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Inequality and Employment in a Dual Economy: Enforcement of Labor Regulation in Brazil

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ABSTRACT

Inequality and Employment in a Dual Economy: Enforcement of Labor Regulation in Brazil*

This paper studies the impact of an increase in the enforcement of labor regulations on unemployment and inequality, using city level data from Brazil. We find that stricter enforcement (affecting the payment of mandated benefits to formal workers) leads to: higher unemployment, less income inequality, a higher proportion of formal employment, and a lower formal wage premium. Our results are consistent with a model where stricter enforcement causes a contraction in labor demand in the formal sector; and where workers value mandated benefits highly, so that there is an increase in the formal sector labor supply, an increase in the willingness to become unemployed to search for a formal sector job, and a decrease in labor supply to the informal sector.

JEL Classification: J23, J30, K31, D63

Keywords: enforcement, labor regulations, inequality, unemployment, informal sector

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"*The evidence shows that labor institutions reduce the dispersion of earnings and income inequality, which alters incentives, but finds equivocal effects on other aggregate outcomes, such as employment and unemployment.*'' in Richard Freeman (2007).

"The results presented in this volume suggest that mandated benefits can reduce employment and that job security regulations have a substantial impact on the distribution of employment and on turnover rates both in Latin America and in OECD countries. The greatest adverse impact of regulation is on youth and unskilled workers." in James Heckman and Carmen Pages (2004).

1. Introduction

Given the rigidity of its labor code, it is puzzling that the levels of wage and employment flexibility in Brazil are comparable to those in the US, where labor law is far less strict.[2] Could it be that labor market institutions have minimal effects on flexibility or, alternatively, are they simply weakly enforced (Caballero, Cowan, Engel and Micco, 2006)? The strength of the enforcement effort conditions how labor regulation affects job flows and other outcomes, such as employment, or income inequality. The effect of regulation on inequality is particularly important in Brazil where, in spite of recent improvements, inequality is still higher than almost anywhere else in the world (IPEA, 2006, Ferreira, Leite and Litchfield, 2006).

A consequence of Brazil's size and diversity is that the levels of enforcement vary widely across cities. For example, recent administrative data (collected by the Ministry of Labor) shows that, in 2002, labor inspectors paid no visits to firms in the city of Itapipoca, Ceara, but visited as many as one out of every ten firms in Irituia, Para. This paper provides an empirical analysis of how unemployment and income inequality relate to the degree of enforcement of labor regulation in each city. We thereby study the potential efficiency-equity trade-off of labor market policy. Moreover, we also examine how enforcement affects poverty, formal and informal employment, and wage inequality within and between the formal and informal sectors. Our findings show that a 10% increase in the enforcement activity at the city level (0.1 of a standard deviation, or sd) leads to a 0.9 percentage point (pp) increase in the unemployment rate (0.15 sd), a 1.5 pp decrease in the use of informal workers (0.1 sd), a 0.01 decrease in the Theil's income

[2] See Botero, Djankov, Laporta, and Lopez de Silanes (2004) for a comparative analysis of labor law, and Barros and Mendonca (1996) and Barros, Cruz, Foguel and Mendonca (1997) for the evidence on flexibility. In fact, this is also true of other Latin American economies (Bartelsman, Haltiwanger and Scarpetta, 2004).

inequality index (0.1 sd), and a 2.6% decrease in the formal-informal wage premium (0.08 sd). The estimated effects for poverty are much smaller (about 0.5 pp, or 0.025 sd).

Two issues need to be addressed in our study. First, while the whole of the labor code addresses a wide variety of problems, enforcement concerns only a few dimensions. From reading Cardoso and Lage (2007) (and from informal conversations with one of the authors), it seems safe to say that increased enforcement affects primarily compliance with severance pay, and with health and safety regulations, although it may also affect the use of informal workers. Second, the strength of enforcement may not be randomly distributed across cities because, say, less compliance attracts more policing. We collect data on two main determinants of enforcement of regulation: the distance between each city and the nearest regional enforcement office, and the number of labor inspectors in each state. We use the interaction between these two variables as an instrument for the degree of enforcement in each city, while controlling for both variables in the outcome regressions. Therefore, the identifying variation in our specification comes from the differential role of distance in states with larger and lower endowments of labor inspectors (see Rajan and Zingales, 1998, for a similar procedure). We discuss in detail the validity of this empirical strategy for Brazil and its potential pitfalls, and present empirical evidence that they are unlikely to be important.

The paper has three unique features. First, we explore administrative data on the enforcement of labor regulations to quantify the within country differences in the strictness of regulation. Surprisingly, almost all papers in the literature focus on the formal aspects of the labor code, independently of the degree of compliance with it (exceptions are Boeri and Jimeno, 2005, Caballero, Cowan, Engel and Micco, 2006).[3] Second, we use detailed microdata (from the population census) on labor market characteristics, namely employment, formality, wages and inequality. This type of data allows us to understand in detail how enforcement affects the operation of the labor market and the contribution of labor market policy for income inequality. Most of the literature focuses on more aggregated outcomes or firm level micro data, but city

[3]The idea of non-compliance is not completely absent from the literature, since the informal sector is often used as a control group when analyzing changes in the labor code. However, the degree of compliance of the formal sector is ignored, and no linkages are allowed between formal and informal sectors.

level variation has not been explored.[4] Third, we interpret our evidence using a multisector model of the labor market in developing countries, which integrates formal and informal sectors and unemployment into a single framework, and emphasizes the links across them (see also Marrufo, 2001). In our study, the enforcement of mandated benefits improves the attractiveness of formal jobs relatively to informal jobs, leading workers to move from one sector to the other.

The consequences of labor market institutions and regulations for labor market outcomes are a constant source of controversy, as illustrated in the quotes with which we start the paper. Our findings speak partly to both sides of the debate. As a result of increased enforcement of mandated benefits, formal jobs become more attractive for workers, but also more expensive for firms. Employment declines because of a contraction in demand, or because of an increase in the willingness to be unemployed while searching for a formal job, as formal sector jobs become better (e.g., Harris and Todaro, 1970, Fields, 1975). Inequality declines because there is downward pressure in formal wages (contraction of demand and expansion of supply) and upward pressure in informal wages (contraction of supply). If formal wages are more flexible at the top than at the bottom of the distribution, inequality within the formal sector also declines. This explanation is very simplistic, but it is remarkably consistent with the data.

Our paper contributes to a long literature. The theoretical framework follows Harberger (1962), Harris and Todaro (1970), Fields (1975, 2005), MacDonald and Solow (1985), Bulow and Summers (1986), Acemoglu (2001),Maloney (2004), and Albrecht, Navarro and Vroman (2006).[5] Although labor regulation is strict in Brazil, there is surprisingly large wage and employment flexibility (e.g., Barros and Mendonca, 1996, Barros, Cruz and Mendonca, 1997). The reason for this may be low enforcement. Therefore, we use a model with minimal rigidities, except for frictions in the job search process in the formal sector.

The main limitation of this model, and of the empirical work, is that it is static. Much of the concern about labor market regulation is that it reduces flexibility in response to shocks

[4]One example is Almeida and Carneiro (2005), who explore similar information on the enforcement of labor regulation, together with firm level data, to assess its impact on firm size.

[5] Several papers try to empirically distinguish across different models of the labor market (segmented and non-segmented). See e.g., Dickens and Lang (1985), Heckman and Hotz (1986), Maloney (1999), Filho, Mendes and Almeida (2004), Navarro-Lozano and Schrimpf (2004), Bosch and Maloney (2006), Almeida and Bourguignon (2006).

(Ljungqvist and Sargent, 1998, Blanchard and Wolfers, 2000, Heckman, 2004), which is a dynamic concern in itself, affecting worker flows.[6] Perhaps the best interpretation of our results (and certainly of our model) is of the medium run effects of regulation in the steady state since our main findings refer to stock variables (e.g., employment and unemployment, GDP per capita). We also do not explicitly consider worker heterogeneity nor cross-city migration, but our empirical work will document what we know about these two variables.

Recent contributions to the literature on informality include work by Schneider and Enste (2000), Friedman, Johnson, Kaufmann, and Zoido-Lobaton (2000), Amaral and Quintin (2005), Galiani and Weischelbaum (2007), Boeri and Garibaldi (2006), Loayza, Oviedo and Serven (2005), de Paula and Scheinkman (2006), Bosch, Goni and Maloney (2007), and World Bank (2007). Especially related to us is the study of inequality in economies with dual labor markets, such as Fields (1979, 2005), or Bourguignon (1990).

Recent surveys of the role of labor market institutions include Layard and Nickell (1999), or Kugler (2007), among many others. As data becomes available, several micro studies also study the effect of labor market regulations in developing countries, such as Kugler (1999, 2001, 2004), Kugler and Kugler (2003), Eslava, Haltiwanger, Kugler and Kugler (2006), Ahsan and Pages (2007), Petrin and Sivadasan (2006), or the studies in Heckman and Pages (2004). Two papers are especially close to our study. On the one hand, Besley and Burgess (2004) explore within country (district level) and across time variation in labor reforms in India to study the effect of labor regulations on productivity, investment, employment and poverty. We explore a very different source of institutional variation, corresponding to a different set of regulations, and use disaggregated labor market data at the city level. Our paper also has an explicit link to

[6] Resource reallocation features very prominently in modern theories of growth (e.g., Aghion and Howitt, 1992, Lentz and Mortensen, 2005, Foster, Haltiwanger and Krizan, 2002). In spite of strict labor market regulations in Latin America there is surprisingly little evidence that regulations significantly affect the ability of the economy to adjust to shocks. Caballero, Engel and Micco (2004) and Bartelsman, Haltiwanger and Scarpetta (2004) report large levels of resource reallocation in developing economics, which are certainly not lower than what we observe in developed countries (see also Eslava, Haltiwanger, Kugler and Kugler, 2005, Micco and Pages, 2004). Eslava, Haltiwanger, Kugler and Kugler (2006) also argue that labor market reforms have a relatively moderate effect on factor reallocation in Colombia, although the interaction between labor reforms and economic shocks may be more important than what is apparent at first sight.

models of the informal sector which is unusual in the literature. On the other hand, Marrufo (2001) examines the consequences of the reform of social security in Mexico. She uses a Harberger model with two employment sectors and worker heterogeneity. Again, the variation we explore and the features of the labor code we study are different. Furthermore, her focus is on employment and tax incidence, while we focus on inequality.

This paper proceeds as follows. In the next section we provide background information and the Brazilian labor market, its institutions, and the structure of the enforcement process. Section 3 presents the simple theoretical framework that guides our work. Section 4 describes the data. Section 5 explains the empirical strategy. Section 6 shows and discusses the empirical results. Section 7 concludes.

2. Labor Market Regulations and Its Enforcement in Brazil

2.1 Labor Regulations

At least on paper, Brazil has one of the least flexible labor market regulations in the world. According to the Doing Business data set, collected by the World Bank, it ranks third worldwide, below Portugal and Panama. There, the law establishes that all employees must have a work permit where the employment history of the worker is registered (*carteira de trabalho*). This permit entitles the worker to several wage and non-wage benefits paid for by the employer, such as retirement benefits, unemployment insurance, and severance payments.[7] Traditionally, the labor code is written into the Brazilian constitution, which makes any amendments very difficult. The constitution of 1988 introduced several changes to the labor code which increased the degree of worker's protection (see e.g., Barros and Corseuil, 2001).

Workers with formal contracts are entitled to a variety of benefits which imply very high costs for firms. The law establishes that workers can work at most 44 hours a week, that the maximum period for continuous shift work is 6 hours, minimum overtime pay is 1.5 times the normal hourly wage, that paid leave is at least 4/3 of normal wage, paid maternity is 120 days, and that the employer contributes monthly to social security and to a job security fund. Every month, employers contribute 8% of the worker's wage to this fund. Overall, in order for a worker

[7] Gruber (1997), Marrufo (2001), Heckman and Pages (2004), or Kugler (2004) find evidence for other countries that employers can, to some extent, pass-through to workers the labor costs associated with formal contracts.

to receive a net wage of Reais 100, the firm needs to disburse approximately Reais 165,7 (see Cardoso and Lage, 2004).

Even though it is not much more difficult to fire a worker in Brazil than in other Latin American countries, it is definitely more costly. Employers must give prior notice to workers and, in the interim period, workers are granted two hours a day to search for a job. This period is never smaller than one month and recently it became proportional to the worker's tenure. During this period, employers cannot adjust the worker's wage so this implies that 25% of the hours are paid but are not worked. In practice the productivity of a dismissed worker also falls once he/she is given notice of dismissal so that the overall decline to production is likely to be well above 25% (Barros and Corseuil, 2001, argue that in most of the cases the fall in production is closer to 100%).

Workers who are dismissed at will have the right to receive compensation paid by the employer, over and beyond that accumulated in the worker's job security fund (FGTS).[8] In particular, the law establishes that a penalty equal to 40% of the fund accumulated during the worker's tenure with the firm is to be paid to the worker. Therefore, dismissal costs are increasing with the duration of the work contract. One obvious perverse effect of such high dismissal benefits is that several workers force their dismissal, potentially increasing turnover rates (which decreases the firm's incentives to invest in the worker and vice-versa), and increasing the firm's costs (see, e.g., Neri, 2002).

Given these strict rules, firms will weight the costs and benefits of complying with the law, and decide a certain degree of evasion. They may decide to hire informal workers, or to hire formal workers without complying fully with specific features of the labor code (e.g., avoid the provision of mandatory health and security conditions, or avoid payments to the social security).

[8] FGTS is a fund administered by the government, employers and employees. The fund accumulates while the worker is employed by the firm. The employer must contribute monthly with 8% of the employee's current wage to the fund (contribution rose to 10% from 2001 onwards). As a consequence the accumulated FGTS of a worker in a given firm is proportional to its tenure. Only workers that are dismissed for an unfair reason or those that are retired have access to this fund. Workers can also use their FGTS in exceptional circumstances like when buying a house or paying large health expenses. Upon dismissal, workers have access to the entire fund, including all the funds accumulated in previous jobs, plus a penalty in proportion to the fund accumulated in the firm from which they are being dismissed.

2.2. Enforcement of Labor Regulations

The expected cost of evading the law is a function of the probability of being caught without complying with the law and of the monetary value of the penalties. In turn, the probability of being caught depends on firm characteristics (such as size and legal status) and on the degree of enforcement of regulation in the city where the firm is located. Compliance with labor regulation in Brazil is publicly enforced by the Ministry of Labor.[9] Given the size of the country, enforcement is first decentralized at the state level (the state level labor office is called *delegacia*) and then at a more local level, the subregion (the local labor office is called *subdelegacia*). The concept of *subdelegacia* is administrative and does not correspond to any geographical unit. In particular, a *subdelegacia* includes more than one city (or *municipio*). In each state, the *delegacia* is always located in the state capital and the number of *subdelegacias* within the state is a function of the size and of the economic importance of each region. For example, the state of Sao Paulo has 21 *subdelegacias* while other smaller states, like Acre or Amapa, only have one *subdelegacia*, which coincides with the *delegacia*.

Labor inspections were not a relevant feature of the Brazilian labor market during the 70's and 80's. In the late 80's the Brazilian economy had several hyperinflation episodes and this contributed to a significant depreciation of the nominal value of the fines. For example, in 1989 the average fine per worker issued by labor inspectors was Reais 70 (at the current exchange rate, USD$1 = 1.95 Reais) while the minimum wage in Brazil was Reais 231 and the dismissal costs could easily go above Reais 700. However, during second half of the 90's labor inspections gained importance. Several reasons are probably behind this. On one hand, labor regulation became stricter after the 1988 Constitution. One the other end, the strong government deficit in the mid 1990s lead the government to search for alternative ways to collect revenue, and labor inspectors began to be used mainly as tax collectors. Their main goal was to collect job security contributions which, even though they cannot be used directly by the government to fund its expenditure, helped reduce the size of the government deficit, at least in an accounting sense. It was probably only after this change that labor inspections gained prominence.

[9] Cardoso and Lage (2007) argue that the integration of firms in international trade and the need to comply with international quality standards (e.g., ISO certificate) implicitly forces firms to comply with regulation. For example, it is often the case that firms who which to export need to prove their compliance with labor regulations and cannot resort to any forms of child labor or slavery.

Labor inspectors are affiliated with a particular *subdelegacia* and report to the head of the *subdelegacia.* In order to deter corruption, labor inspectors are forced to frequently rotate across *subdelegacias*. The maximum period labor inspectors can stay in one *subdelegacia* is twelve months (Cardoso and Lage, 2007). In theory, an inspection can be triggered either by a random firm audit, or by a report (often anonymous) of non-compliance with the law. Reports can be made by workers, unions, the public prosecutor's office, or even the police. In practice, since the number of labor inspectors is low relatively to the total number of reports, most inspections are triggered solely by reports of illegal behavior. Labor inspectors assess the compliance of each inspected firm with several dimensions of labor law (e.g., worker's formal registration, compliance with severance pay, minimum wage regulation and hours of work). Almost all of the targeted firms are formal firms, because it is difficult to visit a firm which is not registered, since no records exist of its activity.

There are different types of labor violations and all violations are punishable with fines. [10] The main type of violations targeted by labor inspectors are the lack of payment of the job security fund and non-compliance with health and safety conditions on the job. Although inspections also target worker registration, this seems to be quantitatively a less important than the other two, at least if we measure it by the number of worker registrations at the mandate of labor inspectors. Nevertheless, looking at the number of worker registrations might not be the best measure if there is a deterrent effect of enforcement. Another important component of labor inspections consists of the fight against slavery and child labor.

Labor inspectors have a performance based pay scheme, which gives them an incentive to penalize infractions. In particular, up to 45% of their wage is tied to the efficiency of the overall enforcement system (1/3 is tied to the inspectors own performance while 2/3's is tied to the system's global performance). Their base salary is also good relatively to comparable alternatives. In 2004, labor inspectors had a monthly wage between USD 2,490 (starting position) and USD 3,289 (top management). Although these inspectors could still have an incentive to collect bribes, in practice, especially in the more recent years, this does not seem to be as serious as in the past.

[10] Inspectors issue fines for the non-registration of workers, disobedience of the official work period or hours worked, non-compliance with the mandatory wage payments (including minimum wages), missing FGTS contributions or health and safety violations.

When faced with violations of the labor code, inspectors must immediately notify the firm. After the notification, the firm has 10 days to present evidence in its defense. After that period, the process is re-examined by a different inspector from the one that issued the fine, who deliberates about its fairness. This result is then reported to the head of the *subdelegacia* (*subdelegado*). If firms do not refute the claim and pay the fine within 10 days of their notification, there is a 50% discount on the amount of the fine. Alternatively, if firms decide to appeal the decision, they must deposit the total value of the penalty until a second decision has been reached. In practice, small and medium firms pay the fines early in the process to take advantage of the discount. Larger firms, with juridical departments, tend to refute the deliberations and, often, avoid the payment of fines altogether.

The fines can be either fixed, or indexed to firm size and profitability. For example, a firm is fined by Reais 446 for each worker that is found unregistered during an inspection. Or, depending on its size and profitability, a firm can be fined by an amount between Reais 16 and Reais 160 per employee, if they do not comply with the mandatory contributions to the FGTS.[11]

Although the number of inspectors have been kept at a relatively low level in early 2000 when compared with a decade before, it has become efficient in reaching a very significant part of the total labor force and of the number of firms in Brazil. In 2002, a total of 304,000 firms were visited by labor inspectors, reaching more than 19,000,000 workers, or 80% of the labor force (Cardoso and Lage, 2007). Of these, approximately 17% of the firms received a notification of non-compliance with the law, but less than 3% of the workers were registered, a remarkably small number given that 50% of employment is informal in Brazil. Although this could reflect in part the fact that informal workers are concentrated in smaller firms, it may also indicate that formalization is not the main outcome of the inspections. When looking at the different types of fines issued by inspectors during 2002, three categories comprise 75% of the total number of fines issued during the year: registration, FGTS, and *other* types of violation (including heath and security violations, see appendix table A1, which presents the proportion of each type of fine in 2002).

[11] Cardoso and Lage (2007) argue that the magnitude of the fines is quite reasonable to work as a deterrent to crime, and that the main problem is their enforcement.

The Ministry of Labor makes an effort to apply an homogeneous criteria for enforcing of labor regulation throughout the country, but in practice it is difficult to do so.[12] Enforcement is not uniform across the country because Brazil covers a very large and diverse geographical area. Inspectors are also probably very heterogeneous. Moreover, they have to travel different distances and face varying workloads depending on where they are located. This gives rise to substantial regional variation in the degree of enforcement across cities, which we will explore econometrically.

3. Theoretical Background

This section presents a simple model of the labor market in a developing country. For simplicity, we present a highly stylized model, with a minimal set of ingredients in order to interpret our basic empirical findings. Reality is much more complex than the model we present, so the model cannot fully explain the microdata. However, simplicity is particularly convenient here because we model multiple labor markets which interact with one another. Our model builds on Lewis (1954), Harris and Todaro (1970), Fields (1975), Bulow and Summers (1986), Acemoglu (2001), Maloney (2004), Albrecht, Navarro and Vroman (2006), and most heavily on MacDonald and Solow (1985). It is also related to Harberger (1962).

We consider a primary sector, a secondary sector, and unemployment. In the primary sector the wage is higher, but there is risk of unemployment because of search frictions, and in the secondary sector there is no unemployment but the wage is lower. W_p and W_s denote wages in the primary and secondary sectors, respectively. Employers in the primary sector face *taxes* T, so that the cost of labor is $W_p + T$. The value of T for formal employees is vT, where $v \geq 0$ (v can be smaller, equal or larger than1). In the secondary sector there is no unemployment because workers can freely enter into self-employment (e.g., selling fruit on the beach), and there is no household sector. In the primary sector there is a process of matching between workers and firms, which creates some frictions in the labor market.

[12] The Ministry of Labor continuously provides training to labor inspectors. Moreover, all inspectors have a common implementation manual and work with similar software. At the end of 2002, there was a total of 2,341 labor inspectors in Brazil.

Workers may not value T at its cost for the employer for two reasons. First, health and safety benefits are an in-kind payment, as opposed to a monetary payment. Second, although the severance pay fund is purely monetary, the worker can only collect it under special circumstances, which may reduce its value to the worker. Therefore, we assume that labor supply decisions depend on $W_p + vT$, where v is the value of each unit of T to the worker. v is larger than zero but can be smaller or larger than 1, depending on whether the workers' valuation of T is above or below its monetary cost to the employers.[13]

There are N workers in the economy, which can be working in the primary sector (N_p) or in the secondary sector (N_s), or searching for a job in the primary sector (N_u):

$$N = N_p + N_s + N_u. \qquad (1)$$

Workers are homogeneous and risk neutral. If U is the unemployment rate in the primary sector ($U = N_u/(N_p + N_u)$), in equilibrium:

$$(1 - U) * (W_p + vT) = W_s. \qquad (2)$$

(where 1-U is the probability of finding a primary sector job given that one is searching). Equation (2) is the main equilibrium condition in Harris and Todaro (1970). From equations (1) and (2) we can derive the labor supply curves for each sector. There are also two labor demand curves, $D_p(W_p + vT)$ and $D_s(W_s)$, which for now we assume independent of each other. In equilibrium W_p and W_s have to be such that:

$$D_p = N_p \qquad (3)$$

$$D_s = N_s \qquad (4).$$

The equilibrium in this model is defined by conditions (1) to (4). Notice that there are 4 equations and 5 unknowns N_p, N_s, N_u, W_p and W_s and, hence, as it stands the equilibrium is indeterminate. Even though the unemployment is not an essential feature of our model and could

[13] A priori, we do not know whether v is smaller or larger than 1. For example, *v* could be smaller than 1 for the severance payments, although a value close to 1 may also not be a bad assumption given that workers can withdraw funds from the job security fund for home purchases. However, we may well have v>1 with regard to health and safety benefits. Furthermore, reality may be much more complex, since uncertainty and information problems can also affect the valuation of T. Even if v>1, coordination problems may prevent workers and firms from reaching an efficient agreement.

be omitted from the analysis, it is central in the literature, it helps justify the existence of wage differentials across sectors, and it is empirically relevant. We assume that U is fixed by some technological reason related with the search process in the labor market. This assumption does not affect our main argument and it simplifies exposition.[14]

This model captures some basic features of labor markets in developing countries, namely the existence of more than one labor markets. It is tempting to call the primary sector the formal sector, and the secondary sector the informal sector. However, much of the most recent literature in this area (e.g., Fields, 1990, 2005, Cunningham and Maloney, 2001, Maloney, 2004), recognizes that there are at least two tiers of informal workers: an upper tier who compete for jobs with formal sector workers, but who choose to remain informal for flexibility or tax reasons, and a lower tier who operate in a different sector. Therefore, the distinction may go beyond the formal-informal typology. Finally, we consider a closed economy with no migration. Using this model, we study the consequences of an increase in enforcement.

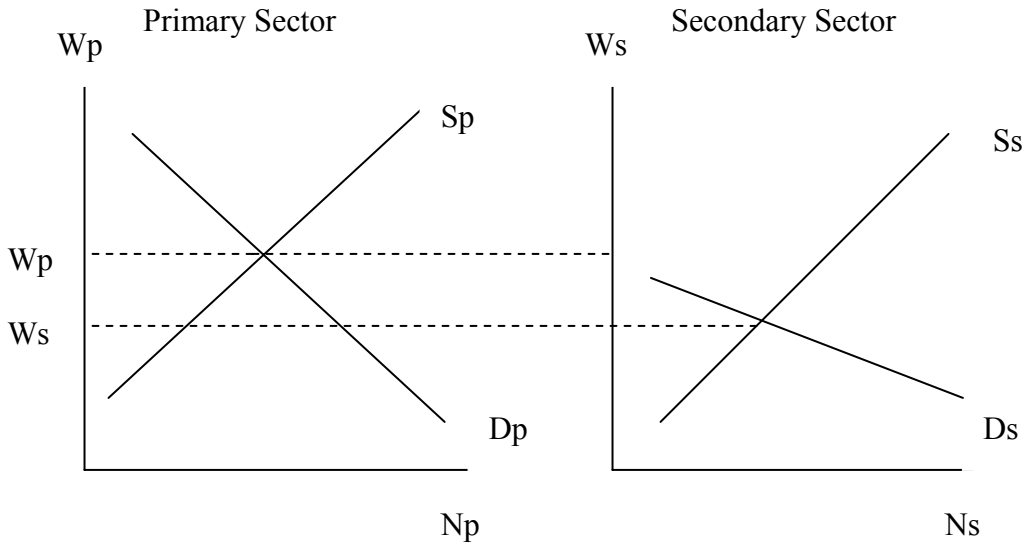
As explained in section 2, most of the enforcement activity concerns two issues: i) ensure the payment of contributions to the severance pay fund, as well as compliance with firing rules and payments; ii) health and safety conditions. Therefore, it is reasonable to assume that enforcement of regulations is primarily focused in the primary sector, and we model it as an increase in T.[15]

We next present a graphic presentation of our model and follow it with a more formal development. Figure 1 shows the initial equilibrium (T=0) in the primary and secondary labor markets. The unemployment rate in the primary sector ($U<1$) sustains the wage differential between the two sectors.

[14] Instead of keeping U fixed, most of the literature fixes Wp (MacDonald and Solow, 1985) or Ws (Fields, 1975), and uses U as an adjustment variable. Since our empirical work features wage adjustments, we did not want to fix any of the wage variables in our model.

[15] It is possible to interpret T as mandated benefits even if there is less than full compliance. Firms choose T such that it equals expected punishment if caught not complying. On average, firms will not comply fully, and sometimes they will be caught. This means that T measures the product of mandated benefits and the compliance rate. The discussion about v is essentially unchanged. Workers are risk neutral, and sometimes they end up in a job with benefits, while other times they end up in one with no benefits.

Figure 1



Due to an increase in enforcement, labor costs for the employer in the primary sector increase from W_p to $W_p + T$, where T refers to contributions to the severance pay fund, as well as safety and health costs, which are now enforced.

Figure 3

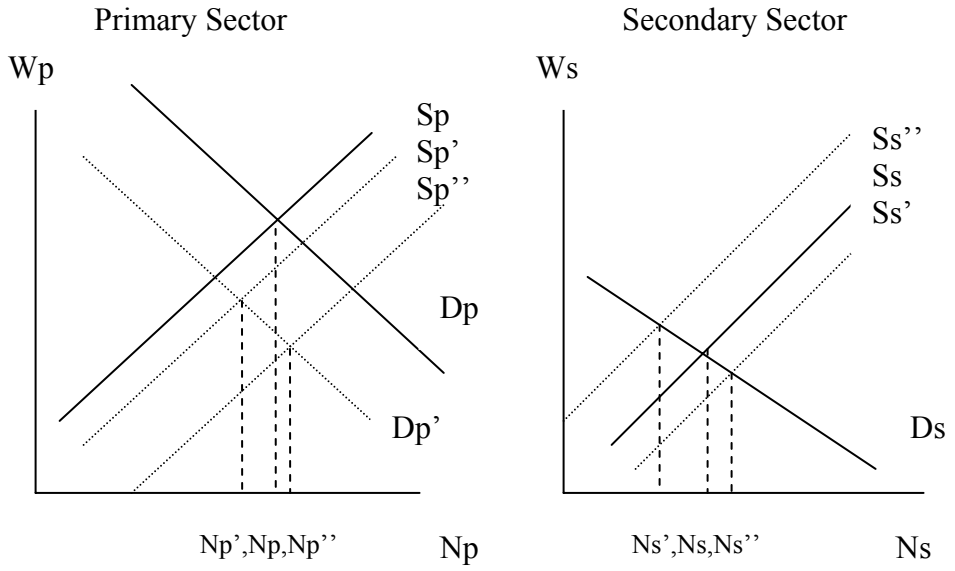


Figure 3 shows the predicted consequences of an increase in enforcement in our model. First, there is a contraction in labor demand in the primary sector from D_p to $D_{p'}$. The difference

in the height of the two curves is exactly T. Labor supply in the primary sector expands in response, because the value of working in this sector increased from W_p to $W_p + vT$. The size of the expansion depends on v.

The simplest case has v = 1, in which case nothing happens in the labor market. Firms and workers are happy to stay in the old equilibrium, just by reshuffling the relative sizes of T and W_p in the compensation package. Even though we do not graph it in the figure, this would correspond to the case where the labor supply curve to the primary sector (Sp) shifts down exactly by T, so that the new equilibrium quantity is exactly equal to the old one (N_p in the figure), and there is no change in the secondary sector (nor in the unemployment rate).

If v < 1 then Sp shifts down but by less than T. If the wage in the secondary sector were constant, we would have a decrease in the primary sector wage and employment. Say the new supply curve is given by Sp'. Notice that, as long as $N_{p'} < N_p$ and we are on the supply curve, we have $W_{p'} + vT < W_p$ since the difference between Sp and Sp' is vT. This decrease in the value of working in the primary sector leads to an expansion in the labor supply of the secondary sector (since U is fixed by assumption). The new equilibrium is at (Wp',Np',Ws',Ns').

Alternatively, suppose v>1. In this case the expansion in Sp is so large that, in equilibrium, there is a contraction in Ss. Intuitively, the workers value the increase in T very highly, and are willing to leave the secondary sector to benefit from it.

This can be shown more formally. For simplicity, assume that:

$$D_p = a - b(W_p + T) \qquad (9)$$

$$D_s = c - d * W_s \qquad (10)$$

$$(1 - U)(W_p + vT) = W_s \qquad (11)$$

$$N_p + N_s + N_u = N \qquad (12).$$

where $U = N_u/(N_p + N_u)$, and a and b are parameters of the labor demand in the primary sector and c and d are parameters of the labor supply in the secondary sector. For simplicity, U is assumed to be constant ($0 < U < 1$).

In equilibrium, $D_p = N_p$ and $D_s = N_s$. This implies that:

$$W_p = \frac{c - N + \frac{a}{1-U} - T\left(d(1-U)v + \frac{b}{1-U}\right)}{\frac{b}{1-U} + d(1-U)}$$

$$W_p + T = \frac{c - N + \frac{a}{1-U} + Td(1-U)(1-v)}{\frac{b}{1-U} + d(1-U)}$$

$$W_s = (1-U)\frac{c - N + \frac{a}{1-U} - T\frac{b}{1-U}(1-v)}{\frac{b}{1-U} + d(1-U)}$$

Finally, $\frac{dW_p}{dT} < 0.$

If $v < 1$, then $\frac{d(W_p + T)}{dT} > 0, \frac{dW_s}{dT} < 0, \frac{dN_p}{dT} < 0, \frac{dN_s}{dT} > 0.$

If $v = 1$, then $\frac{d(W_p + T)}{dT} = 0, \frac{dW_s}{dT} = 0, \frac{dN_p}{dT} = 0, \frac{dN_s}{dT} = 0.$

If $v > 1$, then $\frac{d(W_p + T)}{dT} < 0, \frac{dW_s}{dT} > 0, \frac{dN_p}{dT} > 0, \frac{dN_s}{dT} < 0.$

Given that individuals are homogeneous in this model there is not much we can say about inequality. Still, notice that the wage gap between the primary and secondary sector is given by:

$$Wp - Ws = -Tv\left(1 - \frac{\frac{b}{1-U}U}{\frac{b}{1-U} + d(1-U)}\right) - T\frac{\frac{b}{1-U}U}{\frac{b}{1-U} + d(1-U)} + U\frac{c - N + \frac{a}{1-U}}{\frac{b}{1-U} + d(1-U)}.$$

Therefore, the primary-secondary wage differential always decreases with enforcement:

$$\frac{d(Wp - Ws)}{dT} = -v\left(1 - \frac{\frac{b}{1-U}U}{\frac{b}{1-U} + d(1-U)}\right) - \frac{\frac{b}{1-U}U}{\frac{b}{1-U} + d(1-U)} < 0, \quad \text{since} \; 1 - \frac{\frac{b}{1-U}U}{\frac{b}{1-U} + d(1-U)} > 0 \quad \text{where}$$

(0<U<1). This is a very interesting parameter for our study, since the formal and informal wage premium is empirically an important source of inequality (IPEA, 2006).

There may be several omissions from the model. First, it does not consider linkages in labor demand across sectors. Relaxing this assumption would imply that labor supply can

increase in the formal sector even with $v < 1$.[16] Second, enforcement is assumed not to affect labor costs in the secondary sector, which would happen if these firms were fined for using unregistered workers. In that case, there would also be a contraction in labor demand in the informal sector, which would increase further the shift towards formality, dampening the increase in informal sector wages. Third, the household sector is not considered and unemployment is modeled in a very simplistic way. Fourth, migration is also not taken into account. Migration flows may well respond to changes in the labor market. In principle, migration would tend to make price movements less pronounced and quantity movements more pronounced than otherwise, since prices would be fixed in a national market and quantities would adjust in each city to clear the market. Fifth, individuals are considered to be homogeneous. Adding heterogeneity and self selection, as in a standard Roy model, would be very useful, but would not change the main story line of the paper. Sixth, we ignore the possibility of bribes. In their simplest form, bribes can be seen as a labor costs that need to be paid if the employer decides to disobey the law, in which case most of our analysis would go through with v=0 (since bribes would be of no value for the employee).

4. Data

In the empirical work we use alternative sources of data. First, we use administrative data on the enforcement of labor regulations (in 2002), collected by the Secretary of Inspections at the Ministry of Labor. This data contains information on the number and location of regional labor offices, number of inspected firms, number of fines issued in each city and on the number of inspectors per state. Our measure of enforcement will be the log number of inspections in each city minus the log of the number of firms in the city (i.e., log inspections per firm in the city).[17]

Second, we compute several city level labor market indicators, using a 10% sample of the Brazilian population census in 2000, which contains detailed information on labor market outcomes for 15 million individuals. In particular, we compute the share of individuals in the

[16] This would imply augmenting the demand functions so that $D_p = a - b(W_p + T) + cW_s$ and $D_s = e - f * W_s + g(W_p + T)$ and solve the system.

[17] We take the number of firms in each city in 2002 from the *Cadastro Central de Empresas*, collected by the *Instituto Brasileiro de Geografia e Estatistica* (*IBGE*), which only includes formal firms.

primary and secondary sectors, share of unemployed, average wages in the primary and secondary sectors and measures of income and wage inequality in the city (including several percentiles of the income and wage distributions, and the city 90-10 income and wage ratio). We also compute similar statistics for individuals in different gender, age and education groups.

In the 2000 Census, each individual is classified into one of the following 10 categories: registered domestic worker, unregistered domestic workers, registered wage earner, unregistered wage earner, employer, self-employed, unpaid apprentice, unpaid employee (usually in family business), working for self-consumption, and without status (or not employed). Table A2 reports the proportion of the adult population in each employment category. Registered and unregistered wage earners, self-employed, and non-employed individuals, together account for 90% of the adult population. Therefore, in the empirical work we will focus on these four groups. Informal employment and self-employment are considered two separate categories, as emphasized in the recent literature (Maloney, 2004, Fields, 1990, 2005). Although in some empirical results we will consider them together, in most of the paper they are analyzed separately.

In the census, we also observe the worker's gender, average years of schooling and age. Since we know in which city the household is located, we can compute means and quantiles of the variables of interest at the city level. All city level statistics are obtained using weights. There are 5,513 cities in Brazil in 2002. We have also computed some measures of past informality, poverty and inequality in the city using the 1980 Brazilian census.[18]

Third, we use detailed information on other city level outcomes of interest from two major statistical and research institutes in Brazil - *Instituto de Pesquisa Economica Aplicada* (IPEA), and *Instituto Brasileiro de Geografia e Estatistica* (IBGE).[19] In particular, we collect information on the city's GDP per capita (2000), total number of firms (2000), average firm size (2000), share of agriculture in GDP (2000), share of manufacturing in GDP (2000), share of services in GDP (2000), geographical city characteristics (including geographical area, altitude, longitude and latitude), city transportation costs (1995) and total federal transfers to each city

[18] In the 1980 Census there is no information on the whether the worker has an official work permit. Rather the survey collects information on whether the worker makes social security contributions. Hence, in 1980 the definition of informal worker differs slightly from the one used in 2000. In 1980 a worker is considered informal if he/she do not make any social security contributions.

[19] All these statistics are available online at http://www.ipeadata.gov.br and http://www.sidra.ibge.gov.br/.

(1990), the city head count poverty index and the city Theil inequality index. We also use past city level data published by IPEA for the years 1970, 1980 and 1991. These variables include city population, per capita income, average years of schooling and share of population in urban areas. Because some of the cities in 2000 did not exist in the 70's, 80's or even 1991, we use the more aggregate definition of minimum comparable unit (MCU), published by the IPEA, to obtain an estimate of these city variables in previous years.[20] In particular, for all cities in a given year, we know to which MCU each city was previously mapped into. Therefore, for each MCU we computed the average value of each variable (weighted by population size in each city), and we assigned it to each city in the MCU.

Fourth, we use information on the institutional development of the city, published by IBGE, used in Naritomi, Soares and Assuncao (2007), and kindly provided by the authors. These measures include information on the access to justice in the city, an index of managerial capacity in the city and an index of political concentration in the city (based on a Hirshman-Herfindhal index of the shares of the political parties). The index of managerial capacity in the city measures the quality of local administration, and is used by the Ministry of Planning to monitor the administrative performance of cities. Access to justice in the city is also an index which measures the penetration of the rule of law, in particular the existence of courts or justice commissions in the city. We also consider state aggregates of these variables at the state level, by averaging across cities.

Fifth, we compute the distance and travel time (by car) between each city and the nearest *subdelegacia* in the state. The transportation of inspectors from the *subdelegacia* to each firm is made using ground transportation, usually car. Hence, enforcement of the regulation will be easier and less costly, the closer a *subdelegacia* is from the city where the firm is located. We construct a measure of the accessibility of inspectors to firms by using the travel time from each city to the nearest *subdelegacia* within the state (minimum distance). Data on travel times and travel distances between any two Brazilian cities is available from one of the largest Brazilian auto insurance companies (BB), which collects very detailed information on distances across

[20] In 1970 and 1980 there existed 71% and 72% of the cities that existed in 2000, while in 1991 there existed 82% of the cities in 2000. A MCU is an area (set of cities) which is defined in such a way that can be compared over time.

cities.[21] When firms are located in cities that have a *subdelegacia* the measure assumes the value zero. We also construct the distance between each city and the capital city within the state. In the remaining of the paper we focus on travel time as the most relevant measure of distance. The index of transportation costs between each city and the nearest capital city is taken from IPEA (1995). Sample statistics for the main variables we use are presented in table 1.

5. Empirical Strategy

Ideally, we would like to estimate the model of section 3, augmented with worker heterogeneity and a model for the choice of employment sector (as in Marrufo, 2001). Unfortunately, it is impossible for us to estimate such a model, because while we have some data on plausibly exogenous shifters for labor demand, we do not have them for labor supply and for the choice of sector. In our mind, the next best thing is to be as detailed as possible in describing the way the labor market is working. Therefore, we document not only the effect of enforcement on outcomes such as unemployment and inequality, but also on the structure of the labor market described by the proportion of workers who are formal, informal, or self-employed, and the distribution of wages for each of these groups.

Our main empirical specification is the following:

$$Y_{ij} = \alpha + \beta E_{ij} + \delta X_{ij} + \eta_j + u_{ij} \qquad (5)$$

where Y_{ij} is the outcome of interest in city i and state j, E_{ij} is enforcement in city i and state j, X_{ij} is a vector of city level controls, η_j is a state fixed effect, and u_{ij} is the residual. β is the parameter of interest and measures the impact of enforcement on outcomes. The main outcomes (Y_{ij}) we consider are the share of informal workers in the city, poverty, inequality and unemployment in the city, and several other labor market variables at the city level. Enforcement (E_{ij}) is measured with the log of the number of inspections per firm in the city (computed as the number of visits by labor inspectors plus one, divided by the number of firms in the city).

[21] This information is freely available online at www.bbseguroauto.com.br. We faced two obstacles in the computation of distances. First, some cities have only very recently become cities and we could not locate them with the information available online. We have used maps to find the city nearest to the one we wanted and used that information as an approximation. Second, the majority of cities in the Amazonas state use the maritime rather than the ground transportation both for goods or persons. Hence, the travel distance by car is meaningless for this state. For this reason, we have excluded Amazonas from the analysis.

E_{ij} is potentially correlated with u_{ij}, which implies that we cannot equation (5) using ordinary least squares. This happens for two main reasons. First, enforcement may be stricter in cities where violations of labor law are more prevalent. This would be a natural consequence of the way inspections are triggered, mainly through reports of illegal activity. Second, enforcement may be stricter in cities where institutions are better developed. Both types of cities are likely to be special in several other attributes.

We would like to find an exogenous source of variation for enforcement. As explained in section 2, the enforcement of labor regulation in Brazil is fairly decentralized. The Ministry of Labor is the central institution responsible for the enforcement. However, in each state, there is a delegation of the Ministry located in the state capital and smaller sub-delegations in other locations. Some even lower level local offices (called *postos de atendimento*) are located in several other cities. Inspectors are assigned to these local offices, and travel by car to the surrounding cities to conduct inspections.

Two factors are likely to restrict the allocation of the inspection activity across different cities. One is the number of inspectors at each labor office. The other is the distance they have to travel to reach each city they wish to visit. Even though we do not have detailed data on the first variable, we do know how many inspectors were allocated to each state (probably, by the federal government), which we divide by the number of firms in the state to compute the number of inspectors per firm in the state. As for the second, we are able to compute travel time by car between each city and the nearest *subdelegacia* of the Ministry of Labor.[22] We also conjecture that these two variables interact: in states where there is an abundance of inspectors per firm distance is less of a constraint in determining which locations receive more or less visits.

Both these variables are exclusively related to labor inspections and it is difficult to imagine what other government activities could be directly affected either by the number of inspectors or by the travel distance to the labor office. However, three basic concerns remain concerning omitted variables. First, the location of the labor office may not be entirely random. To our knowledge, the location of most labor offices was decided no later than the 70s, and probably even earlier. In particular, it is possible that the Ministry of Labor decided to locate its local offices in regions where labor offenses were more prevalent at the time, although we must remember that inspection activity was fairly unimportant before the late 1980s, and perhaps even

[22] Our measure is based on travel time (not miles traveled) to account for differences in road quality.

before the late 1990s. Similarly, labor offices could have been located primarily in larger cities, with better institutions and where the recruitment of labor officials would be easier. Second, the allocation of inspectors across states by the federal government may not be random either. In particular, it is likely that more inspectors are allocated to states with more firms or with more offenses. The former would be immediately accounted for by our instrument (since we use inspectors per firm in the state). Next we propose several ways to adequately address the remaining concerns.

In order to explore only the exogenous variation in the variable distance, we need to account for the determinants of the location of labor offices and for indicators of the economic development of the city. In particular, we account for differences across cities in the income per capita, population size, average schooling, and share of the population living in urban areas for each city in 1970, 1980 and 1991.[23] Also, to capture the effects of distance to large markets and distance to central institutions, we include as control variable the travel time between each city and the state capital. State dummies are included in all the specifications.

In order to assess the role of these control variables, table 2 reports a simple exercise. Using data from the 1980 population census, we computed the percentage of informal workers (i.e., workers without social security contributions).[24] Column (1) reports a positive, large, and significant correlation between informality in the 80s and the distance to the nearest labor office. This either means that in 1980 labor inspections were already being effective (which, as explained above, is not likely), or that labor offices were not randomly located. The latter would be a source of concern. In the second column add the set of city characteristics cited above, plus state fixed effects. There is a large reduction in the coefficient, although it remains statistically significant. Finally, in column three we add distance to the state capital, and the coefficient of interest becomes extremely close to zero, and statistically insignificant. This implies that, whatever correlation existed between the location of labor offices and city level illegality in 1980, it is eliminated by the controls we include in the analysis. The fourth column adds another measure of distance to markets to the regression: the log of transport costs to the nearest capital.

[23] In order not to lose observations, if a city does not exist in a given year (because it was not created yet) we assign to it the average value of the variable in the relevant minimum comparable area (see section 4 for a description).

[24] Although not entirely consistent with the definition that we will use in the 2000 Census, this is the only information variable available in this dataset.

Again, the coefficient of interest is basically zero. All standard errors in this and the remaining tables of the paper are robust to the presence of heteroskedasticity.

Furthermore, any differences in city size or city development, or even in the growth of such variables, is accounted for in the set of controls we use, as is distance to markets. Still, in columns five and six of table 2 we use as dependent variables the average schooling in 2000 and the share of urban population in 2000, two variables which are associated with city development but, at least in the short run, are not directly affected by the labor market. We find no correlation between distance and both these variables.

Finally, in columns (7) and (8) we check whether distance is correlated with two measures of the city's institutional development, access to justice and governance. Although their correlation with distance is very small, it is still statistically significant. This implies that some spurious correlation between distance and institutional development is still present (since it is unlikely that labor inspectors strongly determine institutional development).

Therefore, instead of using distance directly as the instrument, we instrument enforcement with the interaction between the number of inspectors per firm in each state and the distance to the nearest labor office, while controlling for state fixed effects and distance. The use of state fixed effects in the regression accounts for the fact that states with different numbers of inspectors per firm may also be different in other dimensions, while distance accounts for the non-random location of enforcement offices. Any remaining variation is given by the differential effect of distance across states with varying abundance of inspectors. This type of empirical strategy is not novel, and it is reminiscent of a difference-in-difference approach where the first difference is across different distances and within state, and the second difference is across states with different levels of inspectors per firm. [25] Our assumption is that states with varying abundance of inspectors do not differ in the way they allocate public goods and transfers across cities located at different distances from the nearest enforcement office. Table 3 provides evidence in support of this assumption.

[25] A similar identification procedure is used by Rajan and Zingales (1998) who examine the effect of financial dependence on growth. Several difference-in-difference strategies (and other grouping estimators) account for location and time effects and implicitly instrument the variable of interest with the omitted interaction between location and time (e.g., see Meghir and Whitehouse, 1995).

The model includes as control variables the distance variable interacted with other state characteristics: the log of the average of per capita GDP in the state between 1970 and 2000, and three measures of city levels institutions averaged at the state level: access to justice, governance and political concentration. Other controls include distance to the state capital and log of transportation costs to the nearest capital interacted with the four variables above, and with the log of the number of inspectors per firm in the state. We expect these variables to absorb any remaining influence of state institutions and state characteristics on regional inequalities. More importantly, table 3 (which we now describe in detail) presents regressions of different variables on the instrument and shows that, after including this set of controls, the instrument is uncorrelated with measured city level institutions, transport infrastructure, social infrastructure, and general law enforcement.

The natural way to think of potentially confounding interactions between state variables, distance to large city centers, and our instrument, is to consider the role of state level policies to reduce regional inequality. One possibility is road construction, but since we measure distance in hours of car travel (not in miles), the quality of the road infrastructure is already accounted for. Alternatively, any type of transportation mean that is almost exclusively used for the transportation of goods in Brazil is the train. We investigated whether the interaction of distance and state inspectors per firm affected the likelihood of each city to have a train station. The coefficient is negative but statistically insignificant.

Another source of confounding interactions could arise if the variation in enforcement is simply capturing variation in the quality of the city institutions. In particular, if states with more inspectors per firm tried to minimize the impact of distance to focal cities on the access to institutions, this correlation would be present even after we instrument labor inspections. We proxy city level institutional quality using three indices: access to justice, governance, and political concentration. The empirical findings do not show evidence that this is a significant source of concern.

Third, we look at city level inequality in basic social infrastructure, measured by the log number of households with access to piped water, sanitation, and electricity (normalized by the number of individuals in the city). We find no correlation between the differential effect of distance across states with access to water and sanitation. There is a very small correlation with access to electricity, but it has the opposite sign to what one would expect if it were capturing

confounding variation in other state policies. Moreover, looking directly at the log of current transfers from states to cities (drawn from state tax revenues) per capita, we find no strong correlation between our instrument and this variable.

Fourth, we checked whether the instrument is correlated with the enforcement of other types of law measured by the number of homicides per 100,000 individuals in the city, and again found no statistically significant effect.

Fifth, the level of development of the state may itself be inequality reducing and could be correlated with the number of available inspectors per state. For example, in more developed states the quality of (private) transportation may be better so that roads are less of an obstacle, and goods and information may flow easily across cities, even if they are remote. This may affect the way economic activities are distributed across cities. The first thing to notice is that the instrument is not correlated with either city size (measured by log population) or log GDP per capita. More interestingly, when we use as the dependent variable the shares of GDP attributed to agriculture, industry and services, these are also not correlated with our instrumental variable. Therefore, the basic structure of economic activities in the city is not substantially affected by the variation we use to instrument enforcement, although (as we will show in the next section) the structure labor market will see some changes.

Finally, we show that the instrument cannot predict past values of the main variables of interest in this paper, namely, city level informality (the share of workers not paying social security), the unemployment rate, inequality (theil index), and the poverty rate measured in 1980.

Table 4 reports that the first stage relationship is strong. The table reports estimates for the coefficient on the instrument, and the average marginal effect of distance on enforcement. The relevant F-statistic measuring the strength of the first stage relationship is shown at the bottom of each column. Since we are using a large set of controls, for transparency we report three different specifications. In the first column we regress enforcement (measured by the log number of inspections per firm in the city) on distance to the nearest labor office (measured in travel time), its interaction with the number of labor inspectors per firm in the state (the instrument), and state fixed effects. In the second column we add distance to the state capital and its interaction with state inspectors per firm. In the third column we present the full specification. Across columns, the marginal effect of distance on enforcement is negative, and the coefficient on the interaction of distance and inspectors in the state is positive, showing that the effect of

distance is smaller in states with more inspectors. The coefficient on this interaction is similar across columns, and the F-statistic is always high so there is no concern of the instrument being weak (Stock and Yogo, 2003).

6. Empirical Findings

6.1 Main Results

Table 5 summarizes the main findings in the paper. There we report the least squares (panel A) and instrumental variables (panel B) estimates of the effect of the log of inspections per firm in the city on the share of informal workers in the city (desfined as those without a work permit and the self-employed), the head count poverty ratio in the city, the unemployment rate in the city and the Theil inequality index. The controls and instruments were described in detail in the previous section and are presented in the table's footnote.

The instrumental variable estimates show that a one unit increase in the log of inspections per firm in the city (a standard deviation increase) leads to a 15 percentage point (or one standard deviation) reduction in the proportion of informal workers in the city, a 9 percentage point (1.5 standard deviations) increase in the unemployment rate, a 0.12 point (one standard deviation) reduction in the Theil inequality index, and a 5 percentage point (0.25 standard deviations) reduction in the poverty rate.

The IV estimates are larger in absolute value than the OLS estimates. This suggests that cities with more crime also have stricter enforcement, which could happen because inspection activities respond to reports, and these are more common in places with more violations of the law. According to the model in section 3, cities with low compliance should have more informality and a higher formal premium (higher inequality). Furthermore, these cities are also more likely to have higher employment, either because fewer people become unemployed to search for a job in the formal sector, or because firms are less constrained.[26]

In line with the findings in Heckman and Pages (2004), our results show that strict regulation increase the unemployment rate severely. Theoretically this could happen either because firms are more constrained or because more individuals start searching in the formal sector. On the other end, as emphasized by Freeman (2007), enforcement is also associated with

[26] This cannot be extrapolated from the model in section 3 because there we keep unemployment fixed.

a strong reduction in inequality. Notice, however, that the effect on the poverty rate is fairly small. This could happen if there is no effect on the income of the poor, or if it is not large enough to lift them out of poverty.

Table A3 (in the appendix) shows that these results are robust to the inclusion of city sectoral composition and average firm size in the city as controls, two variables which may be correlated with the structure of the labor market in the city.

We investigate next what occurs in the labor market so that the reported changes in the unemployment and inequality take place. As suggested by the available evidence on the inspection process in Brazil, we assume that stricter enforcement of labor regulations is likely to affect mostly the compliance with mandated benefits, namely job severance payments, and health and safety regulations. Nevertheless, it is also conceivable that enforcement deters the employment of informal workers by punishing these types of violations.

6.2 Changes in the Labor Market

The model described in section 3, and which we use to interpret the evidence, describes an economy with a primary and a secondary working sector, and an unemployment sector. There is agreement in the literature that formal workers operate in the primary sector of the economy, but that there are two tiers of informal workers: one competing with formal workers in the primary sector, and another working in a secondary sector (Maloney, 2004, Fields, 1990, 2005). This is the view we take in interpreting our empirical results, although we cannot implement it rigorously in practice since we cannot distinguish upper and lower tier informal workers. There is a suggestion in the literature that unregistered workers belong in the lower tier, while part of self-employed workers are likely to be in the upper tier (e.g., Bosch and Maloney, 2006). Table A3 in the appendix gives further evidence on this.

We focus the analysis in four types of workers (non-employed, registered employees, unregistered employees, and self-employed), which together cover 90% of the adult population in Brazil in 2000. Tables 6 and 7 describe the main movements in the labor market. Table 6 shows the effect of enforcement on the share of the adult population in the city in each employment category, in 2000. In cities with a stricter enforcement of regulation there is more formal employment, more non-employment, and less self-employment. There is no statistically significant change in the number of informal wage earners. Table 7 examines movements in

average wages for employment category. It shows that a 1% increase in enforcement is associated with a reduction in the formal sector wages by 0.18% and an increase of 0.20% in the earnings of the self-employed. The reduction in the difference between the wages of formal workers and those of informal workers and self-employed workers is a force linking stricter enforcement with less inequality.

Using the model described in section 3, an increase in the enforcement of mandated benefits in the primary sector is consistent with an expansion of labor supply in the primary sector, a contraction in labor supply in the secondary sector, and a contraction in the demand for primary sector workers. This implies that wages decline in the primary sector and rise in the secondary sector. Our empirical findings show a decline in formal sector wages and a rise in self-employment earnings, but no rise in the wages of informal workers (perhaps because they are a marginal group of workers, isolated from the rest of the economy).

The predictions of the model with regard to quantities are more fragile because unemployment is not carefully modeled. Still, one simple version of the model accommodates the observed increase in formal employment if v (the valuation workers give to mandated benefits) exceeds 1. This is not implausible, since v is likely to be close to 1 for contributions to the severance fund, and may well be above 1 for health and safety regulations. Furthermore, there is a large literature (referred to on footnote 7) documenting a enormous rates of pass-through for social security taxes, which are potentially provide much less direct benefits to the workers than the mandated benefits we refer to here. A more complete model, allowing for non-zero cross wage elasticities, does not even require this condition ($v>1$) to explain the increase in informal employment. Furthermore, it is also possible that increased enforcement constrains the use of informal workers, further increasing the flow of workers to the formal sector.

Notice that these predictions are novel and surprising, since most of the literature argues that that more regulation leads to more informality. The crucial ingredients in our argument are that formal and informal labor markets are integrated (even if there are search frictions in the formal sector) and that mandated benefits are as much benefits for workers and costs for firms, and therefore encourage workers to join formal employment (see also Marrufo, 2001).

As mentioned before, even though unemployment is not explicitly model in section 3, it is simple to explain the decline in employment associated with more enforcement: on one end we have the standard argument emphasizing a contraction of labor demand; on the other end it may

also happen that more workers decide to become non-employed in search of a more attractive job in the formal sector.

6.3 Heterogeneity and Inequality

This final section analyzes individual heterogeneity to better understand our findings for inequality and poverty, and also to give us an insight on a very important topic: how do heterogeneous workers sort across the formal and the informal sectors? Table 8 looks beyond means (as reported in table 7) and focuses on quantiles of the wage distribution. The findings show an overall decline in wage inequality measured by the difference between the 90th and 10th percentiles of the log wage distribution. Within the formal sector there is a clear decline in wage inequality, but the estimates for the other two sectors are much smaller and statistically insignificant. One reason why this may be happening is that i) formal institutions (such as minimum wages or unions) prevent downward mobility in formal wages, especially at the bottom of the distribution, and that ii) the formal sector is the only one where prices fall in response to enforcement. The last two columns of the table are shown for completeness. They document that the decrease in inequality between groups is widespread, and robust to different groupings of individuals. In particular, when enforcement increases, the rural-urban premium falls by 0.39, and the education premium (the difference between log wages of those with 9 years of schooling and above and those with less than 9 years of schooling) falls by 0.25.

Inequality changes not only because there are movements in prices, but also because changes in the composition of individuals in each sector. In order to document this, table 9 reports how average schooling and inequality in schooling in each sector respond to increased enforcement. It documents that those individuals induced to shift into the formal sector have low levels of schooling when compared to those individuals already there, thereby increasing average schooling among the self-employed and decreasing it among formal workers. Notice that average schooling among informal employees also declines which suggests that this sector also undergoes some changes in its composition, even if total employment does not move.

Finally, table 10 reports that increases in non-employment induced by stricter enforcement are not uniform across the wage distribution. We group individuals in 6 groups, according to their position in the distribution of household per capita income: 0-10 percentile, 10-25, 25-50, 50-75, 75-90, and 90-100. It is striking that enforcement affects non-employment mostly for the poorest individuals in society. This is probably reflected in the incomes of the

poorest group and it may be behind the small observed decrease in poverty. Table 10 also reports that losses in employment are especially large among females and low skilled workers, two groups with special vulnerability, but not among young workers.

7. Conclusion

This paper studies the effect of an increase of enforcement of labor regulation on unemployment and inequality, using city level data from Brazil. We explore variation in the enforcement of labor market regulations using a new administrative dataset with information on the intensity of enforcement activity for all cities in Brazil. We use detailed micro data on the labor market, namely employment, formality, wages and inequality. This allows us to understand in detail the operation of the labor market and the contribution of labor market policy for inequality. We interpret our findings in light of standard multi-sector models of the labor market in developing countries, which integrate formal and informal sectors and unemployment in a single framework, and emphasize the links across them.

Our findings show that stricter enforcement (which affects mostly the cost of formal workers) leads to higher unemployment and to less inequality. We conjecture that stricter enforcement increases the firm's total labor costs and also the worker's non-wage benefits. Therefore, stricter enforcement leads to a decrease in the demand for formal workers but also leads to an increase in its supply and to a decrease in the supply of informal workers. Overall, there is an increase in unemployment and in the share of formal employment as well as a decrease in the formal wage premium (a major determinant of inequality). In sum, our results are consistent with regulations having important distributional effects (e.g., Freeman, 2007) as well as efficiency effects on the economy (e.g., Heckman and Pages, 2004). Therefore, well designed labor policy should take this trade-off into account.

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Table 1: Summary Statistics in the Sample

	Obs	Mean	S.D.	Min	Max.
	(1)	(2)	(3)	(4)	(5)
Log Inspected Firms per firm City	5,505	0.94	0.99	0.00	4.78
Log Inspectors per firm in the state	5,513	1.693	0.53	1.07	2.96
Distance to the nearest labor office (hours)	5,287	1.96	1.73	0.00	13.91
City distance to the State capital city (hours)	5,272	4.50	2.56	0.00	14.99
City transportation costs	5,495	5.89	0.78	0.39	8.69
City Latitude	5,507	-16	8	-34	5
City Longitude	5,507	46	6	32	73
City Altitude	5,507	412	293	0	1628
Log City Geografical Area	5,507	6.20	1.28	1.06	11.99
Access to Justice City	5,506	0.90	0.83	0.00	3.00
Governance City	5,505	3.17	0.91	1.00	5.85
Political Concentration City	5,504	0.23	0.10	0.07	1.00
Share Informal Workers City	5,507	0.74	0.17	0.22	1.00
Poverty Rate City	5,507	0.46	0.23	0.03	0.93
Unemployment Rate City	5,507	0.11	0.06	0.00	0.59
Theil Inequality Index City	5,507	0.52	0.11	0.19	1.27
Share Population Jobless	5,507	0.37	0.09	0.00	0.78
Share Population Formal Jobs	5,507	0.14	0.09	0.00	0.51
Share Population Informal Jobs	5,507	0.16	0.06	0.01	0.49
Share Population Self-Employed	5,507	0.20	0.09	0.00	0.70
Log wages in formal sector	5,497	5.93	0.35	3.69	7.65
Log wages in informal sector	5,507	5.73	0.42	4.47	7.38
Log wages self-employed	5,506	6.00	0.58	3.77	8.27
Log GDP per capita City	5,507	8.08	0.76	6.14	12.13
Log population City	5,507	9.36	1.11	6.68	16.16
Share migrants City	5,507	0.44	0.22	0.03	1.00
Log number firms City	5,505	5.09	1.52	0.00	13.05
Log Av. Firm size City	5,505	3.29	0.82	0.73	7.49
Share GDP Agriculture	5,492	0.29	0.19	0.00	0.86
Share GDP Manufacturing	5,507	0.20	0.17	0.00	0.95
Share GDP Services	5,507	0.52	0.16	0.03	0.97
Years schooling formal sector	5,504	6.18	1.42	0.00	11.16
Years schooling informal sector	5,507	5.29	1.39	1.52	10.80
Years schooling self-employed	5,506	4.45	1.59	0.32	10.29

Source: Brazilian Ministry of Labor (2002), Population census (2000).

Table 2: City characteristics and Enforcement of Labor Regulation Regulations

Dependent Variable:	Share Informal Workers (1980)	Share Informal Workers (1980)	Share Informal Workers (1980)	Share Informal Workers (1980)	Av. Years Schooling (2000)	% Urban Population (2000)	City Access to Justice Index (2000)	City Governance Index (2000)
Method:	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance to the nearest labor office (hours)	0.034	0.011	0.000	0.000	-0.002	-0.001	-0.021	-0.015
	[0.002]***	[0.001]***	[0.001]	[0.001]	[0.004]	[0.002]	[0.008]**	[0.009]*
City level characteristics in 91, 80 and 70	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State level dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City distance to the state capital city	No	No	Yes	Yes	Yes	Yes	Yes	Yes
City transportation cost nearest capital	No	No	No	Yes	Yes	Yes	Yes	Yes
Observations	5,287	5,271	5,256	5,245	5,245	5,245	5,244	5,243

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. The table reports the least squares estimates of the share of informal workers in the city in 1980 on the distance between each city and the nearest subdelegacia. Column (2) adds state fixed effects and the income per capita, population size, average schooling and share of population living in urban areas in each city in 1970, 1980 and 1991. Column (3) adds distance to the state capital city and column (4) adds the city transportation cost to the nearest capital.

Table 3: The Cost of Enforcement of Labor Regulation and City Level Outcomes

	N. Obs	Distance to the nearest labor office (hours) * Inspectors per firm in the state
	Method: OLS	
	(1)	(2)
Train Stations City (dummy)	5,242	-0.025
		[0.020]
Access to Justice City	5,244	-0.037
		[0.041]
Managerial Capacity City	5,243	-0.035
		[0.041]
Political Concentration City	5,243	-0.002
		[0.004]
Households Piped Water pc City	5,242	-0.014
		[0.041]
Households Sanitation pc City	5,242	-0.001
		[0.078]
Households Electricity pc City	5,242	-0.02
		[0.011]*
Current Transfers from State to City	4,518	0.044
		[0.063]
Homicide Rate City	5,242	-0.067
		[0.074]
Log Population City	5,242	-0.039
		[0.032]
Log GDP pc City	5,242	0.022
		[0.025]
Share Agriculture in GDP City	5,228	0.002
		[0.007]
Share Manufactiring in GDP City	5,242	-0.007
		[0.008]
Share Services in GDP City	5,242	0.006
		[0.007]
Share Informal Workers City (1980)	5,242	-0.004
		[0.005]
Unemployment Rate City (1980)	5,242	0.002
		[0.001]*
Theil Index City (1980)	5,242	0.008
		[0.006]
Poverty Rate City (1980)	5,242	0.002
		[0.004]

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. The table reports the least squares estimates of each of the variables reported in each row on the distance to the nearest labor office (hours) interacted with the number of labor after controlling for all the variables as in column (3) of table 3. Households with piped water, sanitation and electricity are measured with the logarithm of number of households with these amenities normalized by the total number of individuals in the city. When not reported variables refer to either 2000 or 2002 depending on the availability. More details on the construction of the variables are provided in section 4 of the paper.

Table 4: Labor Inspections and City Level Distance to the Enforcement Offices

Dependent Variable:	Log Inspected Firms per firm in city	Log Inspected Firms per firm in city	Log Inspected Firms per firm in city
Method:	OLS	OLS	OLS
	(1)	(2)	(3)
Distance to the nearest labor office (hours) * Inspectors per firm in the state	0.068	0.139	0.183
	[0.017]***	[0.026]***	[0.048]***
City distance to the nearest labor office (Average Marginal Effect)	-0.237	-0.156	-0.095
	[0.012]***	[0.015]***	[0.015]***
City distance to the nearest labor office (hours)	Yes	Yes	Yes
City distance to the nearest labor office squared	Yes	Yes	Yes
City distance to the nearest labor office (hours) * State Level Institutional Quality	No	No	Yes
City distance to the State capital city (hours)	No	Yes	Yes
City distance to the State capital city squared	No	Yes	Yes
City distance to the State capital city (hours) * Inspectors per firm in the state	No	Yes	Yes
City distance to the State capital city (hours) * State Level Institutional Quality	No	No	Yes
City transportation costs	No	No	Yes
City transportation costs squared	No	No	Yes
City transportation costs * Inspectors per firm in the state	No	No	Yes
City transportation costs * State Level Institutional Quality	No	No	Yes
City Institutional quality	No	No	Yes
City altitude, latitude and longitude	No	No	Yes
State level dummies	Yes	Yes	Yes
City level characteristics in 91, 80 and 70	No	No	Yes
Observations	5,284	5,269	5,240
R squared	0.22	0.24	0.37
F-test (H0: Distance to the nearest labor office (hours) * Inspectors per firm in the state = 0)	15.95	28.82	14.65

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. The table reports the least squares estimates of the log of the share of inspected firms per firm in the city on the distance to the nearest labor office (hours) interacted with the number of labor inspectors in the state, controlling for state level dummy variables and several city level characteristics. City level characteristics include distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. The variables capturing institutional quality include access to justice, political concentration, management quality in public administration and the GDP per capita. City transportation cost captures the monetary transportation cost between each city and the nearest capital city in 1995. City characteristics in 1991, 1980 and 1970 include logs of total population, per capita income, average years of schooling and share of population in urban areas. All the variables are defined in the appendix.

Table 5: Enforcement of Labor Regulation and City Level Efficiency and Equity Indicators (2000)

Dependent Variable:	Share Informal Workers	Poverty Rate	Unemployment Rate	Inequality Index
	(1)	(2)	(3)	(4)
Panel A: OLS				
Log Inspected Firms per firm in city	-0.018	-0.009	0.003	-0.008
	[0.002]***	[0.001]***	[0.001]***	[0.002]***
Observations	5,240	5,240	5,240	5,240
Panel B: IV				
Log Inspected Firms per firm in city	-0.150	-0.052	0.093	-0.119
	[0.043]***	[0.023]**	[0.026]***	[0.043]***
Observations	5,240	5,240	5,240	5,240

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Panel A reports the estimates of the city variables reported in each column on the log of the inspected firms per firm in the city, controlling for state level dummy variables and several city level characteristics. Panel B reports the instrumental variable estimates using city distance to the nearest labor office interacted with the number of state level inspectors per firm as instrument. City level characteristics include distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. It also includes the city level controls for income per capita, population, av schooling and share of urban population in 1991, 1980 and 1970.

Table 6: Enforcement of Labor Regulations and Employment Composition in the City

	No Job Status (Unemployed and Out of the Labor Force)	Formal Wage Earners	Informal Wage Earners	Self Employed
	(1)	(2)	(3)	(4)
		Panel A: OLS		
Log Inspected Firms per firm in city	0.001	0.01	0.002	-0.006
	[0.001]	[0.001]***	[0.001]*	[0.001]***
Observations	5240	5240	5240	5240
		Panel B: IV		
Log Inspected Firms per firm in city	0.065	0.062	0.018	-0.097
	[0.028]**	[0.021]***	[0.017]	[0.032]***
Observations	5,240	5,240	5,240	5,240

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Panel A reports the least squares estimates of each city level variable reported in each column on the log of the inspected firms per firm in the city, controlling for state level dummy variables and several city level characteristics. Panel B reports the instrumental variable estimates using city distance to the nearest labor office interacted with the number of state level inspectors per firm as instrument for the log of inspected firms per firm in the city. City level characteristics include the distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. It also includes the city level controls for income per capita, population, av schooling and share of urban population in 1991, 1980 and 1970.

Table 7: Enforcement of Labor Regulations and City Average Wages, by Employment Status

	All Wage Earners	Formal Wage Earners	Informal Wage Earners	Self-employed	Wage Premium Formal-Informal	Wage Premium Formal-S.E.
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: OLS			
Log Inspected Firms per firm in city	0.004	-0.006	0.006	0.013	-0.012	-0.019
	[0.004]	[0.004]	[0.004]	[0.006]**	[0.005]**	[0.007]***
Observations	5,240	5,230	5,240	5,239	5,230	5,229
			Panel B: IV			
Log Inspected Firms per firm in city	0.045	-0.180	0.080	0.199	-0.261	-0.385
	[0.071]	[0.089]**	[0.075]	[0.097]**	[0.119]**	[0.144]***
Observations	5,240	5,230	5,240	5,239	5,230	5,229

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Panel A reports the least squares estimates of each city level variable reported in each column on the log of the inspected firms per firm in the city, controlling for state level dummy variables and several city level characteristics. Panel B reports the instrumental variable estimates using city distance to the nearest labor office interacted with the number of state level inspectors per firm as instrument for the log of inspected firms per firm in the city. City level characteristics include distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. It also includes the city level controls for income per capita, population, av schooling and share of urban population in 1991, 1980 and 1970.

Table 8: Enforcement of Labor Regulations and the Distribution of Wage Inequality in City

	Percentile90/Percentile10				Wage Premiums	
	All Wages	Wages Formal Workers	Wages Informal Workers	Wages Self-Employed Workers	Urban-Rural	Schooling
	(1)	(2)	(3)	(4)	(7)	(8)
			Panel A: OLS			
Log Inspected Firms per firm in city	-0.042	-0.023	-0.016	-0.028	-0.005	0.002
	[0.006]***	[0.007]***	[0.007]**	[0.007]***	[0.007]	[0.007]
Observations	5,240	5,230	5,240	5,239	5,185	5,240
			Panel B: IV			
Log Inspected Firms per firm in city	-0.374	-0.433	0.072	-0.117	-0.391	-0.247
	[0.129]***	[0.152]***	[0.121]	[0.120]	[0.169]**	[0.130]*
Observations	5,240	5,230	5,240	5,239	5,185	5,240

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Panel A reports the least squares estimates of each city level variable reported in each column on the log of the inspected firms per firm in the city, controlling for state level dummy variables and several city level characteristics. Panel B reports the instrumental variable estimates using city distance to the nearest labor office interacted with the number of state level inspectors per firm as instrument for the log of inspected firms per firm in the city. City level characteristics include distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. It also includes the city level controls for income per capita, population, av schooling and share of urban population in 1991, 1980 and 1

Table 9: Enforcement of Labor Regulations and the Schooling Distribution, by Employment Status

	Average Years of Schooling				Inequality in Years of Schooling			
	No Labor Market Status	Formal Workers	Informal Workers	Self Employed Workers	No Labor Market Status	Formal Workers	Informal Workers	Self Employed Workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A: OLS				
Log Inspected Firms per firm in city	-0.003	-0.094	-0.052	0.025	0.017	0.036	0.032	0.089
	[0.007]	[0.018]***	[0.014]***	[0.011]**	[0.029]	[0.024]	[0.026]	[0.030]***
Observations	5,240	5,237	5,240	5,239	5,237	5,240	5,240	5,239
				Panel B: IV				
Log Inspected Firms per firm in city	-0.058	-1.208	-0.510	0.604	-1.102	0.319	0.705	1.201
	[0.117]	[0.438]***	[0.307]*	[0.225]***	[0.587]*	[0.395]	[0.504]	[0.552]**
Observations	5,240	5,237	5,240	5,239	5,237	5,240	5,240	5,239

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Panel A reports the least squares estimates of each city level variable reported in each column on the log of the inspected firms per firm in the city, controlling for state level dummy variables and several city level characteristics. Panel B reports the instrumental variable estimates using city distance to the nearest labor office interacted with the number of state level inspectors per firm as instrument for the log of inspected firms per firm in the city. City level characteristics include distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. It also includes the city level controls for income per capita, population, av schooling and share of urban population in 1991, 1980 and 1970.

Table 10: Enforcement of Labor Regulations and Non-Employment by Income and Vulnerability Groups

	Share Individuals Out of the Labor Force, by Income and Vulnerability Groups								
	Percentile 0-10	Percentile 10-25	Percentile 25-50	Percentile 50-75	Percentile 75-90	Percentile 90-100	Females	Low Educated Workers	Younger Workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Panel A: OLS				
Log Inspected Firms per firm in city	0.008	0.005	0.001	-0.001	-0.005	-0.001	0.002	0.001	-0.001
	[0.002]***	[0.001]***	[0.001]	[0.001]	[0.001]***	[0.001]	[0.002]	[0.002]	[0.001]
Observations	5,240	5,131	5,238	5,240	5,240	5,240	5,240	5,240	5,240
					Panel B: IV				
Log Inspected Firms per firm in city	0.115	0.096	0.052	0.006	0.002	-0.010	0.074	0.083	0.065
	[0.037]***	[0.034]***	[0.023]**	[0.018]	[0.018]	[0.019]	[0.034]**	[0.033]**	[0.029]**
Observations	5,240	5,131	5,238	5,240	5,240	5,240	5,240	5,240	5,240

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Panel A reports the least squares estimates of each city level variable reported in each column on the log of the inspected firms per firm in the city, controlling for state level dummy variables and several city level characteristics. Panel B reports the instrumental variable estimates using city distance to the nearest labor office interacted with the number of state level inspectors per firm as instrument for the log of inspected firms per firm in the city. City level characteristics include distance to the nearest labor office, its square and interactions with state level measures of institutional quality, distance to the state capital city, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city transportation costs, its square and interactions with the number of inspectors per firm in the state and interactions with state level measures of institutional quality, city altitude, city latitude and city longitude. It also includes the city level controls for income per capita, population, av schooling and share of urban population in 1991, 1980 and 1970.

Table A1: Proportion of Labor Market Fines in the City (2002)

	Obs	Average	SD
	(1)	(2)	(3)
Worker's Formal Registration	1,453	0.22	0.31
Mandatoty Work Period	1,453	0.10	0.20
Mandatory Work Pause Period	1,453	0.09	0.17
Wage	1,453	0.09	0.18
FGTS Contributions	1,453	0.26	0.32
Other (incl. Health, Security Restrictions)	1,453	0.23	0.29

Source: Brazilian Ministry of Labor (2002)

Table A2: City Employment Composition

	Obs.	Share Total Population
	(1)	(2)
Domestic worker with formal work permit	5,507	0.008
Domestic worker without formal work permit	5,507	0.025
Employee with work permit	5,507	0.137
Employee without work permit	5,507	0.163
Employer	5,507	0.015
Self-Employed	5,507	0.196
Unpaid apprentice	5,507	0.001
Unpaid employee	5,507	0.036
Worker self-consumption	5,507	0.046
No employment status	5,507	0.373

Source: Brazilian Ministry of Labor (2002)

Table A3: Distribution of City Wages by Employment Status

	Percentile 10	Percentile 50	Percentile 90
	(1)	(2)	(3)
Formal Wage Earners	5.03	5.60	6.51
Informal Wage Earners	4.52	5.34	6.37
Self-employed	4.35	5.40	6.69

Table reports moments of the wage distribution for the formal wage earners, informal wage earners and self-employed, respectivley.

Table A4: Robustness on Enforcement of Labor Regulation and City Level Efficiency and Equity Indicators (2000)

Dependent Variable:	Share Informal Workers	Poverty Rate	Unemployment Rate	Inequality Index
	(1)	(2)	(3)	(4)
Panel A: OLS				
Log Inspected Firms per firm in city	-0.013	-0.008	0.003	-0.008
	[0.002]***	[0.001]***	[0.001]***	[0.002]***
City Sector GDP composition	Yes	Yes	Yes	Yes
City Firm and Worker characteristics	Yes	Yes	Yes	Yes
Observations				
Panel B: IV				
Log Inspected Firms per firm in city	-0.132	-0.058	0.076	-0.131
	[0.040]***	[0.022]***	[0.022]***	[0.043]***
City Sector GDP composition	Yes	Yes	Yes	Yes
City Firm and Worker characteristics	Yes	Yes	Yes	Yes
Observations				

Standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. Table reports the same specifications as in table 6 but includes additional city level controls to capture the city's sector composition as well as firm and worker characteristics. City sector GDP composition includes the city's share of GDP in agriculture, industry and services. City firm and workers characteristics include av. age, share females, share migrants and av. firm size in the city.