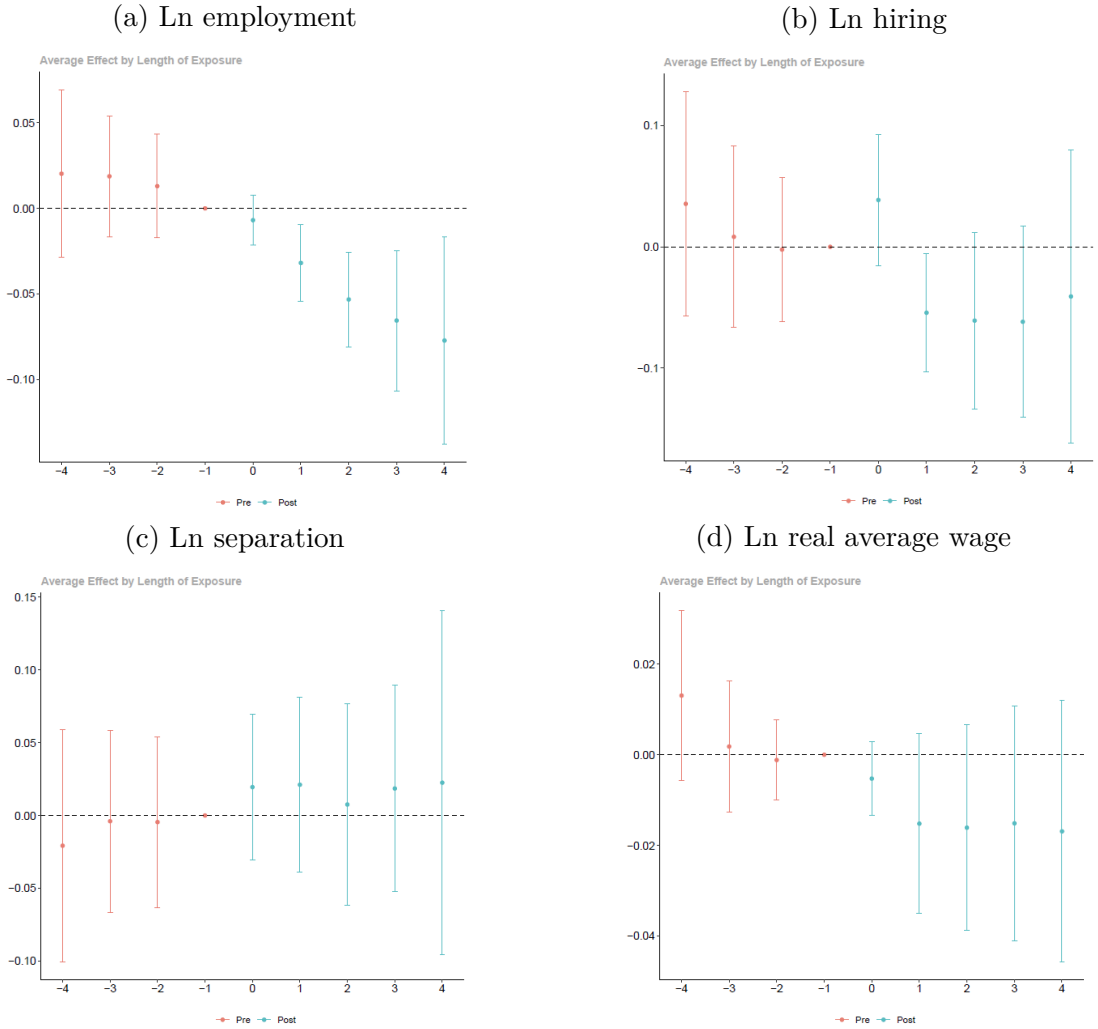
Table 9: The average effects of inspection on Establishments' outcomes - Sun and Abraham (2021)

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Post_inspection	-0.1715*** (0.0112)	-0.1849*** (0.0181)	-0.1423*** (0.0168)	-0.0451*** (0.0058)
Mean of the variable in the pre-treatment	31.86	6.97	6.53	1,393.25
N ^o of observations	1,139,732	1,139,732	1,139,732	1,139,732

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on exit, ln employment, ln hiring, ln separation and ln real average wage. The estimation sample is the semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.

C Additional results

Figure 19: The effects of inspection on Establishments' outcomes - 2013 to 2017



Note: This figure shows labor market outcomes before and after inspection. The omitted category is the semester before the event. 95% confidence interval based on standard errors clustered at the firm level.

Table 10: The average effects of inspection on Establishments' outcomes - 2013 to 2017

	(1)	(2)	(3)	(4)
	Ln employment	Ln hiring	Ln separation	Ln real average wage
Post_inspection	-0.0524*** (0.013)	-0.0358*** (0.0248)	0.0236 (0.0225)	-0.0149** (0.0069)
Mean of the variable in the pre-treatment	30.82	5.81	5.97	1,434.24
N ^o of observations	518,060	518,060	518,060	518,060

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of inspection on exit, ln employment, ln hiring, ln separation and ln real average wage. The estimation sample is the semester panel of companies from 10 to 500 inspected only once between 2007 and 2017 that existed in all years (balanced panel). Means of dependent variables are computed from all pre-event semesters. Standard errors are clustered at the firm level.