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Are Labor Inspections Protecting Workers' Rights? Adding the Evidence from Size-based Labor Regulations and Fines in Peru

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This paper analyzes how changes in the enforcement of labor regulations impact on the compliance rate in a context where the labor rules and the characteristics of the labor inspection system differ by firm size. In addition to the channels analyzed in the existing literature –the deterrence effect of labor inspections and the movement of displaced workers into the informal sector, this paper adds a margin of adjustment not analyzed before: firms can reduce their size to take advantage of lower penalties for violating the labor rules and/or less stringent regulations. I analyze empirically which forces have dominated for workers employed in firms of different size in Peru during 2008-2013. I measure the enforcement of labor regulations as the number of labor inspections per hundred workers at the regional level, and I instrument it using a measure of the arrival cost of labor inspectors to the firms. The findings reveal that the degree of enforcement had little impact on the compliance with labor regulations. The effect of firms reducing their size to enjoy lower fines and/or less stringent regulations was small in magnitude and the direction of the effect was not clear. The general lack of effect of the enforcement measure on the compliance with the labor rules indicates that the labor inspection system is not effective in Peru, either because it is not able to generate the incentives to comply with labor regulations (e.g. because of lack of resources) or because it fails to overcome the consequences of the adjustment process associated to an increase in the compliance level (e.g. displaced workers moving into the informal sector of the economy).

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1. Introduction

The non-compliance with labor market regulations is widespread in Peru as in many Latin American countries. In 2014, 54.2% of salaried workers in the private sector didn't receive pension contributions, 48.8% didn't have a labor contract, while 32.4% received a monthly earning below the legislated minimum wage (SEDLAC, 2016). As expected, the share of workers uncovered by labor benefits is larger when they are employed in firms of small size. For instance, 87.6% of salaried workers in private firms of 10 employees or less didn't receive pension contributions in 2014 according to the national household survey, while that figure was 48.9% for workers in firms of 11 to 100 employees.

The government of Peru has implemented a set of policies during the 2000s with the aim of increasing the level of compliance with labor regulations (ILO, 2014). These measures included a special labor regime for small-sized firms, the Labor Regime for Micro and Small firms (MYPE regime), set up in 2003 and expanded in 2008.¹ Initially, this regime reduced the strictness of some labor obligations for micro firms.² Since 2008, it also covers small firms but the reduced stringency of labor regulations is usually lower for them. Thus, micro firms have less strict labor regulations compared to small firms in some cases, e.g. health insurance contributions. Other labor regulations continue being applicable to all workers regardless the size of the firm where they work, e.g. the minimum wage.

The labor inspection system is other strategy used by the government of Peru to increase the level of compliance with the labor rules. As in other Latin American countries, inspection activities are focused on formal firms in Peru. Labor inspections are leaded and carried out by regional agencies spread throughout the country. When a labor inspector detects a violation to a labor market regulation, a monetary fine is proposed. In Peru, fines differ according to the severity of the violation and the number of workers affected. The fines also vary depending on the size of the firm that was detected violating the labor rules. Micro and small firms are benefited with a 50% reduction in the amount of the fine compared to what a large firm would have paid for the same violation.

¹ Other measures were the introduction of a simplified income tax system for micro firms and the implementation of an electronic payroll system in 2008 which replaced the previous payroll books (ILO, 2014).

² According to the classification endorsed in 2008, a micro firm employs between 1 and 10 workers, while a small firm employs between 1 and 100. The classification also considers thresholds on the value of annual sales. Any other firm is considered a large firm. See Section 3 for more details.

In this paper I explore microdata from Peruvian household surveys for the period 2008-2013 to analyze how changes in the enforcement of labor regulations affect the compliance rate at the regional level in a context where the labor rules and the characteristics of the labor inspection system differ according to firm size. I expect the usual forces analyzed by other papers to be at play here –the deterrence effect of labor inspections and the movement of workers to the informal sector of the economy where firms are not inspected (Ronconi, 2010; Bhorat et al. 2012; Almeida and Carneiro, 2012; Almeida et al., 2013). However, the design of labor market regulations in Peru jointly to a scheme of penalties for violations to the labor rules that depends on the size of the firms add a margin of adjustment not analyzed before. When the degree of enforcement increases, large firms may choose to cross the size threshold to become small and enjoy lower fines and/or less rigid labor regulations. Small firms may become micro in order to face more flexible labor regulations and equal fines. I intend to identify empirically which forces have dominated for micro, small and large firms in Peru during 2008-2013 and to disentangle some of them.

In absence of firm level data, I use information from the Peruvian household survey (ENAHO) where workers report their own working conditions and the size of the firm where they are employed. I restrict the analysis to the period 2008 (a new definition of small firms was implemented that year) to 2013 (a new change in the classification of firms and some changes to the labor inspection system were introduced in 2014). Information on labor benefits includes enrolment into the pension system and having a labor contract. The surveys also collect information on the number of hours of work during the last week and labor earnings that I compare with the legislated maximum of weekly hours of work and with the minimum wage respectively. The sample comprises wage employees from the private sector aged 15 to 65 (the legislated retirement age) and excludes workers from the primary sector, domestic workers, and workers with apprenticeship contracts all of whom have labor regimes different from the MYPE regime and the General Labor Regime –the regime applicable to firms of large size.³ I measure the regional degree of enforcement as the annual number of inspection per hundred salaried workers in the private sector. There is no information regarding differences in the inspection

³ The labor regime for domestic workers is established in the Ley de Trabajadores del Hogar (Law 27986). Workers from the agricultural and livestock sectors have a labor regime ruled by the Ley de Promoción Agraria (Law 27360), while workers from the mining sector have some sector-specific regulations, such as the minimum wage for mining workers. Workers with apprenticeship contracts are also subject to special regulations, such as the maximum weekly hours of work.

intensity by size of the firm. The only reference about this point is an annual inspection target of 20% of micro firms established by law.

The identification of the effect of the degree of regional enforcement on the compliance with labor regulations requires dealing with the possible impact of the compliance rate on the degree of enforcement (reverse causality problem) and the correlation of the enforcement measure with unobserved institutional and development time-varying characteristics at the regional level (omitted variables problem). I propose to use an instrumental variable strategy. The proposed instrument is a measure of the arrival cost of labor inspectors to the firms. Labor inspectors travel by car or using public transportation from the local inspection agencies to the firms to be inspected. The extension of the road network and the traffic in each region provides a measure of the arrival cost to the firms. The arrival cost is defined as the logarithm of the number of per capita crossing vehicles per kilometer of regional roads. First stage results show that the measure of arrival cost is a strong predictor of the regional enforcement level.

Results reveal that the regional degree of enforcement affected the compliance with only few of the labor regulations analyzed. The estimated impacts differ depending on the size of the firms where workers are employed and on the geographic area. An increase in the number of inspections per hundred workers leads to an increase in the shares of workers earning the minimum wage in small and large firms, and to an increase in the share of workers in micro firms having a labor contract, although this last result is statistically weak. When the sample is restricted to the urban area, an increase in the degree of enforcement generates a reduction in the shares of workers enrolled into the pension system in small and large firms, indicating different adjustment patterns in urban and rural areas. No effect was found for the compliance with the maximum hours of work regardless the size of the firm where workers are employed. The findings also show that the effect generated by firms crossing the size thresholds to enjoy lower monetary fines and/or more flexible regulations is small in magnitude and it is not clear in which direction operates –it increases the compliance in some cases and it reduces it in some others.

The general lack of effect of the enforcement measure on the compliance with the labor rules leads to the conclusion that the labor inspection system is not effective in Peru, either because it is not able to generate the incentives to comply with labor regulations (e.g. because resources are scarce, fines are too low, and/or labor inspectors turn a blind eye on violations to the rules) or

because it fails to overcome the consequences of the adjustment process associated to an increase in the compliance level (e.g. displaced workers moving to the informal sector of the economy).

This paper contributes to the literature that analyzes the relationship between enforcement of labor market regulations and labor market outcomes. The large non-compliance level with the labor law especially in developing countries, has led to the emergence of studies emphasizing the importance of enforcement of labor regulation. Among the studies analyzing country-specific experiences, the evidence indicates that higher enforcement of the labor law increases the compliance with labor market regulations (Ronconi, 2010; Almeida and Carneiro, 2012; Almeida et al., 2013) or does not generate any effect (Bhorat et al., 2012), increases the compliance among men and reduces the compliance among women (Viollaz, 2016), reduces firms' size and possibly productivity (Almeida and Carneiro, 2009), decreases job creation and increases job destruction (Almeida and Poole, 2013), reduces de provision of non-mandated benefits (Almeida et al., 2013), and generates wage adjustments -mainly reductions of formal wages at the top of the wage distribution and increases of informal wages (Almeida and Carneiro, 2012; Almeida et al., 2013). Regarding the effect of the degree of enforcement on the level of compliance, the channels analyzed by this literature have been the deterrence effect of labor inspections and the movement of displaced workers to the informal sector of the economy. This paper brings into consideration, to my knowledge for the first time, an additional margin of adjustment which is the downsizing of firms in order to take advantage of less stringent labor regulations and/or lower penalties for violating the labor rules.⁴

The paper is structured as follows. The next section (Section 2) provides a description of labor market regulations in Peru and statistics on the compliance level. Section 3 describes the labor inspection system and proposed an enforcement measure to be used in the empirical analysis. Section 4 discusses theoretically the expected effects of a change in the degree of enforcement on the compliance with labor rules in Peru. Sections 5 and 6 present the empirical strategy and the results obtained, while Section 7 concludes.

2. Size based labor regulations and compliance in Peru

⁴ There is an extensive literature on the effect of size dependent policies on firm behavior, such as tax evasion (for instance, Kanbur and Keen, 2014) and incentives to remain inefficiently small (for instance, Garicano et al., 2013). However, this topic has not been considered by the literature analyzing the relationship between enforcement of labor market regulations and the level compliance.

2.1 Labor market regulations

In Peru, workers' rights are established in the Political Constitution and protected by the labor inspection system led by the Ministerio de Trabajo y Promoción del Empleo (Labor Ministry or MTPE). Wage employees are entitled to several benefits. Some of these benefits differ according to the size of the firm, being less generous for workers in firms of smaller size.

Firms in Peru are classified into micro, small and large according to the number of employees and the value of annual sales. This classification was established with the purpose of implementing development and formalization policies for micro and small firms. The first classification was endorsed by the Ley de Promoción y Formalización de la Micro y Pequeña Empresa (Law 28015) passed on 2003. A Legislative Order in 2008 (Legislative Order 1086) changed the classification and that one prevailed until 2013.⁵ According to this classification, a micro firm employs between 1 and 10 workers and its annual sales are equal or below 150 tax units.⁶ A small firm employs between 1 and 100 workers and the annual sales are between 151 and 1700 tax units. Any other firm is considered medium or large. I will refer to these firms as large firms in this paper.

Special labor benefits for workers in micro firms –lower benefits compared to workers in other firms- were first established in the MYPE regime set up in 2003 (Law 28015). Some modifications to the MYPE regime were introduced in 2008 (Legislative Order 1086). First, the degree of stringency of labor regulations -or conversely, the generosity of labor benefits- was reduced even more for micro firms. Second, small firms were included in the regime with a degree of stringency of labor rules in between the degree for micro and large firms. Labor relationships in large firms continue being regulated by the General Labor Regime.

The main differences in labor benefits for workers in micro and small firms compared to workers in large firms are as follows. Vacation time and family allowances are equal for workers in micro and small firms and smaller than the benefit for workers in large firms. The surcharge for night shifts is larger for workers in small and large firms compared to workers in micro firms. The contributions to the health insurance system are paid entirely by the employer for workers in large and small firms (ESSALUD system), while the state pays half of the contribution for

⁵ The Law 30056 that was passed on 2013 and came into force in 2014 classifies firms according to the annual value of sales only.

⁶ The tax units are units of reference used for tax purposes. For instance, the tax unit was set at 3450 nuevos soles (1158 USD) in December 2007 and it was 3700 nuevos soles in December 2013 (1329 USD).

workers in micro firms (SIS system). Regarding the contributions to the pension system, they are completely paid by workers in Peru while employers have the obligation of enrolling employees into the system and deducting the contributions from the monthly wage. The 2008 reform established they are mandated for workers in all firms, but workers in micro firms can choose to contribute to the Sistema de Pensiones Sociales (SPS) in which case, the state pays half of the contribution. The SPS, however, has not started to operate. Thus, between 2008 and 2013, the previous rule was applied meaning that the enrolment into the pension system was voluntary for workers in micro firms. Finally, the compensation for length of service, the annual reward and the severance pay are lower for workers in micro firms compared to workers in small and large firms, and these benefits are also lower for workers in small firms in comparison to workers in large firms.

Other workers' rights established in the General Labor Regime apply to all workers regardless the size of the firm. They include: a monthly wage equal or above the minimum wage; a maximum of 8 working hours a day and 48 hours a week; a break of no less than 45 minutes a day; a minimum of 24 hours of rest time during the week; a paid maternity leave of 90 days and a paternity leave of four days. All labor relationships must be established through a written contract (Ley de Productividad y Competitividad Laboral, Law 728).

2.2 Compliance with labor market regulations

Compliance with labor market regulations is low in Peru. The Encuesta Nacional de Hogares (ENAHOG) contains data on pension contributions, monthly earnings, hours of work, and labor contracts. All the information is reported by workers. With this information it is possible to construct binary variables indicating if a wage employee is enrolled in the pension system, if he/she earns a monthly wage equal or above the minimum, if he/she works no more than the legal maximum of weekly hours, and if he/she has a labor contract.⁷

The sample of workers from the private sector aged 15 to 65 (excluding workers from the primary sector, domestic workers, and workers with apprenticeship contracts) comprised 47.8% of wage employees on average during 2008-2013. Only 44.0% of them were enrolled into the pension system, 66.0% earned a monthly labor income in the main occupation equal or above the

⁷ In Peru, the minimum wage for employees working less than 4 hours a day is proportional to the number of hours worked (Ministerial Resolution 091-92). That adjustment was included in the calculation of the compliance rate. I considered the number of weekly hours of work in the main occupation only.

minimum wage, 60.8% worked no more than legal maximum of weekly hours, and only 43.5% had a written labor contract (Figure 1).

Among wage employees, 49.3% were employed in micro firms (between 1 and 10 employees) during 2008-2013, while the figures for small (between 11 and 100 workers) and large firms were 28.0% and 22.7%.⁸ The pattern of compliance with labor market regulations by firm size indicates that the share of workers covered by these regulations tends to be larger the larger the size of the firm (Figure 1). The percentage of labor relationships governed by a labor contract –a regulation that applies equally to all firms- was approximately 7 times larger for workers employed in large firms compared to micro firms. The ratio was around 4.5 for the percentage of workers enrolled into the pension system. The gap in this case is in keeping with the voluntary nature of the pension contributions for workers in micro firms during the analyzed period. The percentage of workers earning the minimum wage or above –a regulation that applies equally to all firms- was almost twice as large in large firms compared to micro firms. Finally, the increasing pattern of compliance by size of the firm is not present for the maximum hour of work per week –another regulation with no difference by firm size. The share of salaried workers covered by this regulation was very similar in the three groups of firms, and it was slightly larger in micro and small firms compared to large firms.

The pattern of compliance with labor market regulations also differs by region (Figure 2). The average percentage of workers enrolled into the pension system during 2008-2013 ranged from a minimum of 11.2% in Apurimac to 62.3% in Ica. There is also a large heterogeneity in the coverage of the minimum wage legislation by region. Apurimac was also the region with the lowest percentage of workers earning the minimum wage or more (37.1%), while Lima had the highest rate of coverage (76.1%). The average percentage of workers with a labor contract was only 14.3% in Apurimac -minimum value-, while the maximum was 58.4% in Callao. Finally, the average compliance with the legal maximum of weekly hours of work was larger compared to the other labor regulations. In Loreto, the region with the minimum rate of compliance, 52.6% of salaried workers worked no more than the legal maximum of weekly hours, while in Cajamarca the compliance reached 71.5% (the highest rate).

⁸ I classified firms into micro, small and large using the criterion of number of employees and information of the size of the firm where workers are employed, as data on the value of annual sales is not available.

Calculations on the intensity of compliance with labor regulations indicate that the average percentage of workers in the sample that enjoyed the four labor benefits covered by the ENAHO was only 17.8% over the period (Figure 3). The percentage covered by at least one of them was 92.4%, while the percentage with none of them reached 15.0%. The percentages of workers receiving all labor benefits and receiving at least one of them increase with the size of the firm. The opposite occurs with the percentage who does not receive any labor benefits.

The large percentage of workers receiving some of the benefits but not all of them reveals that firms do not restrict their choices to complying with all the regulations or not complying with any of them. One possible interpretation is that firms choose the regulations they violate depending on the saving of labor costs and on the expected fine. The data analyzed so far shows that the non-compliance is larger for the enrolment into the pension system and the labor contract which are “serious” violations and penalized with a lower fine than the non-compliance with the minimum wage and the maximum hours of work which are “very serious” violations in the Peruvian system.⁹

3. The labor inspection system in Peru

3.1 How the labor inspection system works?

The labor inspection system in Peru is a public service set up to monitor the compliance with labor market and social security regulations in the private sector, give guidance and technical advice on labor matters, and penalized the violations to the rules.

The structure of the system follows the recommendations of the International Labor Organization (ILO Agreement 81). There is a central authority, the Dirección Nacional de Inspección del Trabajo (National Labor Inspection Office or DNIT) which is part of the MTPE and was created through the Ley General de Inspección del Trabajo passed on 2006 (Law 28806). Its role is to promote the cooperation between all the inspection agencies in the country and between labor inspectors on the one hand, and employers and workers on the other hand. Each of the 25 regions in Peru has one Inspección Regional de Trabajo in its jurisdiction (regional inspection agency of high rank) and some of them have Inspecciones Zonales de

⁹ Next section provides details on the labor inspection system in Peru and on the fines applied.

Trabajo (regional inspection agencies of low rank).¹⁰ The labor inspection functions of the regional agencies extend to each region's territory.¹¹

Every year, the DNIT prepares the national annual plan of labor inspections in coordination with regional governments. Then, each regional government leads and carries out the labor inspections in its territory, as it states in the Ley Orgánica de Gobiernos Regional (Law 27867). The electronic payroll system implemented in place of the old payroll books in 2008, allowed to extend the reach of the MTPE, easing the planning of the inspection functions (Rani, et al., 2013; Díaz, 2014b; ILO, 2015).¹² Between 2008 and 2011, the annual plan of labor inspections was under the Plan RETO, a national program aimed to increase the registration of employees in the electronic payroll system. However, the guidelines of the program were not different to the criteria established in the Ley General de Inspección del Trabajo.

Labor inspections are focused on formal firms – those enrolled in the tax register (Registro Único de Contribuyentes or RUC in Peru). Informal firms are subject to guidance and orientation interventions regarding labor market regulations. There is no indication about differences in the inspection intensity by size of the firm. Theoretically, large firms are expected to face a higher probability of being detected violating the labor law (Levy, 2008). The only reference regarding this point in Peru is in the Ley de Promoción y Formalización de la Micro y Pequeña Empresa (Law 28015) which established an annual inspection target of 20% of micro firms.

Labor inspections are carried out in urban areas mainly. The rural sector has received labor inspections, but they are not usually part of the annual inspection plan (Díaz, 2014a; Díaz, 2014b). The reason is the scarcity of resources. As was documented for other Latin American countries, the labor inspection system in Peru has very few labor inspectors for the size of its working population (Weil, 2008). For instance, in 2009 the system had only 406 labor inspectors in the whole country, only 6 of the 25 regions had a supervisor, and most labor inspectors were

¹⁰ The region of Junin has 5 regional agencies, Arequipa, Ica, Piura and San Martin have 4 regional agencies, Cusco, La Libertad, Lima, Moquegua and Ucayali have 3 regional agencies, Amazonas, Ancash, Apurimac, Cajamarca, Loreto, Madre de Dios, Puno and Tacna have 2 regional agencies, while Ayacucho, Callao, Huancavelica, Huanuco, Lambayeque, Pasco and Tumbes have one regional agency. The number of regional agencies did not change during the period covered in this study.

¹¹ There is only one exception to the regional boundaries of labor inspection activities. The DNIT can assign a regional inspection agency to perform labor inspections in a different region when a firm to be inspected carries out its activities in more than one region.

¹² The electronic payroll system in place between 2008 and 2010 was due to employers with more than 3 employees (Decreto Supremo 018-2007). In 2011, some clarifications were introduced to the legislation regarding the electronic payroll system (Decreto Supremo 015-2010 and 008-2011). With these modifications, all employers have the obligation to present electronically the information about employees, remuneration, and contributions.

concentrated in the regions of Lima and Callao (Díaz, 2014; Julca Babarzy, 2013; Requejo Alemán, 2013). According to the Ley General de Inspección del Trabajo (Law 28806), the MTPE jointly to the regional governments should guarantee the availability of human resources and equipment to carry out the inspections. In case the means of transport to arrive to the firms to be inspected are lacking, the MTPE and regional governments should refund the transport expenses. However, in most regional agencies the transport expenses are covered long after the labor inspections are carried out, and in some of them they are never reimbursed (Requejo Alemán, 2013).

Labor inspectors target different types of violations. “Minor” violations include violations to documentary requirements mostly, such as the lack of delivery of the labor contract or pay stub to workers. “Serious” violations include the lack of essential data of labor contracts in the employees’ register that firms keep, violation of regulations regarding the amount, place and time of payment of remuneration and labor benefits including contributions to the health insurance and pension system, lack of labor contract or the unilateral modification of the contract by the employer. “Very serious” violations include among others, the non-compliance with the minimum wage legislation, violation of regulations regarding the extension of working days, holidays and leaves, violation of norms related to child labor, any discriminatory behavior of the employer, and actions affecting the workers’ dignity.

When labor inspection activities finish, the labor inspector prepares a report about the results. If a situation of non-compliance with the law is detected, the employer receives a proposal to solve the irregularity in certain period of time in exchange for a reduction in the penalty.¹³ The amount of the fine depends on the severity of the irregularity detected and on the number of workers affected by the violation. Between 2008 and 2013, the penalization ranged between 1 and 5 tax units for a minor violation, between 6 and 10 tax units for a serious violation, and between 11 and 20 tax units for a very serious violation. The firm pays a percentage of that amount depending on the number of workers affected by the violation, being the percentage higher the larger the number of workers affected. The total value of the monetary penalization cannot exceed 30 tax units, and micro and small firms are benefited by a 50% discount on the amount of the fine.

¹³ If the situation of the non-compliance persists, the amount of the fine increases depending of the severity of the violation.

Important changes were introduced to the labor inspection system in 2013. The Law 29981 created the Superintendencia Nacional de Fiscalización Laboral (SUNAFIL) to be the central authority of the system and applied new rules to the distribution of labor inspection functions. The SUNAFIL started operating in April 2014. Under the new structure, the system is mainly centralized on the SUNAFIL which has the role of perform labor inspections on large and small firms, while the regional inspection agencies have the role to inspect micro firms.

3.2 Enforcement of labor market regulations

The measure of enforcement of labor market regulations is the number of labor inspections per hundred salaried workers employed in the private sector in each region and year, excluding workers from the primary sector, domestic workers and workers with apprenticeship contracts.

Enforcement is expected to vary at the regional level for at least two reasons. First, as pointed out in the previous sub-section, labor inspection resources (labor inspectors and means of transportation) differ across regions. Second, labor inspections were leaded and carried out by the regional agencies with jurisdiction in each region during the period analyzed. That means that regional agencies had the space to pursue different objectives, e.g. maximize the compliance level or preserve employment opportunities when regional economic conditions are bad and unemployment high. Moreover, the Peruvian labor inspection system follows the Latin approach where inspection responsibilities are highly decentralized (Piore and Schrank, 2008). Inspectors have enormous discretion and flexibility in carrying out their activities, leading possibly to different enforcement efforts across regions and even to corruption practices. Regarding the last point, the low level of remuneration received by labor inspectors in Peru has been pointed out as a high risk of corruption (Requejo Aleman, 2013).

Figure 4 reports the time series of some variables related to the inspection system between 2008 and 2013. Panels (a) and (b) show for the country as a whole, the number of inspections and the number of inspections per hundred salaried workers. Both variables present a similar pattern over time, with an initial increase and a subsequent reduction. The total number of inspections was 60 thousand a year on average, while the number of inspections as a percentage of salaried workers was around 1.4. The lower two panels show the evolution of variables related to the results of labor inspections. The number of violations to labor market regulations detected by labor inspectors is presented in Panel (c). After a year of no improvements in the detection of

labor infractions at the beginning of the period analyzed, the number of violations discovered and reported increased between 2009 and 2010. The detection standstill between 2008 and 2009 may be related to the international crisis as labor inspectors may have turned a blind eye to protect businesses. Between 2010 and 2013, the number of violations detected increased slightly despite the reduction in the number of inspections. Panel (d) shows the total value of the fines applied (although not necessarily collected). The monetary value of the penalizations moved erratically over the period, and it did not follow the trend of the number of violations detected in some of the years. That could be explained by the characteristics of the fines scheme, which depends on the severity of the violation and on the number of workers affected.

Figure 5 presents the variation in the measure of enforcement across regions and over time. More specifically, the figure shows the annual change in the number of inspections per hundred salaried workers for each of the 25 region and some consecutive years. Between 2008 and 2009, the degree of enforcement increased in most regions. The average change in the enforcement measure was 0.45 inspections per hundred salaried workers, ranging from a minimum of -0.29 (Apurimac) to a maximum of 1.80 (Pasco). Changes tended to be larger for regions with higher levels of enforcement in 2008, indicating a change in the structure of the enforcement degree across regions.¹⁴ Between 2010 and 2011, the enforcement decreased in most regions. In this case, regions with larger levels of enforcement in 2010 tended to exhibit the largest reductions.¹⁵ For the period 2013-2012, the average change in the enforcement measure was again negative and ranged from a minimum of -0.48 (Apurimac) to a maximum of 0.80 (Ucayali).

4. Theoretical channels

The labor inspection system has the role of protecting workers' rights. When the enforcement of labor market regulations increases, for instance through a rise in the number of inspections, an increase in the level of compliance is expected. The increased compliance is explained by the perception of a higher probability of being inspected and fined (deterrence effect).

The rise in labor costs for firms that increased their compliance level can lead them to reduce the size of their labor force, among other margins of adjustment (Micco and Pages, 2006; Ahmad

¹⁴ The average change in the enforcement measure for the 12 regions with lower level of enforcement in 2008 was 0.41 inspections per hundred workers, while the average change for the regions above the median value of 2008 was 0.50.

¹⁵ The average reduction in the enforcement measure for the regions below the median value of 2010 was 0.04 inspections per hundred workers, while the average reduction for the regions above the median of 2010 was 0.29.

and Pages, 2007; Amin, 2008; Almeida and Carneiro, 2009).¹⁶ A possible associated effect is that workers who lose their jobs may offer their hours of work in the informal sector depending on workers' valuation of the mandated benefits being enforced (Almeida and Carneiro, 2012; Almeida et al., 2013). That effect is possible because labor inspections are focused on formal firms in Peru. Thus, an increase in the enforcement effort may lead to a growth in the share of workers not covered by labor benefits (movement into the informal sector effect).

The different degrees of stringency of labor market regulations according to firm size in Peru, i.e. regulations are less strict the smaller the size of the firm, and the heterogeneities in the characteristics of the labor inspection system according to firm size, i.e. fines are lower for micro and small firms, create other margin of adjustment. More specifically, firms can decide to cross the size thresholds in order to enjoy lower fines and/or less stringent labor regulations (size thresholds effect). I differentiate three regimes depending on the severity of regulations and fines that firms face. First, there is the regime of "*same labor market regulations and different fines*". That is the case of labor benefits entitled to all workers regardless the size of the firm, such as the minimum wage, which violation leads to fines twice as large for large firms compared to micro and small firms (for a given number of workers affected by the violation). Second, there is the regime of "*different labor market regulations and equal fines*". That is the case of some labor benefits which differ between micro and small firms, such as the enrollment of workers into the pension system, which violation is equally penalized by the labor inspection system (for a given number of workers affected by the violation). Finally, the regime of "*different labor market regulations and different fines*" refers to those regulations with different degrees of stringency between micro/small firms and large firms, such as paid vacation time, which are penalized harder in absolute terms when the offender firms is large.

Under the regime of "*same labor market regulations and different fines*" an increase in the enforcement level can lead large firms which are not complying with some labor rule/s to become small in order to be penalized with a lower fine in case of being detected by a labor inspector.¹⁷ This decision will depend on the evaluation of the change in the cost and benefit of evading the regulations and the change in revenues due to a small number of workers. The

¹⁶ For instance, firms can adjust the level of investment (Besley and Burgess, 2004; Scarpetta and Tressel, 2004; Autor, Kerr and Kugler, 2007), hourly wages (Almeida and Carneiro, 2012), non-mandated benefits or hours of work (Almeida, Carneiro and Narita, 2013).

¹⁷ I am assuming that a large firm that was complying with all the labor rules before the increase in the degree of enforcement does not change its behavior and continues with perfect compliance.

benefit of not complying with the labor rules will be the same in a per worker basis under this regime, but the cost will be smaller because small firms pay lower fines compared to large firms. For those firms that decide to cross the size threshold, the reduction in the number of employees could take place through the dismissal of workers or through the substitution of formal workers with informal workers, as the number of employees considered to become part of the MYPE regime is the staff enrolled in the electronic payroll system. Thus, an increase in the enforcement level *may* result in a reduction in the average compliance level for firms of small size and an increase for large firms, *ceteris paribus*.

An increase in the enforcement effort under the regime “*different labor market regulations and equal fines*” can generate incentives for small firms which are violating some labor rule/s to become micro in order to enjoy more flexible regulations. For these firms, the cost of being detected by a labor inspector continue being the same under this regime (micro and small firms are equally penalized for the same violation), but the benefits are smaller due to the less stringent regulations for micro compared to small firms. For those firms that decide to cross the size threshold and become micro, the adjustment may involve the dismissal of workers or the substitution of formal with informal workers. Overall, under this regime an increase in the average compliance with labor regulations for small firms is possible, while the average compliance level may increase or fall for micro firms, *ceteris paribus*.

Finally, under the regime “*different labor market regulations and different fines*” an increase in the enforcement level generates incentives in opposite directions. On the one hand, large firms can benefit from lower fines if they become small, increasing the incentives to keep violating labor regulations. On the other hand, these regulations are more flexible for micro and small firms under this regime, implying that the compliance will be cheaper if a large firm becomes small.

The three regimes described so far are not mutually exclusive, meaning that firms make decisions considering all the incentives arising from a change in the degree of enforcement given their size before the change. All in all, the design of labor market regulations jointly to the heterogenous penalization policy by firm size and the focus of labor inspections on formal firms generate incentives to the compliance with labor rules which go in opposite directions and differ by firm size. The combination of the different forces at work may end up offsetting the intended

effect of labor rules and the labor inspection system: to increase the share of workers covered by labor benefits.

5. Empirical model

In this section I detail the econometric strategy to analyze the relationship between enforcement of labor market regulations and compliance in the Peruvian labor market differentiating by firm size.

The main specification regresses indicator variables for compliance with the enrollment into the pension system, with the minimum wage, with the maximum weekly hours of work, and with a written labor contract (one at a time) for individual i , in region r and year t (Y_{irt} in equation (1) below) on the measure of enforcement for region r and year t , which is defined as the logarithm of the number of inspections per hundred salaried workers (E_{rt} in equation (1)) and its interaction with indicator variables for the size of the firm where worker i is employed (I_{irt}^s in equation (1), s =micro, small, large). The sample includes wage employees from the private sector aged 15 to 65 (the legislated retirement age), excluding workers from the primary sector, domestic workers, and workers with apprenticeship contracts. Firms are classified into micro, small and large using the criterion of the number of employees, but not the thresholds of annual sales as that information is not available in the household surveys.

The model also controls for a set of individual characteristics (X_{irt} in equation (1)) (gender, age and age squared, indicator variables for the educational level, an indicator variable of civil status, the number of children under 14 years of age at home, race and urban area indicators, and economic sector indicator variables), and several variables at the region level with variation over time (W_{rt} in equation (1)). These regional variables are included to control for characteristics that can be correlated with the level of enforcement and can affect the level of compliance as well, like the regional business and political cycle and the development level (Piore and Schrank, 2008; Ronconi, 2010; Murillo et al., 2011; Ronconi, 2012). These variables are the fiscal result as a percentage of total incomes, the logarithm of the amount of per capita money lent by the banking system to the private sector, the logarithm of the per capita MWh of electricity consumed, the regional unemployment rate, the logarithm of the average per capita household income, the share of poor households receiving food programs, the Gini coefficient of the per capita household income, and the share of precarious dwellings. Finally, I also include as a

control variable the logarithm of the number of orientation actions per hundred salaried workers in each region and year.¹⁸

$$Y_{irt} = \beta X_{irt} + \sum_s \gamma_s E_{rt} I_{irt}^s + \alpha W_{rt} + \delta_r I_r + \delta_t I_t + \varepsilon_{irt}. \quad (1)$$

The model includes region and year fixed effects (δ_r and δ_t in equation (1) respectively). The standard errors are clustered at the region level.¹⁹

The parameters of interest in equation (1) are γ_s , where s denotes micro, small and large. There are reasons to believe that E_{rt} is potentially correlated with the error term. The first one is a reverse causality argument. A low level of compliance with labor market regulation can result in a higher level of enforcement. The second one is an omitted variables argument. The enforcement level can be correlated with unobserved institutional and development time-varying characteristics at the region level (not captured by the region fixed effects), generating a spurious correlation with the compliance with labor market regulations. Considering the possible endogeneity of the enforcement measure in equation (1), I implement an instrumental variable strategy. The proposed instrument is a measure of the arrival cost faced by labor inspectors. Labor inspectors travel by car or using public transportation from a regional agency in region r to the firms to be inspected in some location of region r . The extension of the road network in region r provides a measure of the arrival cost to the firms. With a wider network, a higher geographic dispersion of firms is expected, increasing the arrival cost in terms of money and time. The arrival cost is also affected by the traffic in the road network in each region. A larger number of vehicles is expected to increase the transportation cost as well. The instrumental variable is defined as follows:

$$Z_{rt} = \log(RN_{rt} * T_{rt}). \quad (2)$$

The variable RN_{rt} is the extension of the region road network (national plus regional roads) in kilometers divided by the region territory. This variable differs greatly across regions, but the

¹⁸ The Data Appendix provides details on variables definitions and sources of data.

¹⁹ I estimate linear models as they capture an average effect of economic interest avoiding interpretation problems arising from a non-linear second stage (Angrist and Krueger, 2001).

variation over time is small. The variable T_{rt} measures the number of per capita crossing vehicles in the road network in region r and year t . The arrival cost is defined as the logarithm of the number of per capita crossing vehicles per kilometer of the ratio territory–region road network. If the extension of the road network and the traffic capture the regional development level, that will imply a violation to the exclusion restriction of the instrument. However, I expect to be capturing the development level with the region fixed effects and with the regional regressors with variation over time.²⁰

Table 1 provides the first stage results for different specifications using Z_{rt} and its interaction with indicator variables of firm size as instruments for the enforcement measure E_{rt} and its interaction with indicators of firm size. Column (1) controls for all the individual characteristics in X_{irt} and for some of the regional variables (fiscal result, logarithm of the per capita credit to the private sector, logarithm of the average per capita income, share of poor households receiving food programs, Gini coefficient of the per capita household income, and logarithm of orientation actions per hundred workers) –specification (1) from here onwards. Column (2) includes all the previous controls and adds some business cycle and development variables at the regional level. They are the logarithm of the per capita MWh of electricity consumed, the regional unemployment rate, and the share of precarious dwellings –specification (2) from here on.

The measure of the arrival cost of labor inspectors is statistically significant at 1% level in the two proposed specifications, and the estimates are stable across models. As expected, an increase in the measure of arrival cost reduces the degree of enforcement. Specifically, a rise of 1% in the arrival cost reduces the enforcement in around 0.16-0.18% regardless the size of the firm. Considering, for instance, the average annual change in the regional cost of arrival measure (8.34%), this relationship turns into a reduction of the enforcement level of around 1.33%-1.50%.

6. Results

6.1 Changes in the enforcement measure and compliance by firm size

²⁰ Regional inspection agencies are based in the main cities of each region (e.g. capital city) where a large share of firms is expected to be located. A measure of the geographic dispersion of firms in each region’s territory would improve the instrument as an arrival cost measure. However, the lack of that information does not affect the validity of the instrument.

Table 2 shows the estimates of the effect of the enforcement measure on the compliance with the enrolment into the pension system, minimum wage, maximum weekly hours of work, and labor contract. As explained in Section 4, different forces are expected to be at play. First, more enforcement should increase the compliance level through a deterrence effect. Second, small and large firms may decide to adjust their size to become micro and small respectively in order to enjoy lower fines and/or more flexible regulations. Third, workers who become unemployed in the adjustment process may find a job in the informal sector of the economy which is not inspected.

Panel 1 shows the results for the compliance with the enrolment into the pension system. Column (1) presents the average result without allowing the effect to differ by firm size. The estimated coefficient is very small in magnitude and not significant statistically. When the model includes interactions with indicator variables for the size of the firm where a worker is employed (columns (2) and (3) for the two specifications described above), there is a negative effect on large firms although not significant. In small firms the share of workers enrolled into the pension system falls with a higher level of enforcement in comparison to large firms in both specifications (effect significant at 10% level). Thus, the total effect is negative for small firms although significant in specification (1) only. Specifically, a 10% increase in the enforcement measure reduces the rate of enrolment into the pension system by 3.3 percentage points in small firms. For micro firms, both the differential effect with respect to large firms and the total effect are positive but not significant. The last column shows OLS estimates using specification (2) for comparative purposes. The effects go in the same direction than IV estimates, but they are smaller in absolute value.

Panel 2 of Table 2 shows the effects of the enforcement measure on the compliance with the minimum wage regulation. There is a general increase when the model doesn't distinguish by size of the firm (column (1)). The next two columns show that a rise in the enforcement measure leads to higher shares of workers earning the minimum wage in large and small firms. The effect is approximately 3 percentage points for each 10% increase in the level of enforcement. The effect in micro firms is zero statistically.

Estimates of the impact of the enforcement measure on the share of employees working no more than the legal maximum of weekly hours appear in panel 3 of Table 2 and show no effect at all. The estimated coefficients are very small and not significant in statistically terms.

Finally, panel 4 in Table 2 presents the effect on the compliance with the labor contract regulation. The effects are zero statistically, except for an increase in the share of employees with a labor contract in micro firms (significant at 10% level using specification (2)). The effect indicates an increase of 2 percentage points in the share of workers covered by this regulation in micro firms for each 10% increase in the degree of enforcement.

In summary, few statistically significant effects of the degree of enforcement on the compliance with labor regulations were found. This could be indicating the lack of effectiveness of the labor inspection system or the effect of forces operating in opposite directions. As pointed out before, firms make decisions considering all the incentives arising from a change in the degree of enforcement, and these incentives could go in different directions and differ depending on the size of the firms. According to the results obtained here for Peru, in large firms the share of workers earning the minimum wage increased, but no change was observed for other regulations. For workers employed in firms of small size, there was a rise in the share receiving the minimum wage and a reduction in the share enrolled into the pension system (although this effect was not robust to the inclusion of additional regressors), with no change in the remaining labor rules. Finally, in micro firms the share of workers with a labor contract increased, with no change in the other labor benefits analyzed. The few effects identified were mainly in the direction of increasing the level of compliance, indicating that at least for these few cases the deterrence effect of labor inspections jointly to any positive impact of the size thresholds effect dominated over the movement into the informal sector effect and any negative impact of the effect of firms crossing the size thresholds. For the remaining labor regulations, these positive and negative forces (if any) offset each other leading to null effects.

6.2 Separating the effect of firms crossing the size thresholds

The next step is to try to disentangle the effect generated by firms crossing the size thresholds from the estimates obtained in the previous sub-section. In the absence of firm level data, I calculated the shares of workers employed in firms of a size right above the thresholds in each region, economic sector and year.²¹ I expect these shares to represent the mass of workers who

²¹ There is an extensive literature on the bunching effect generated by size dependent regulations using firm level data (for instance, Chetty et al., 2011). The estimations in this sub-section are not an attempt to identify such effect, but to control for any possible re-assignment of workers from one side of a size threshold to the other side as a consequence of a change in the enforcement level.

can potentially move from being in a small firm to be in a micro firm, and from being in a large firm to be in a small one. Then, I included as control variables the interaction between the share of workers above the size threshold for micro firms (10 employees) and indicator variables for micro and small firms, and the interaction between the share of workers above the size threshold for small firms (100 employees) and indicator variables for small and large firms. The reasoning is that the movement of firms from the right to left of a size threshold as a response to a higher degree of enforcement can have an impact on the compliance level at both sides of the threshold.

Table 3 shows the results obtained using specification (2) and three different definitions of workers who can potentially cross the size thresholds: the share of workers in firms that surpass the size thresholds by 25%, 50% and 75%.²² The estimates for the enrolment into the pension system appear in panel 1 and show qualitatively similar results than before: a reduction in the share of enrolled workers in small firms compared to large firms, but no significant effect for the aggregate of small firms. The comparison of this statistically significant coefficient with previous estimates in Tables 2 reveals a small increase of the effect in the model that uses the 25% definition, and a small reduction in the 50% and 75% models. Results for the minimum wage regulation show an increase in the share of workers earning the minimum wage in large and small firms (Panel 2 of Table 3). The magnitude of the effects are similar than before in the model that controls for the share of workers in firms surpassing the size thresholds by 25%, and lower when that percentage is 50% and 75%. Estimates for the compliance with the maximum weekly hours of work show again no statistically significant effect (Panel 3 of Table 3). Finally, the previous increase in the share of workers in micro firms having a labor contract disappears when the model controls for the size thresholds effect (Panel 4 of Table 3). In the models that use the 50% and 75% definitions, the effect is close to be significant at 10% level and the magnitude smaller than in previous estimations in Table 2.

In summary, this sub-section has shown that only a small part of the few impacts identified in the previous sub-section was explained by the size thresholds effect. The generally smaller magnitude of the effects found in this sub-section indicates that the decision of firms to change their size to enjoy lower fines and/or more flexible regulations leads to increases in the

²² For instance, for the share of workers in firms that surpass the size threshold by 50%, I calculated the shares of workers in firms between 11 and 15 employees (50% above the size threshold of 10 employees for micro firms) and the share of workers in firms between 101 and 150 employees (50% above the size threshold of 100 employees for small firms).

compliance with the rules. The remaining positive impacts on the share of workers covered by labor market benefits (minimum wage in large and small firms) should be explained by the dominance of the deterrence effect of labor inspections over the movement of laid off workers to the informal sector of the economy.

6.3 Additional estimations

In order to obtain further confirmation of previous findings, I run two additional set of regressions. The first one excludes the rural area from the sample. Section 3 pointed out that the rural area has received labor inspections during the period analyzed, but inspection activities are mainly focused on urban areas due to the scarcity of resources. Under these conditions, it is possible that businesses located in the rural area do not perceive any change in the probability of being inspected when the percentage of inspections per hundred workers changes, fading away the effect of the enforcement measure.

The results obtained when restricting the sample to urban observations appear in Table 4. For each of the outcome variables, column (1) shows the instrumental variables estimates using specification (2), while column (2) also controls for the size thresholds effect using the share of workers in firms surpassing the size thresholds by 50%. The share of workers enrolled into the pension system falls for urban workers in large firms when the degree of enforcement increases (effect significant at 10% level). This effect disappears when the model controls for the effect of firms crossing the size thresholds. In small firms, the share of workers enrolled into the pension system falls in both models and the reduction is larger when the size thresholds effect is not controlled for (column (1)). There is no change for workers in micro firms. As in previous estimates, the shares of workers earning the minimum wage increase in small and large firms. For large firms, the impact is larger when the size thresholds effect is included as part of the main effect (column (1)), but the opposite occurs for small firms. There is no significant effect on the share of workers covered by the legal maximum of weekly hours, while the share of workers with a labor contract increases in micro firms when the model controls for the size thresholds effect (column (2)).

The second set of estimations uses a different definition for the instrument. The instrumental variable used so far was proportional to the extension of the road network and the traffic in each region and year. This measure could be overestimating the arrival cost in regions having more

than one inspection agency in its territory –i.e. I am assuming that each agency covers certain geographic area of the region. To capture this aspect of labor inspections, I redefine the instrumental variables dividing the previous definition by the number of inspection agencies in each region.²³

The results obtained with the new definition of the instrumental variable appear in Table 5 where column (1) shows the instrumental variables estimates using specification (2), and column (2) also controls for the size thresholds effect using the 50% definition. The share of workers who are enrolled into the pension system falls in small firms with respect to large firms when the degree of enforcement increases. That is true in both models, but no effect is found for the aggregate of small firms. The effect is also nil for large and micro firms. The share of workers earning the minimum wage increases in large firms, but not in small firms. The magnitude of the effect for large firms is similar in both models. No effect appears for workers in micro firms. Finally, the shares of workers with labor contract and working no more than the legal maximum of weekly hours are not affected by the degree of enforcement regardless the size of the firm.

In summary, this sub-section has shown that different adjustment patterns seem to be at work in urban and rural areas. First, the share of workers enrolled into the pension system falls in large and small firms in the urban area when the enforcement level increases. This reduction in the compliance level was not significant statistically when the sample also included the rural area. Second, the size thresholds effect operates reducing the compliance level in urban areas, while it works in the increasing direction when the rural area was included. The remaining evidence obtained in this sub-section has indicated that the increased compliance with the minimum wage in large firms is robust to the new definition of the instrument, but not the increase in the share of workers in small firms earning the minimum wage and the share of workers with labor contract in micro firms.

7. Concluding remarks

This paper has analyzed how changes in the enforcement of labor regulations affect the compliance rate in a context where the labor rules and the characteristics of the labor inspection system differ by firm size. This allowed adding to the analysis a margin of adjustment not

²³ The new instrument is defined as $Z'_{rt} = \log(RN_{rt} * T_{rt}/A_r)$, where A_r denotes the number of inspection agencies in each region.

covered by previous literature –firms deciding to cross a size threshold to enjoy lower fines and/or less stringent labor regulations.

The theoretical discussion indicated that firms make decisions considering all the incentives arising from a change in the degree of enforcement, and these incentives could go in opposite directions and be different depending on the size of the firms. First, the deterrence effect of labor inspections should lead to increases in the compliance level when there is a rise in the enforcement effort due to the firms' perception of a higher probability of being inspected and fined. Second, the increase in labor costs due to a higher compliance level may lead some firms to reduce the size of their labor force. Displaced workers may offer their hours of work in the informal sector resulting in a reduction in the compliance rate. Third, less stringent regulations and lower monetary fines for firms of micro and small size generate incentives for small and large firms to become micro and small respectively when the degree of enforcement increases. Depending on the labor regulation considered, the size thresholds effect may lead to increases or reductions in the compliance level.

The empirical analysis used Peruvian household survey data for the period 2008-2013 to identify how changes in an enforcement measure with variation at the regional and time level (logarithm of inspections per hundred salaried workers) impact on the compliance with four labor regulations (minimum wage, enrolment into the pension system, labor contract, and maximum weekly hours of work) differentiating by firm size. The results obtained using an instrumental variable strategy -being the instrument a measure of the arrival cost of inspectors to the firms- revealed that the enforcement effort had little impact on the compliance with labor market regulations.

The few statistically significant effects found differ by firm size and also by geographic area. The most robust finding was an increase in the shares of workers earning the minimum wage in small and large firms. These results were robust to the restriction of the sample to urban observations and also to the definition of the instrument in the case of workers employed in large firms. There was an increase in the share of workers in micro firms having a labor contract as a result of an increase in the level of enforcement. This result appeared using the whole sample and the sample restricted to the urban area, but was statistically weak and not robust to the change in the instrument. When the sample was restricted to the urban area, a reduction in the shares of workers enrolled into the pension system in small and large firms appeared, indicating

different adjustment patterns in urban and rural areas. Finally, no effect was found for the compliance with the maximum hours of work in any of the specifications and samples used regardless the size of the firm where workers are employed.

The main contribution of this paper was to bring into consideration a margin of adjustment not analyzed before. When faced with a higher degree of enforcement, firms may decide to reduce its size in order to enjoy lower fines and/or more flexible labor regulations. This is possible in Peru where the monetary penalties for violating the labor rules and the stringency of labor regulations are lower the lower the size of the firms. The results revealed that the size thresholds effect was small in magnitude and it was not clear in which direction operated. It increased the compliance with the rules in some cases –minimum wage in small and large firms using the whole sample, and it reduced it in some others –enrolment into the pension system in small and large firms using the urban sample.

All in all, the enforcement of labor market regulations had little impact on the compliance level in Peru over the period 2008-2013. In the few cases where significant effects were found, the deterrence effect of labor inspections was strong enough to generate increases in the compliance with labor market regulations sometimes -minimum wage in small and large firms-, but was offset by the movement of displaced workers into the informal sector some other times - enrolment into the pension system in small firms of urban areas. The simultaneous increase and reduction in the compliance with the labor rules is compatible with the evidence showing that most salaried workers in Peru enjoy some labor benefits but not all of them, meaning that firms do not restrict their choices to comply with all the labor regulations or to not comply with any of them.

The general lack of effect of the enforcement measure on the compliance with the labor rules leads to the conclusion that the Peruvian labor inspection system was not effective during the period analyzed, either because it was not able to generate the incentives to comply with labor regulations (e.g. because resources were scarce, fines were too low, and/or labor inspectors turned a blind eye on violations to the rules) or because it failed to overcome the consequences of the adjustment process associated to an increase in the compliance level (e.g. displaced workers moving into the informal sector of the economy).

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Table 1: Enforcement of labor market regulations and arrival cost of labor inspectors

Dependent variable:	Log(enforcement)		Log(enforcement)*I _{MICRO}		Log(enforcement)*I _{SMALL}	
	(1)	(2)	(1)	(2)	(1)	(2)
Log(arrival cost)	-0.157 [0.0385]***	-0.174 [0.0437]***	-0.0552 [0.0292]*	-0.0679 [0.0331]*	-0.0182 [0.0134]	-0.0223 [0.0154]
Log(arrival cost)*I _{MICRO}	-0.000665 [0.00151]	-0.000779 [0.00157]	-0.0483 [0.0332]	-0.0482 [0.0331]	-0.0112 [0.00349]***	-0.0113 [0.00346]***
Log(arrival cost)*I _{SMALL}	-0.00440 [0.00254]*	-0.00448 [0.00255]*	-0.00955 [0.00348]**	-0.00958 [0.00354]**	-0.0582 [0.0300]*	-0.0582 [0.0301]*
Effect on Micro firms	-0.158 (0)***	-0.175 (0)***	-0.104 (0.001)***	-0.116 (0.001)***	-0.029 (0.028)**	-0.034 (0.028)**
Effect on Small firms	-0.161 (0)***	-0.178 (0)***	-0.065 (0.035)**	-0.077 (0.026)**	-0.076 (0.009)***	-0.081 (0.007)***
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	No	Yes	No	Yes	No	Yes
Region and Year fixed effec	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,345	51,345	51,345	51,345	51,345	51,345
R ²	0.820	0.825	0.821	0.825	0.499	0.503

Notes: OLS estimations. Standard errors clustered at the region level between brackets and p-value for the test of significance of the linear combination of coefficients between parentheses. Individual controls include sex, age and age squared, educational level, civil status, number of children at home, race, area, size of the firm and sector of activity. The set of regional controls 1 includes the number of orientation orders per hundred workers, fiscal result, credit to the private sector, per capita household income, beneficiaries or food programs, and inequality index. The set of regional controls 2 adds unemployment rate, electricity consumption, and precarious dwellings. See Data Appendix for sources and definitions of variables. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 2: Compliance by firm size and enforcement of labor regulations

Dependent variable:	<i>Panel 1</i>				<i>Panel 2</i>			
	=1 if worker receives pension contributions				=1 if worker earns the minimum wage			
	IV (1)	IV (2)	IV (3)	OLS	IV (1)	IV (2)	IV (3)	OLS
Log(enforcement measure)	-0.0202 [0.0359]	-0.211 [0.160]	-0.170 [0.168]	-0.0118 [0.0240]	0.125 [0.0237]***	0.326 [0.165]**	0.336 [0.163]**	-0.00939 [0.0251]
Log(enforcement measure)*I _{MICRO}		0.316 [0.287]	0.315 [0.288]	0.0157 [0.0286]		-0.367 [0.284]	-0.361 [0.283]	0.00477 [0.0324]
Log(enforcement measure)*I _{SMALL}		-0.119 [0.0678]*	-0.122 [0.0671]*	-0.0139 [0.0295]		-0.0146 [0.0784]	-0.0166 [0.0778]	0.0368 [0.0245]
Effect on Micro firms		0.1050 (0.442)	0.1450 (0.264)	0.0039 (0.797)		-0.0410 (0.749)	-0.0250 (0.835)	-0.0046 (0.8)
Effect on Small firms		-0.3300 (0.056)*	-0.2920 (0.11)	-0.0257 (0.205)		0.3114 (0.073)*	0.3194 (0.059)*	0.0274 (0.095)*
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Region and Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,345	51,345	51,345	51,345	51,345	51,345	51,345	51,345
R ²	0.398	0.384	0.385	0.398	0.212	0.199	0.199	0.213

Table 2 (cont.): Compliance by firm size and enforcement of labor regulations

Dependent variable:	<i>Panel 3</i>				<i>Panel 4</i>			
	=1 if worker works the max. weekly hours or less				=1 if worker has a labor contract			
	IV (1)	IV (2)	IV (3)	OLS	IV (1)	IV (2)	IV (3)	OLS
Log(enforcement measure)	-0.0284 [0.0401]	0.0311 [0.100]	0.0364 [0.101]	-0.0234 [0.0273]	0.0436 [0.0310]	-0.129 [0.181]	-0.112 [0.185]	0.00441 [0.0238]
Log(enforcement measure)*I _{MICRO}		-0.0573 [0.164]	-0.0582 [0.164]	-0.00705 [0.0272]		0.316 [0.296]	0.313 [0.295]	0.000399 [0.0238]
Log(enforcement measure)*I _{SMALL}		-0.128 [0.0989]	-0.129 [0.0994]	0.0242 [0.0251]		-0.0926 [0.111]	-0.0949 [0.109]	-0.0299 [0.0363]
Effect on Micro firms		-0.0262 (0.781)	-0.0218 (0.807)	-0.0305 (0.06)*		0.1870 (0.133)	0.2010 (0.09)*	0.0048 (0.734)
Effect on Small firms		-0.0969 (0.323)	-0.0926 (0.349)	0.0008 (0.938)		-0.2216 (0.132)	-0.2069 (0.179)	-0.0255 (0.352)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Region and Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,345	51,345	51,345	51,345	51,345	51,345	51,345	51,345
R ²	0.029	0.027	0.028	0.029	0.479	0.466	0.466	0.479

Notes: OLS and IV estimations. The instrument is the logarithm of the per capita crossing vehicles per kilometer of regional roads. Standard errors clustered at the region level between brackets and p-value for the test of significance of the linear combination of coefficients between parentheses. Individual controls include sex, age and age squared, educational level, civil status, number of children at home, race, area, size of the firm and sector of activity. The set of regional controls 1 includes the number of orientation orders per hundred workers, fiscal result, credit to the private sector, per capita household income, beneficiaries or food programs, and inequality index. The set of regional controls 2 adds unemployment rate, electricity consumption, and precarious dwellings. See Data Appendix for sources and definitions of variables. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 3: Compliance by firm size and enforcement of labor regulations. Controlling for the size thresholds effect

Dependent variable:	<i>Panel 1</i>			<i>Panel 2</i>		
	=1 if worker receives pension contributions			=1 if worker earns the minimum wage		
	25%	50%	75%	25%	50%	75%
Log(enforcement measure)	-0.154 [0.185]	-0.139 [0.155]	-0.130 [0.151]	0.336 [0.163]**	0.297 [0.150]**	0.289 [0.142]**
Log(enforcement measure)*I _{MICRO}	0.297 [0.315]	0.265 [0.258]	0.251 [0.243]	-0.361 [0.283]	-0.321 [0.262]	-0.302 [0.244]
Log(enforcement measure)*I _{SMALL}	-0.139 [0.0627]**	-0.119 [0.0523]**	-0.106 [0.0496]**	-0.0166 [0.0778]	-0.00325 [0.0773]	-0.000564 [0.0740]
Effect on Micro firms	0.1430 (0.305)	0.1260 (0.268)	0.1210 (0.256)	-0.0250 (0.796)	-0.0240 (0.836)	-0.0130 (0.901)
Effect on Small firms	-0.2930 (0.158)	-0.2580 (0.131)	-0.2360 (0.132)	0.3194 (0.068)*	0.2938 (0.063)*	0.2884 (0.054)*
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	Yes	Yes	Yes	Yes	Yes	Yes
Region and Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,345	51,345	51,345	51,345	51,345	51,345
R ²	0.385	0.389	0.391	0.199	0.202	0.204

Table 3 (cont.): Compliance by firm size and enforcement of labor regulations. Controlling for the size thresholds effect

Dependent variable:	<i>Panel 3</i>			<i>Panel 4</i>		
	=1 if worker works the max. weekly hours or less			=1 if worker has a labor contract		
	25%	50%	75%	25%	50%	75%
Log(enforcement measure)	0.0562 [0.130]	0.0746 [0.123]	0.0899 [0.128]	-0.149 [0.229]	-0.127 [0.197]	-0.124 [0.194]
Log(enforcement measure)*I _{MICRO}	-0.0854 [0.192]	-0.114 [0.174]	-0.136 [0.177]	0.342 [0.352]	0.306 [0.299]	0.294 [0.285]
Log(enforcement measure)*I _{SMALL}	-0.148 [0.143]	-0.152 [0.145]	-0.162 [0.147]	-0.0394 [0.124]	-0.0298 [0.110]	-0.00846 [0.116]
Effect on Micro firms	-0.0292 (0.747)	-0.0394 (0.61)	-0.0461 (0.556)	0.1930 (0.146)	0.1790 (0.107)	0.1700 (0.102)
Effect on Small firms	-0.0918 (0.41)	-0.0774 (0.389)	-0.0721 (0.425)	-0.1884 (0.232)	-0.1568 (0.233)	-0.1325 (0.244)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	Yes	Yes	Yes	Yes	Yes	Yes
Region and Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,345	51,345	51,345	51,345	51,345	51,345
R ²	0.028	0.028	0.027	0.468	0.471	0.472

Notes: IV estimations. The instrument is the logarithm of the per capita crossing vehicles per kilometer of regional roads. Standard errors clustered at the region level between brackets and p-value for the test of significance of the linear combination of coefficients between parentheses. Individual controls include sex, age and age squared, educational level, civil status, number of children at home, race, area, size of the firm and sector of activity. The set of regional controls 1 includes the number of orientation orders per hundred workers, fiscal result, credit to the private sector, per capita household income, beneficiaries or food programs, and inequality index. The set of regional controls 2 adds unemployment rate, electricity consumption, and precarious dwellings. See Data Appendix for sources and definitions of variables. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 4: Compliance by firm size and enforcement of labor regulations. Urban area

Dependent variable:	=1 if worker receives pension contributions		=1 if worker earns the minimum wage		=1 if worker works the max. weekly hours or less		=1 if worker has a labor contract	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Log(enforcement measure)	-0.252 [0.144]*	-0.144 [0.132]	0.266 [0.142]*	0.254 [0.128]**	0.0257 [0.0939]	0.0561 [0.120]	-0.105 [0.155]	-0.0920 [0.169]
Log(enforcement measure)*I _{MICRO}	0.236 [0.215]	0.206 [0.202]	-0.313 [0.240]	-0.278 [0.226]	-0.0861 [0.146]	-0.151 [0.166]	0.266 [0.243]	0.259 [0.247]
Log(enforcement measure)*I _{SMALL}	-0.0832 [0.0657]	-0.0903 [0.0533]*	-0.00842 [0.0709]	0.0134 [0.0746]	-0.113 [0.0808]	-0.124 [0.118]	-0.0533 [0.116]	-0.00654 [0.121]
Effect on Micro firms	-0.0160 (0.894)	0.0620 (0.528)	-0.0470 (0.743)	-0.0240 (0.819)	-0.0604 (0.531)	-0.0949 (0.213)	0.1610 (0.105)	0.1670 (0.076)*
Effect on Small firms	-0.3352 (0.008)***	-0.2343 (0.046)**	0.2576 (0.085)*	0.2674 (0.06)*	-0.0873 (0.219)	-0.0679 (0.233)	-0.1583 (0.128)	-0.0985 (0.291)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms crossing threshold effect	No	Yes	No	Yes	No	Yes	No	Yes
Region and Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44,098	44,098	44,098	44,098	44,098	44,098	44,098	44,098
R ²	0.380	0.383	0.192	0.195	0.030	0.030	0.465	0.467

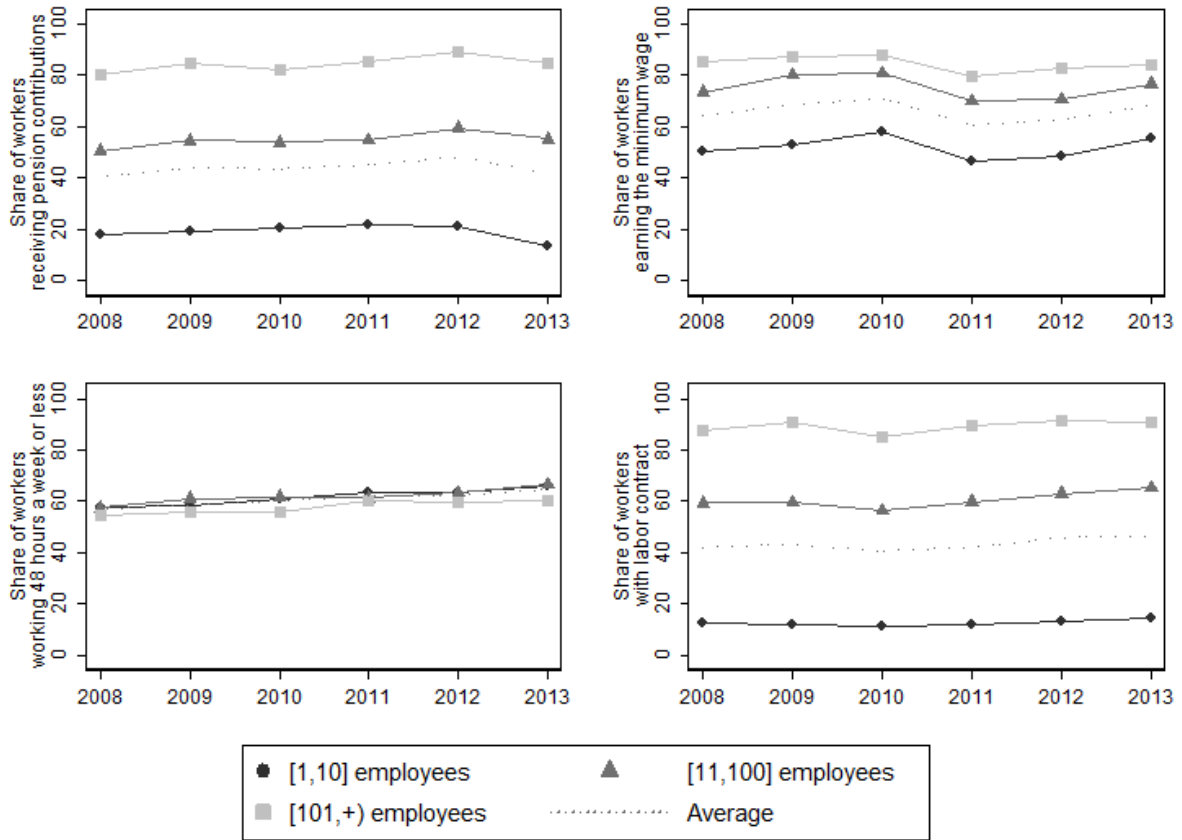
Notes: IV estimations. The instrument is the logarithm of the per capita crossing vehicles per kilometer of regional roads. Standard errors clustered at the region level between brackets and p-value for the test of significance of the linear combination of coefficients between parentheses. Individual controls include sex, age and age squared, educational level, civil status, number of children at home, race, area, size of the firm and sector of activity. The set of regional controls 1 includes the number of orientation orders per hundred workers, fiscal result, credit to the private sector, per capita household income, beneficiaries or food programs, and inequality index. The set of regional controls 2 adds unemployment rate, electricity consumption, and precarious dwellings. See Data Appendix for sources and definitions of variables. The size thresholds effect used the definition of the 50%. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 5: Compliance by firm size and enforcement of labor regulations. Change in the definition of the instrument

Dependent variable:	=1 if worker receives pension contributions		=1 if worker earns the minimum wage		=1 if worker works the max. weekly hours or less		=1 if worker has a labor contract	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Log(enforcement measure)	-0.170 [0.138]	-0.0937 [0.137]	0.292 [0.158]*	0.295 [0.150]**	0.0832 [0.0708]	0.0838 [0.0599]	-0.0533 [0.115]	-0.0642 [0.134]
Log(enforcement measure)*I _{MICRO}	0.282 [0.292]	0.234 [0.258]	-0.436 [0.293]	-0.362 [0.250]	-0.0399 [0.110]	-0.0792 [0.103]	0.249 [0.245]	0.228 [0.223]
Log(enforcement measure)*I _{SMALL}	-0.214 [0.129]*	-0.181 [0.0988]*	-0.0536 [0.0605]	-0.0386 [0.0558]	-0.0851 [0.0677]	-0.0806 [0.0804]	-0.201 [0.126]	-0.101 [0.0844]
Effect on Micro firms	0.1120 (0.532)	0.1403 (0.299)	-0.1440 (0.396)	-0.0670 (0.554)	0.0433 (0.552)	0.0046 (0.938)	0.1957 (0.168)	0.1638 (0.115)
Effect on Small firms	-0.3840 (0.111)	-0.2747 (0.199)	0.2384 (0.18)	0.2564 (0.121)	-0.0019 (0.986)	0.0032 (0.97)	-0.2543 (0.195)	-0.1652 (0.298)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms crossing threshold effect	No	Yes	No	Yes	No	Yes	No	Yes
Region and Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,345	51,345	51,345	51,345	51,345	51,345	51,345	51,345
R ²	0.381	0.388	0.195	0.201	0.028	0.028	0.465	0.472

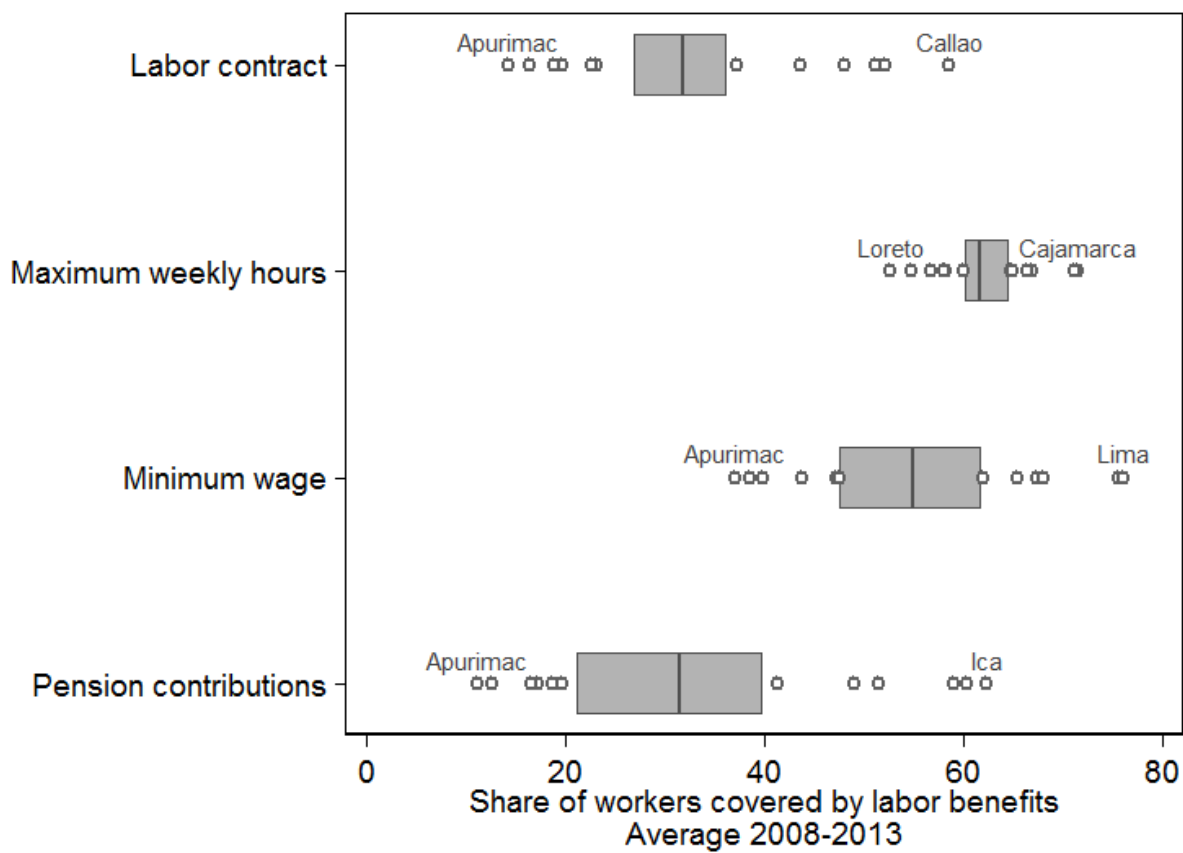
Notes: IV estimations. The instrument is the logarithm of the per capita crossing vehicles per kilometer of regional roads divided by the number of regional inspection agencies. Standard errors clustered at the region level between brackets and p-value for the test of significance of the linear combination of coefficients between parentheses. Individual controls include sex, age and age squared, educational level, civil status, number of children at home, race, area, size of the firm and sector of activity. The set of regional controls 1 includes the number of orientation orders per hundred workers, fiscal result, credit to the private sector, per capita household income, beneficiaries of food programs, and inequality index. The set of regional controls 2 adds unemployment rate, electricity consumption, and precarious dwellings. See Data Appendix for sources and definitions of variables. The size thresholds effect used the definition of the 50%. *** significant at 1%, ** significant at 5%, * significant at 10%.

Figure 1: Compliance with labor market regulations by firm size. 2008-2013



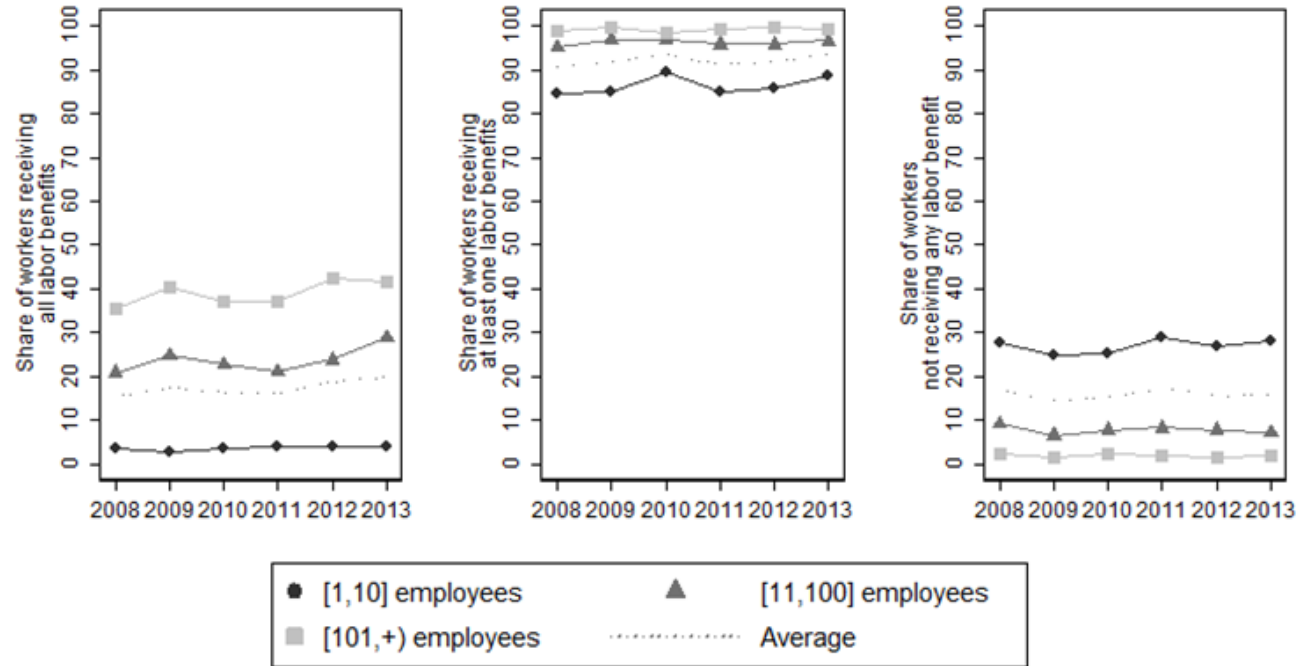
Source: Own elaboration based on Encuesta Nacional de Hogares.

Figure 2: Compliance with labor market regulations by region. 2008-2013



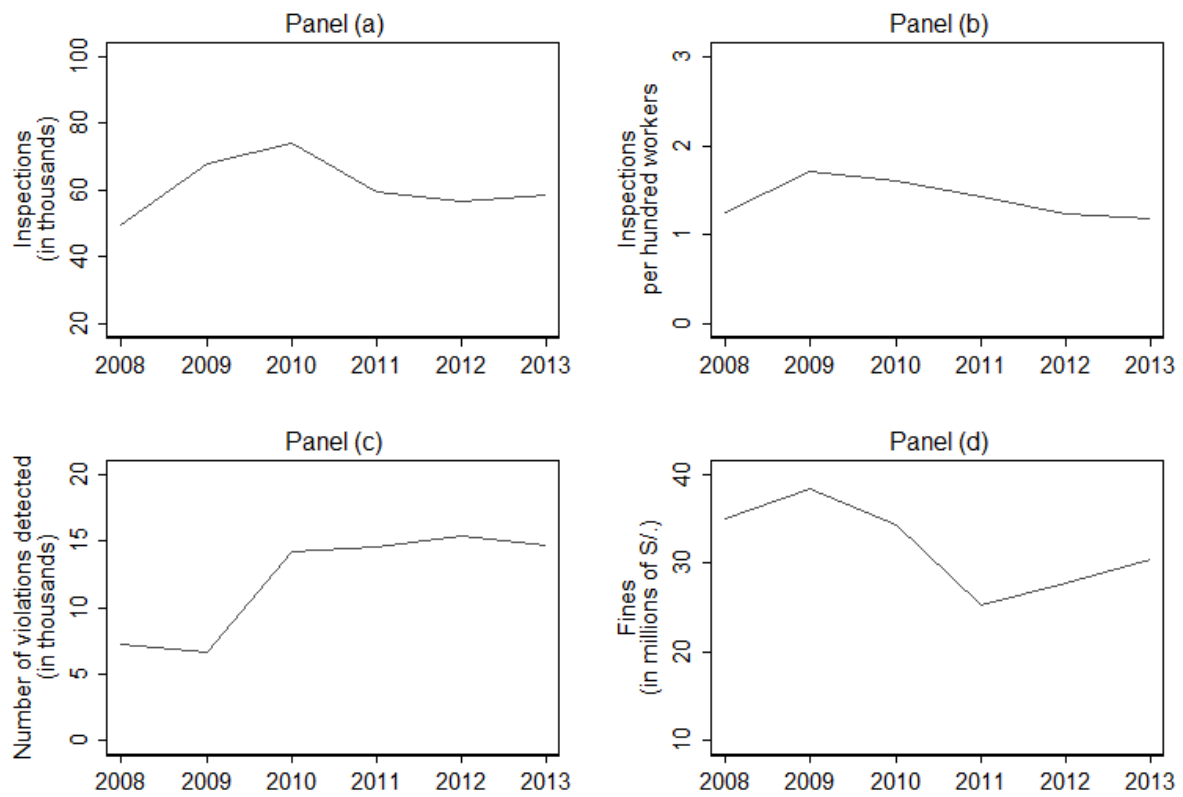
Source: Own elaboration based on Encuesta Nacional de Hogares.

Figure 3: Intensity of compliance with labor market regulations. 2008-2013



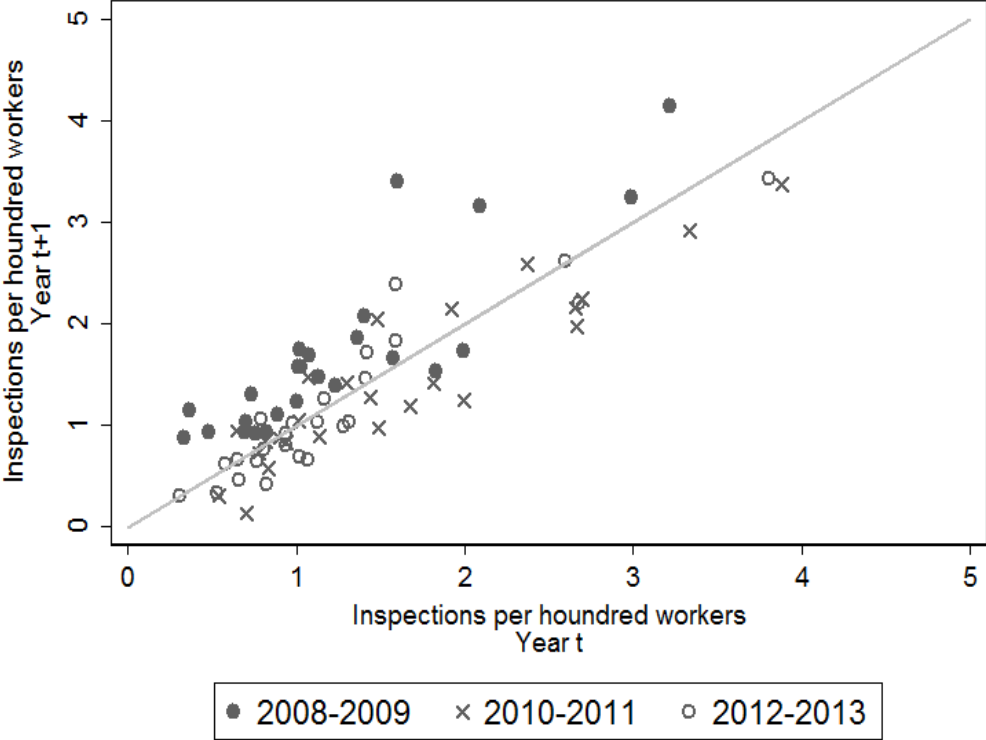
Source: Own elaboration based on Encuesta Nacional de Hogares.

Figure 4: Inspections, violations to labor market regulations detected and penalties imposed. 2008-2013



Source: Own elaboration based on Ministerio de Trabajo y Promoción del Empleo.

Figure 5: Annual changes in the enforcement measure across regions



Source: Own elaboration based on Ministerio de Trabajo y Promoción del Empleo.

Data Appendix

Enforcement measure

I collected information published by the Ministerio de Trabajo y Promoción del Empleo (Labor Ministry or MTPE) on the total number of annual inspections in each of the 25 regions from 2008 to 2013. I generated a measure of enforcement defined as the logarithm of the ratio of inspections per hundred salaried workers in each region and year. The data covers the 24 regions of Peru and Callao (constitutional province). The region of Lima includes information on Lima Metropolitana (metropolitan province). Data from the MTPE also contains the number of guidance and orientation orders in each region and year. I use this information to construct a control variable.

Labor inspectors travel by car or using public transportation from the regional inspection agency to the firms to be inspected. The extension of the road network and the traffic in each region are measures of the inspection costs which I use to instrument the enforcement measure. Data on the extension of the national and regional road networks in each region and year was obtained from the Ministerio de Transporte y Comunicaciones. The extension of the road network is measured in kilometers and was normalized by the corresponding region's territory, which data comes from the Instituto Nacional de Estadística e Informática. Information on the traffic in the road network of each region and year comes from the Ministerio de Transporte y Comunicaciones. The variable is measured in number of vehicles crossing regional tollbooths and was normalized by the population of each province using data from the Instituto Nacional de Estadística e Informática. Some regions do not have tollbooths (Huancavelica, Loreto, Madre de Dios, Pasco, Ucayali and Callao). In those cases, I assigned the average value of crossing vehicles in neighboring regions.

Worker level data

I use the Peruvian household survey, Encuesta Nacional de Hogares (ENAHO) for the period 2008-2013. The ENAHO contains information about working conditions and labor benefits. This data includes the annual labor income, the number of hours of work per week, contributions to the pension system, and having a labor contract. All the information is reported by workers. In order to construct indicator variables of compliance with labor market regulations, I divide the annual labor income in the main occupation by 12 and compare the monthly value with the

minimum wage. I use the minimum wage that was in force in the month and year each worker was interviewed. Data on the minimum wage comes from the MTPE. For the compliance with the legal maximum of weekly hours of work, I use information on the number of hours worked in the previous week in the main occupation.

Workers who do not receive the mandated benefits could be employed in a formal or an informal firm. The Peruvian household survey contains information regarding the legal entity of the firm where a worker is employed and the accounting system it uses (whether it is the accounting system required by the tax authority or not). This information is used in the literature to identify the formality status of employers and self-employed workers (Rodríguez and Higa, 2010), but is not considered a good indicator of the formality status of the firm where a salaried worker is employed, as it is expected to capture that information with error. Thus, the effect of changes in the degree of enforcement on the compliance with labor market regulations will be reflecting the average impact on the formal and the informal sectors of the economy.

The ENAHO provides data on individual characteristics used as control variables in the empirical analysis. They are gender, age, indicator variables for educational levels, indicator variable of civil status, number of children under 14 years of age at home, indicator variables for race and urban area, and indicator variables for the economic sector and the size of the firm where each worker is employed.

Regional data

I use different sources of data to construct control variables with variation over time related to the political-business cycle and development level of each region. I use the primary result (total incomes – primary expenditures) as a political business cycle variable. This data was obtained from the Banco Central de Reserva del Perú, it was expressed in constant prices of 2005 and was normalized by the total incomes in each region. To control for regional economic cycles, I use several variables. First, the amount of money lent by the banking system to the private sector was obtained from the Banco Central de Reserva del Perú. This variable was expressed in constant prices of 2005, normalized by the regional population, and then expressed in logarithm. Second, the MWh of electricity consumed was also obtained from the Banco Central de Reserva del Perú. This variable was normalized by the population in each region and expressed in logarithm. Third, the regional unemployment rate was calculated from the ENAHO. Finally, the set of

development variables at the regional level includes: the logarithm of the average per capita household income expressed in constant prices of 2005 and calculated from the ENAHO, the number of households receiving food programs as a percentage of the total number of poor households was obtained from the Instituto de Estadística e Informática, the Gini coefficient of the per capita household income was calculated from the ENAHO, and the share of precarious dwellings was also obtained from the ENAHO and defined as the percentage of dwellings located in a shanty town (“vivienda en villa”) or households living in inconvenient places.