

# **Do Payroll Tax Breaks Stimulate Formality?**

## **Evidence from Colombia's Reform**

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### **Abstract**

Alternative work arrangements have grown rapidly around the world. In Latin America, these alternative work arrangements have long been part of the labor market and have continued to grow. The informal sector grew rapidly in Latin America over the past few decades comprising up to half of the working population in many countries. Some attribute the growth in alternative work arrangements and informality to regulations and taxes, while others argue that it is precisely the lack of enforcement of regulations that allows unprotected employment arrangements to flourish. We examine whether reducing taxes associated with employment stimulates formal sector employment. We exploit the fact that the Tax Reform introduced in Colombia in 2012 affected only certain types of workers and not others. In particular, workers earning less than 10 minimum wages (MW) and self-employed workers with more than 2 employees experienced a reduction of payroll taxes of 13.5% between 2013 and 2014. We use the Colombian Household Surveys, Social Security records and the Monthly Manufacturing Sample to conduct difference-in-difference analyses of the reform. We find evidence of increased formal employment for the affected groups after the reform using all three datasets. We find that the probability of formal employment and the likelihood of transitioning into registered employment increased for the affected groups after the reform. We also find that the level and share of permanent employment relative to temporary employment grew after the reform for those earnings less than 10 MW. The results are greatest for those in smaller firms and for those earnings close to the MW.

**JEL Codes:** H2, J2, J24, and J31.

**Keywords:** Payroll taxes, Informality, Tax reform, Permanent employment.

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## 1. Introduction

Latin America and other developing regions depend on payroll taxes to finance pensions, disability and maternity benefits, and worker's compensation for those suffering from workplace injuries. In the case of Colombia, payroll taxes are also used to finance the National Vocational Training Service (*Servicio Nacional de Aprendizaje*, SENA, in Spanish) and the Colombian Institute for Family Welfare (*Instituto Colombiano de Bienestar Familiar*, ICBF, in Spanish). Until very recently, mandatory contributions in Colombia were close to the European median, where the payroll tax rate was about 40 percent (Gill et al., 2005). However, payroll contributions are much higher compared to countries with relatively less regulated labor markets, such as the United Kingdom and the United States, where contributions have fluctuated between 15 and 20 percent of total compensation (OECD, 2015).

In Latin America and continental Europe, high payroll taxes increase the labor costs that companies have to pay, thus discouraging companies from hiring workers. Nonetheless, from a theoretical perspective, the impact of payroll taxes on the labor market is ambiguous. On one hand, when workers value the benefits paid for with payroll taxes as much as the amount they contribute, increases in payroll taxes should be fully passed through from companies to employees in the form of lower salaries, with a neutral effect on unemployment. Consequently, in this case, employers would not experience increases in their overall labor costs. On the other hand, if wages are not fully flexible or if payroll taxes fund services that do not directly benefit all employees (such as SENA or ICBF), then wages would not absorb the total payroll taxes as lower wages and there would be an increase in labor costs and a reduction in employment.

Empirical studies from various countries show mixed evidence regarding the impact of payroll taxes on employment and wages. For instance, Gruber and Krueger (1991) and Gruber

(1994) find neutral effects on employment in the United States (i.e., full pass-through of taxes onto wages). Gordon (1972) also finds full pass-through taxes onto wages and no impact on employment in the United States. Nevertheless, Vroman (1974) and Harmermesh (1979) find that there is partial pass-through with non-neutral effects on wages and employment. Kaestner (1996) finds that there is no pass-through from payroll taxes onto wages for young workers in the United States.

In most Latin American countries, minimum wages are relatively high and constitute a binding restriction on formal sector employment (see, for example, Maloney et al., 2004). As a result, in this context, it is not feasible to pass-through higher payroll taxes to employees as lower wages, so it is more likely that increases in payroll taxes reduce formal employment. Gruber (1997) finds that a reduction in payroll taxes is completely passed-through to employees in the form of higher wages, without an impact on employment, in Chile. By contrast, Kugler and Kugler (2009) find that a 10 percent increase in payroll taxes reduces manufacturing employment by five percent among the least skilled workers. In this context, the increase in payroll taxes was not transferred to employees through lower wages. This finding is consistent with evidence provided by Maloney et al. (2004) that the minimum wage was binding in Colombia at the time.

In the current study, we explore the effects of the recent drop in the payroll tax rate associated with the Tax Reform, Law 1607, implemented at the end of 2012. The goal of this reform was to increase employment and, in particular, formal employment. As a result, in this study we focus on evaluating the impact of the reform on formal employment. Although the effects of changes in payroll taxes have already been studied in the Colombian context, it is important to study the effects of this particular reform for two reasons. First, the effects of changes in payroll taxes are likely to be asymmetric depending on whether there is a hike or a

decline. Due to a binding minimum wage, it is more feasible for a reduction in payroll taxes to be passed-through to employees as higher wages than for an increase in payroll taxes to be passed through to employees as lower wages. On the other hand, changes in the tax rate would have larger effects on employment if the taxes were used to finance services that do not directly benefit contributors and that, as a result, cannot be passed-through to workers' wages.

In Colombia, the link between benefits and contributions was relatively weak before the introduction of Law 1607. This made workers less willing to accept the lower wages offered by employers in response to increases in non-wage labor costs. As Kugler and Kugler (2009) show this implies that there is less formal employment and, consequently, it becomes harder to find a formal sector job. Kugler and Kugler (2009) provide evidence that reductions in payroll taxes – often proposed to stimulate demand for low-wage labor – are an effective measure to reduce unemployment and informality among young and low-skilled workers, especially if the tax cuts are focused on indirect benefits (like SENA and ICBF).

The analysis in this paper examines the effects of Law 1607, which reduced payroll taxes for those with less than 10 minimum wages and for self-employed who hired two employees or more. These are the two groups that qualify for payroll tax reductions under the reform. The analysis exploits the fact that specific groups of employers and employees were affected by the reform to estimate the impact of the reduction in the payroll tax using a quasi-experimental evaluation design. The analysis consists of comparisons of the following two pairs of groups: (i) workers with fewer and more than 10 minimum wages, before and after the reform; and (ii) self-employed workers with two or more employees, and others who either are not self-employed or who are self-employed but hire fewer than two employees, before and after the reform.

Our analysis uses three different data sets to examine the effects of the reform. In particular, we analyzed data from: the Household Surveys collected by the Colombian National Department of Statistics (*Gran Encuesta Integrada de Hogares* or GEIH, in Spanish), administrative data from the Social Security System (*Planilla Integrada de Liquidación de Aportes* or PILA, in Spanish), and survey data from the Monthly Manufacturing Sample (MMS). The data from the Household Surveys and from the Social Security records enable us to examine individual-level data to analyze effects on levels and transitions to the formal sector. The data from the MMS allow us to examine the effects of the reform on permanent employment at the establishment-level.

The results from the three data sets consistently show positive effects of the reform on formal employment. The results from the Household Surveys show an increase of 6 percentage points or a 9.5% increase in the probability of having a signed contract, and an increase of 6.8 percentage points or a 10% increase in the probability of contributing to the pension and/or health schemes for those with less than 10 minimum wages after the reform. The effects are bigger among smaller companies. Likewise, the results using Social Security records show an increase of 3.5 percentage points or 15.2% in the probability of going from informality or unemployment to formality for those paid under 10 minimum wages after the reform.

The results also show small positive effects for self-employed workers with more than three employees using both the Household Survey and Social Security data. The probability of employment and of transitioning to a job with health benefits and/or pensions increases by two and sixteen percentage points after the reform for self-employed workers with more than three employees.

The results using the Manufacturing Sample also show that the reform increased permanent employment in the manufacturing sector. The evidence shows that manufacturing establishments that pay less than 10 minimum wages on average increase their number of permanent employees by 46 workers. They also show that the percentage of permanent workers employed by those establishments increased by 10% following the reform. In general, the reform is associated with an increase in formal employment for individuals and for companies with less than 10 minimum wages after the reform. The effects are robust to different specifications and are greater among smaller companies.

## **2. Changes in the Structure of Payroll Taxes**

In 2012, Colombia introduced important legislative changes to reduce payroll taxes. The most important reform in changing payroll taxes since the reforms of the 1990s was the introduction of Law 1607. This reform reduced payroll taxes for workers with low wages, who *a priori* should have experienced greater distortions and had fewer formal job opportunities due to the higher labor costs before the reform. Payroll taxes were 29.5% in 2012, they fell to 24.5% in 2013 and reached 16% in 2014, after the tax reform was fully implemented.

A couple of years before, in 2010, the First Employment Law reduced effective payroll taxes, by allowing companies to deduct them from their income tax, for employers hiring young workers and others entering the labor force. As a result, in this analysis we try to distinguish the First Employment Law effects from those of the more expansive reforms introduced by Law 1607.

## 2.1. Law 1607 of 2013

The tax reform introduced with Law 1607 included exemptions to employer payroll taxes used to finance training programs, family and childcare programs, and compulsory health benefits. While Congress ratified the law in 2012, the exemptions were only first granted on May 1<sup>st</sup>, 2013 for contributions going to training programs (SENA, 2%) and family and childcare programs (ICBF, 3%), for a total exemption of 5% in payroll taxes. Importantly, those who contribute payroll taxes to these programs typically use neither training nor family and childcare programs. This means that the link between the benefits and contributions to the programs is weak. Beginning on January 1<sup>st</sup>, 2014, the exemptions were also applied to employer contributions to the Contributory Health Scheme (of 8.5%), first introduced in 1993 by article 204 of Law 100. In our analysis, we evaluate the differential impact on formal employment for workers exempted and not exempted from these taxes by the new law starting in 2013.

According to Law 1607, issued by decree 862 in April 26, 2013, the exemption on payroll taxes applies to two groups of individuals. First, it applies to all legal, contributing for profit entities paying taxes and that have in their payroll workers who individually accrue fewer than ten (10) monthly, legal, minimum wages. Second, it applied to all self-employed individuals who employ two or more workers. The law also indicates those individuals who do no benefit from the exemptions. Importantly, it includes all employees who earn more than 10 minimum wages and self-employed individuals who employ fewer than two employees.<sup>1</sup>

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<sup>1</sup> Others excluded from the exemptions are legal entities that do not pay income taxes, such as unions, community action boards, horizontal joint ownership boards, those listed in articles 22, 23, 23-1, and 23-2 of the National Tax Code, legal non-profit entities, such as cooperatives, employee funds, associations, corporations, and foundations. Also excluded are those operating in Free Tax Zones established by 2012 or with pending applications at that time as well as users of previous Free Tax Zones that have qualified or could qualify in the future to these zones and that are subject to the special income tax rate of 15% established by the first subsection of article 240-1 of the National Tax Code.

At the same time, the Colombian government introduced its Plan to Increase Productivity and Employment or PIPE program (*Plan de Impulso a la Productividad y el Empleo* in Spanish), which intended to replace the revenues lost from the exemptions for SENA, ICBF and public health insurance through other sources of funding. To offset the revenue losses from the exemptions, the tax reform included an equity income tax or CREE (*Impuesto sobre la Renta para la Equidad* in Spanish). The CREE rate was 9% starting in 2013. In 2015, the CREE increased by an additional 5%, which has continued to increase by 1% every year until 2018.

The CREE percentage was distributed as follows: 1.4 percentage points go to SENA, 2.2 percentage points go to ICBF, and 4.4 percentage points go to the social security health scheme. The additional 1.2 percentage point charged during the first three years was devoted to financing public institutions of higher education (40%), the subsidized health scheme (30%), and social investments in the agricultural sector (30%). Importantly, the equity income tax is levied on profits and, thus, tends to affect the most profitable firms, which are also the largest firms.

In conclusion, beneficiaries of the payroll tax exemptions instituted by Law 1607 from 2012 are CREE contributors who hire workers with less than 10 minimum wages and self-employed individuals who hire two or more workers. The reduction of the employer payroll tax rates for SENA and ICBF by 5% and of health contributions by 8.5% introduced by the reform intends to not only reduce informal employment, but also to generate new formal jobs. The reason why employment creation in the formal sector would be incentivized is that payroll taxes, which are associated with formal employment, would fall. Even though the equity income tax was introduced, this tax is on profits and not associated with employment, thus, de-linking the new taxes from the costs associated with formal job creation.



## 2.2. Law 1429 from 2010

Before the implementation of the Tax Reform, the First Employment Law was introduced in 2010. This reform also reduced the effective labor costs generated by payroll taxes to certain types of recently hired workers. The First Employment Law allows companies to deduct from their income tax contributions the payroll tax payments destined to finance services not directly benefiting all their employees, including tax contributions to finance SENA, ICBF, as well as contributions to the Solidarity Guarantee Fund or FOSYGA (*Fondo de Solidaridad y Garantías* in Spanish), which subsidizes health services for the poorest, and the contributions to the Minimum Pension Guarantee Fund or SGP (*Sistema General de Pensiones* in Spanish) which subsidizes pensions for the poorest.<sup>2</sup> Although this law also covered pensions, the First Employment Law is more limited in the number of individuals to which it applies relative to the payroll tax reform. This is because it is only valid for new hires who are: young workers, women over 40, and earning less than 1.5 times the minimum wage, as opposed to the 10 minimum wage threshold in the 2012 tax reform.

In addition, the benefits only apply to new workers. The law defines new workers as those who appear for the first time in the administrative social security records, or those who were previously in the system identified as self-employed workers. This prevents companies from trying to claim exemptions for workers who are laid-off and rehired or new hires that are simply replacing previously hired workers.

To benefit from the deductions of Law 1429, employers must also fulfill the following requirements established by the law. Companies have to be formally registered and have to hire

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<sup>2</sup> These deductions applied to companies that hired: workers younger than 28 years of age; female heads of households; individuals who have been displaced or are in the process of reintegration; individuals who are disabled; women older than 40 years of age, and workers earning less than 1.5 minimum wages.

the type of workers described by the law. Also, they have to increase their payrolls and not replace old personnel. That is, the number of employees must increase relative to the number of employees that were contributing in the previous year, and the total value of payroll must increase by the month of December of the previous year in which the discounts are applied.

In the empirical analysis presented in this paper, we will focus on the impacts of the Tax Reform (Law 1607) by exploiting the fact that the reform covered certain groups but not others. Moreover, we will attempt to disentangle the effects of the tax reform from those of the First Employment Law (Law 1429) since the latter preceded the tax reform and some of the coverage may have overlapped.

### **3. Data**

#### **3.1. Household Surveys**

Colombia collects cross-sectional data on labor force participation, earnings, and quality of life indicators of households since the 1960s. However, since the start of this data collection process and up to 2006, data were only available for 13 cities and their metropolitan areas. Starting in 2006, the entire survey covers 24 cities and their metropolitan areas. In addition, the modules on labor markets and household earnings also cover rural sectors.

The purpose of this data collection effort is to provide information about the size and structure of the labor force (employed, unemployed, and inactive) as well as of socio-demographic characteristics of the population. Consequently, the Household Surveys allow to classify the population according to the concepts detailed by the International Conference of Labor Statisticians (CIET, in Spanish); to calculate the main labor market indicators (participation rate, occupation rate, unemployment rate, etc.); to measure general population characteristics (characteristics of dwellings, access to public services); to obtain socio-demographic information

from the population (sex, schooling levels, civil status, etc.), and to measure employment characteristics, among others.

The existing database is the result of a probabilistic sampling of several stages, stratified by unequal conglomerates, and weighed for the 24 capital cities and their metropolitan areas. The universe is the entire civilian, non-institutionalized population residing in Colombia. The sampling unit is a segment of 10 contiguous households. The sample size is 20,669 households. The sampling error is no greater than 5% and possesses national coverage, including differentiation by zone, department, and large regions. Data were collected weekly for big cities and monthly for capital cities.

In order to construct the treatment group that was exempt because they earned less than 10 times the minimum wage, we calculated a variable called Times Minimum Wage (MW) as the ratio of nominal yearly earnings to the yearly minimum wage (515,000 Colombian pesos for 2010; 535,600 Colombian pesos for 2011; 566,700 Colombian pesos for 2012; and 589,500 Colombian pesos for 2013). We, then, used this variable to construct a dummy for 10 times the MW. We also constructed variables for self-employment, employers, and contract type for wage earners. We also construct firm size variables that identify if firms are less than 3 employees; between 4 and 10; between 10 and 50, and more than 50 employees. This allows us to construct an indicator for the second treatment group by interacting the self-employment dummy with the less than 3 employee dummy. We also created an indicator for 2013 to capture the effects of the reform by interacting the post-reform period with the indicators of whether workers earned less than 10 times the MW and whether they were self-employed and hired at least two employees.

For the dependent variables, we constructed several measures of formality. In particular, we constructed five different measures of formality: an indicator that takes the value of 1 if the

employee has a written contract and zero otherwise; an indicator that takes the value of 1 if the employer or employee contributed to social security and zero otherwise; an indicators that take the value of 1 if the employer or employee contributed either to the health system, pensions, and workers' compensation and zero otherwise.

Among the control variables, we include data on socio-economic factors about individuals, such as age, age squared, marital status, whether the person is literate (i.e., can read and write), years of schooling, department dummies, and year dummies among others.

Finally, to corroborate the robustness of the results, we create additional variables to generate placebos by replacing some criteria, and controls for the First Employment Law. In particular, we generated a variable for fewer than 20 MW, as well as variables for individuals younger than 29 years of age, women older than 40 years, and for individuals with salaries below 1.5 MW in order to control for the First Employment Law.

Table 1 shows different measures of formality for the years from 2010 to 2013. The table shows that formality has increased over time, regardless of the measure used. For example, the proportion of people who contribute to health or pension schemes or both increased from 67.7% in 2010 to 70.7% in 2013. Similarly, the proportion of people contributing to workers compensation increased from 59.2% in 2010 to 64.5% in 2013. The proportion of individuals with a written contract from 63.5% in 2010, to 66.1% in 2013. The coverage of the reform was broad, since 99.6% of workers in 2012 (the year that the reform was approved) earned less than 10 MW. Also, 16.2% of individuals were self-employed workers and 11.1% were self-employed with more than 3 employees in 2012. Finally, about half of the individuals in the sample, 50.8%, are men; about 23.2%, are married; 52.8%, have a high school degree while a minority of them has no high school in 2013.

Table 2 presents results from simple correlations between the Less than 10 MW dummy with the various measures of formality as well as individual characteristics. The table shows that those with less than 10 MW are less likely to have written contract, to have their employer make contributions to the health system and/or to a pension fund, and to have their employer make contributions to workers' compensation. This is contrary the effect we find below of a positive effect on formality after the introduction of the reform. The table also shows that those with less than 10 MW are more likely to be women, are more likely to be employed in smaller firms, and are less likely to be married. Those with less than 10 MW are also more likely to illiterate, to be high school drop outs, to be high school graduates, and to have degree a from a training college but less likely to have a University degree. This is why, below, we control for all of these characteristics in the estimations below.

### **3.2. Social Security Administrative Records**

The social security records come from the PILA, which is the data that integrates all the payroll contributions made by workers. These records contain contributors' reported information for each of the funds in which workers are required to contribute. It is the responsibility of the contributor to provide information in order for the contributions to be paid by the Social Security System.

The PILA database analyzed in this study has around 1.25 billion registries that reflect the tracking of 16.8 million individuals over 7 years (from 2008 through 2014). The data has no defined periodicity, since they are based on the contribution reports to the health and pension systems made by individuals at any point in time during the period from 2008-14. This means that a person may register more than one monthly payment to the same fund and that the number of days quoted in a month can be greater than the duration of the month.

For this analysis, we consolidated all the payment reports and quoted days for each fund in each month. The total monthly income was converted to constant December 2014 prices using the monthly inflation rate for each state.<sup>3</sup> This was then used to estimate the number of times a person earns the minimum wage. In addition, the database contains reports from the contributing company and reports related to employees. Using this code, we added individuals who reported monthly for one company and used this to infer the firm size. The database has no information regarding date of birth or age for individuals before 2014, so we did not consider these characteristics. The control variables were constructed for each month, year, type of industry, and state.

We consider workers who have a payment report as being in the formal labor market at that moment in time. Thus, we estimate transitions from non-employment to formal or registered employment as those in which an individual was not in the system the previous month and then appears as contributing into the system the next month. The results of contributions to the health and pension funds are very similar, but there is a possibility of registering payments to the health scheme without actually working. For this reason, we rely only on registries into the pension funds to identify transitions into formal employment.<sup>4</sup>

The analysis includes an unbalanced panel by individual year-month. Consequently, some of the controls in later periods do not contain any information. These are considered as additional categories in the fixed effects.

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<sup>3</sup> There are 33 states or geographic units in Colombia. These geographic units include 26 departments, the capital city, the islands of San Andres and Providencia, and 5 territories.

<sup>4</sup> We use a randomized sample of 25% from the universe of individuals in social security records for all of our estimations. We restricted our estimations to the 25% sample due to the long computation time associated with processing the full sample.

Table 3 shows the descriptive statistics for the PILA database for the entire sample used in the analysis and by company size. The proportion of employees transitioning from outside the labor force, unemployment, or informality towards formality or the fraction of individuals who enter into registered employment is, on average, about 23% per month. The average size of registered companies in the PILA database is of 840 employees.

### **3.3. The Monthly Manufacturing Sample**

The Monthly Manufacturing Sample (MMS) includes data on employment, wages, production, and characteristics of establishments in the manufacturing sector, i.e., those with Industry Code CIIU Rev. 3.<sup>5</sup> The data of the MMS are used to detect changes that could occur in the manufacturing sector in the short-term, including changes in employment, wages, hours worked, production, and sales of Colombian manufacturing establishments. At the same time, the sample allows to determine the performance of the sector in different industrial activities; to determine the size and evolution of different sectors; to create competitiveness indices; to analyze the impact of the economic dynamics on the productive sector; and to construct an index to temporarily estimate GDP.

The accountant, manager, owner, or the person in charge of accounting matters in the establishment provides information on the establishment to DANE (the National Administrative Statistics Department). The MMS uses as sampling, observation, and analysis unit the industrial establishment and it is part of the Annual Manufacturing Sample with a 5% error rate at the national level. It includes stratified probabilistic sampling (although random for each stratum),

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<sup>5</sup> This dataset dates back to May 1962, when the country started compiling industrial sampling data in order to build employment and wage indicators. In parallel, the country also collected data on industrial production, an effort that was stopped in 1970 when the data collection process was unified under a single system, using industrial codes based on ISIC Rev. 1. This design was in use until 1980. In 1978, the design of the sample was modified to comply with the adoption of new industrial codes, ISIC Rev. 2. This design was maintained until 1990. Towards the end of the 1990s and the beginning of the 21<sup>st</sup> century, the current design of the MMS was adopted to include changes in the representativeness of the sample and to include a third revision of the ISIC industrial codes.

and stratification is done by production, personnel, and type of industry. The compilation of the information is performed within the first 20 days of each month.

These data are subject to confidentiality restrictions and statistical reserve. Although we had access to the data through DANE's computers, it is not possible to get access to these data outside of the country. For this reason, the descriptive information we obtained from the database is limited. One of the reasons for such confidentiality is a company that meets certain characteristics (for instance, size, production, and type of industry) may be the only company in a region and, as a result, confidentiality would be lost. Confidentiality is one of the main agreements with the companies providing information.

In this study, we use the MMS to examine the impacts of the reform on employment and hours worked of different types of workers in the manufacturing sector. The data to which we had access has about 120,770 entries (about 16,400 annual entries). The database we used had information on the establishment characteristics previously mentioned as well as monthly temporary jobs from January 2007 through April 2014. Even though there is an identifying number that may seem unique, it is not possible to do a panel-like tracking because often times the response of each unit is voluntary and it is sometimes forcefully imputed because of probabilistic matters.

We constructed several variables with the MMS for analysis. Unlike the Household Surveys and the Social Security data, the MMS does not have individual level wages. We can, however, estimate the ratio of the average wage in the establishment to the MW of 515,000 in 2010 Colombian pesos. Then, we estimate a dummy variable for establishments whose average wages are less than 10 times the MW to identify establishments in which employees are most likely affected by the payroll tax reform. Our outcomes are the total number of the total number of



production and non-production permanent employees and the proportion of permanent production and non-production workers out of the total number of employees (both permanent and temporary).

The idea is that permanent employment should increase both in levels and as a proportion of total employment, since payroll taxes are required for permanent workers but largely exempt temporary workers.<sup>6</sup> We also examine the impact of the reform on the number of hours worked by permanent employees. Since the fixed cost of hiring a permanent worker goes down, employers should now prefer hiring more permanent workers and reducing their hours worked. We also construct a placebo of fewer than 20 MW, to check that our results are driven by the reform and not by some other factor that affects firms paying lower wages.<sup>7</sup>

Table 4 shows descriptive statistics for the MMS data. The average share of permanent non-production and permanent production employees in the sample are 52.2% and 99.5%, respectively. The average number of yearly regular and extraordinary hours worked for permanent non-production employees are 19,587 and 1,725, respectively.

Figure 1 shows the distribution of establishments by state. The vast majority of manufacturing establishments are in Bogota, Antioquia, and el Valle; the rest of the establishments are distributed throughout the country. Bogota, the capital of Colombia, has 32.9% of the establishments and 7.3% are located in the state of Cundinamarca (a state right next to Bogota); 21.4% are in the state of Antioquia; 12.8% are in the state of Valle; 6.3% are in the state of Atlantic (in the Caribbean coast) and 3.4% are in the state of Santander. The rest are distributed

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<sup>6</sup> Temporary workers mostly operate under the modality of “prestación de servicios” (provision of service contracts). Under these contracts, temporary workers are hired without benefits and are not employees as such. They get their own healthcare and have to set aside 13% for income taxes to pay the “retención en la fuente” tax.

<sup>7</sup> The share with earnings above 10 MW is 0.8 percent and of those one quarter earn over 20 MW, after applying expansion factors to the sample.

throughout the country with no more than 2.5% of the establishments located in any one of the other states.

#### 4. Empirical Evidence

We explore empirically whether the reduction of payroll taxes and restructuring of taxes generated incentives to create formal jobs. We also evaluate if the reform increases employment at the extensive margin (number of employees) and reduced employment at the intensive margin (number of hours) using data at the individual-, household- and establishment-level. We use the Colombian Household Surveys, Social Security records and the Monthly Manufacturing Sample to conduct difference-in-difference (DiD) analyses of the reform.

##### 4.1 Results from the Household Surveys

We estimate the following model to calculate the probability of having a formal job using data from the Household Surveys:

$$P(F_{it}) = \beta X_{it} + \lambda_s + \lambda_r + \tau_t + \delta_0 \text{Less 10 MW}_{it} + \delta_1 \text{Post}_t \times \text{Less 10 MW}_{it} + \delta_2 \text{Post}_t \times \text{Self-Employed\_More 3 Employees}_{it} + u_{it}$$

where  $P(F_{it})$  is the probability of having formal employment and where formal employment is equal to one if the individual has a formal job defined as: (a) having a written contract, (b) the individual or employer pays for health benefits, (c) the individual or employer contributes to a pension fund, (d) the individual or employer contributes to a health and/or pension scheme, or (e) the individual or employer pays for workers' compensation.  $\text{Less 10 MW}_{it}$  is a dummy variable that equals one if the person receives fewer than 10 minimum wages (10 MW).  $\text{Self-Employed\_More 3 Employees}_{it}$  is an indicator that equals one if the employee is self-employed and hires

three or more workers.<sup>8</sup>  $Post_t$  is an indicator for whether the person is observed after 2013. Thus, the coefficients on the interaction terms,  $\delta_1$  and  $\delta_2$ , capture the effects of the reform on formal employment.  $X_{it}$  is a vector of controls that includes characteristics such as age, marital status, gender, schooling level, firm size, and an indicator for whether the employee is self-employed or not as well as interactions between this last indicator with firm size.<sup>9</sup> The sectorial, geographic, and temporal effects are captured by  $l_s$ ,  $f_r$  and  $\tau_t$ , respectively. We cluster standard errors by state.<sup>10</sup>

Table 5 reports coefficients  $\delta_1$  and  $\delta_2$ , which capture the effects of the individuals with fewer than 10 minimum wages and on self-employed with more than 3 employees.<sup>11</sup> The results show that the reform generated an increase in the probability of having formal employment. Specifically, the probability of having a written contract after the reform is 6 percentage points greater for employees with wages less than 10 MW. The probability of contributing to health benefits is 6.2 percentage points higher. The probability of contributing to a pension scheme increased by 6.9 percentage points and the probability of contributing to a health and/or pension system increases by 6.8 percentage points for workers with fewer than ten MW after the reform. Finally, the probability of contributing to workers' compensation increases by 5.7 percentage points. These coefficients are robust and are significant even with clustered standard errors. To

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<sup>8</sup> Note that the data does not allow distinguishing 2 or more employees, so we construct a variable for three or more employees.

<sup>9</sup> Our treatment group is composed of workers earning below 10 MW and the comparison group of those with earnings above the 10 MW threshold. Since a potential concern is baseline unbalance among individuals in each group, we control for possible baseline differences in education, experience, age, race and gender, among others.

<sup>10</sup> Another potential concern is that lower wage individuals, say those earning above but close to the minimum wage may be more prone to transitioning into and out of formal employment. To explore that issue, Figure 2 presents the probability of formal employment (defined as contributing to health or pensions) as a function of the fraction of wages out of the MW in 2010. We find that this plot is roughly flat (except at low multiples of the MW), implying that the probability of being formal is not directly related to wages as multiples of the MW. Below, we perform robustness tests by leaving out of the control group those wages very close to the MW.

<sup>11</sup> As a baseline, we separate out the impact of lower payroll taxes, by first estimating a simple DiD design including only wage earners (comparing those above and below the 10 MW threshold) and then individually estimating the effect on self-employed individuals (by comparing those above and below the two workers threshold).

understand the magnitude of these effects, we estimated the elasticity of employment with respect to non-wage labor costs. The effects translate into elasticities of 0.2 and 0.22 for the effects regarding written contracts and jobs that contribute to health or pensions. These effects are in line with the effects at the lower end of the range of 0.15-0.75 reported by Hamermesh (1996).

Table 5 also reports coefficients of the post-reform indicator interacted with the indicator for self-employed workers with 3 or more employees. The results show that the probability to pay for health benefits or a pension fund increases by 1.6 and 2 percentage point among self-employed workers with more than two employees after the reform. This effect translates into an elasticity of employment of 0.07, which is about a third of the elasticity we calculated for workers with less than 10 minimum wages.<sup>12</sup>

When the effects are estimated separately for men and women, we continue to find effects for those with less than 10 minimum wages as well as effects for the self-employed with more than 3 employees for both men and women. Panel B of Table 5 shows the effects for women and Panel C for men. The results for those earnings less than 10 MW are greater for women and they are observed across all measures of formality. For example, the probability of having a written contract increases to 12.3 percentage points while the probability of contributing to either health or pension benefits increases to 10.5 percentage points for women earning more than 10 MW after the reform, which correspond to elasticities of 0.42 and 0.34 respectively. The results in Panel C shows equivalent effects on these measures of formality of 2.9 and 4.4 percentage points for men,

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<sup>12</sup> We have also estimated the impact of the effects in separate regressions when we only include the interaction of Less than 10 MW with the reform dummy and when we only include the interaction of Self-employed with More than 3 Workers with the reform dummy. These results are reported in Appendix Tables 1 and 2. The regressions reported in Appendix Table 1 for those with Less than 10 MW are estimated only for those with positive earnings. The regressions reported in Appendix Table 2 for the Self-Employed with More than 3 Workers are estimated only for the self-employed. Since the two variables were shown not to be correlated in Table 2, it is not surprisingly that the results are very similar to those reported in Table 5 when both effects are included simultaneously.

which correspond to elasticities of 0.1 and 0.14 respectively. By contrast, the effects on the probability of formality on the self-employed with more than 3 employees is similar for women and men, except for the probability of having a written contract.<sup>13</sup>

Table 6 shows the results of the effects of the Tax Reform by firm size. The results show that Law 1607 had greater effects on formal employment among those working in the smallest firms. Panel A report estimates for the full sample; Panel B report estimates for those in firms with 10 or fewer employees; Panel C report results for firms between 11 and 49 employees, and Panel D report results for those in firms with 50 or more employees. The effects for those working in firms with 10 or fewer employees are larger than those for the entire sample. The probability of having a written contract and the probability of making health and pension contributions increases by about six percentage points for self-employed workers with more than 3 employees and it increases tenth-fold for those with less than 10 minimum wages. The effects for workers with less than 10 minimum wages and who work in firms with 11 to 49 employees are significant and bigger than those in the entire sample, but smaller than those found for small firms with fewer than 10 employees. Formality for those earning less than 10 minimum wages in medium-sized firms increased between 11 to 13 percentage points, but there is no effect among self-employed workers in medium-sized firms except for the pension contributions definition of formality.

By contrast, the probability of making health and pension contributions among workers earning less than 10 minimum wages in firms with 50 or more employees increased by only 1.3 percentage points after the reform, which is a much smaller effect than the one found in the full sample. The effects are, thus, bigger among those in smaller and medium size firms than for those

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<sup>13</sup> To allow for the possibility that those closer to the MW may be much more likely to go from informality to formality, we restrict the treatment group to exclude workers close to the MW. Appendix Table A3 excludes those workers with wages that are 10% around the MW. The results are very similar to the ones reported in Table 4.

in bigger firms. This makes sense given that bigger firms were more likely to have to pay the CREE and smaller and medium size firms are more likely to have qualified for exemptions for employees closer to the MW and for self-employed hiring others.

As a check that these results capture the effects of the reform and not some other factors affecting workers after the reform, we performed regressions with placebos. In our placebo, we changed the threshold of ten MW (as specified by Law 1607) to 20 MW in order to calculate the dummy variable for employee wages. In these regressions, we excluded all workers with fewer than 10 MW. Table 7 shows these results with clustered standard errors. We found that there was no effect on formality for people with fewer than 20 MW. As can be observed on Table 7, in many cases the coefficients become negative and they were always insignificant.<sup>14</sup>

Finally, Table 8 shows similar effects to those presented in Tables 4 and 5, but controlling for effects on groups affected by the First Employment Law. In particular, we included indicators for individuals younger than 29 years of age, women older than 40, and individuals earning less than 1.5 MW and we interacted them with a post-2011 indicator, since the First Employment Law was enacted in December 2010. These results show that the effects of the interaction between the reform and employees with less than 10 MW are still positive and significant and similar in magnitude even when controlling for the First Employment Law. In this case, the probability of having a written contract and health or pension contributions increase by about 6.4 to 7 percentage points, respectively, for those earning less than 10 MW. The effects for the self-employed with more than 3 employees also remain positive and significant and of similar magnitude to those we found without controlling for the First Employment Law. The effects for

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<sup>14</sup> Another placebo could involve examining the impact for those below 5 MW or some other threshold below the 10 MW threshold. The problem with this approach, however, is that those with less than 5 MW were indeed affected by the reform so it does not offer a true placebo.

women older than 40 years of age and for those who earn less than 1.5 MW after 2011 are neither statistically nor economically significant. On the other hand, the First Employment Law does seem to have a positive, though small, impacts on younger workers with less than 29 years of age.

In conclusion, people earning less than 10 minimum wages benefited the most from the reform in terms of having a higher likelihood of holding a formal sector job and the effects are greater for women and for workers in small firms.<sup>15</sup>

#### 4.2. Results from Social Security Records

We estimated the following model to calculate the impact of the reform on transitions from unemployment, inactivity, and informal employment into registered employment:

$$P(F_{it}) = bX_{it} + l_s + f_r + \tau_t + \mu_m + \delta_0 \text{Less 10 MW}_{it} + \delta_1 \text{Post}_t \times \text{Less 10 MW}_{it} + \delta_2 \text{Post}_t \times \text{Self-employed More 3 Employees}_{it} + u_{it}$$

where  $P(F_{it})$  is the probability of transitioning from non-employment or informal employment into the formal sector.  $\text{Less 10 MW}_{it}$  and  $\text{Self-employed More 3 Employees}_{it}$  are indicators for groups exempted from the payroll tax, that is, those with less than 10 minimum wages and self-employed workers with two or more employees.  $\text{Post}_t$  is an indicator for whether the company is observed after 2013.  $X_{it}$  includes economic activity and size of the firm. The PILA database does not contain data on age, education, or any other individual characteristic. The geographic and

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<sup>15</sup> The announcement of the Tax Reform in 2012 and its enactment in 2013 may have motivated firms and workers to agree to report earnings around the 10 MW to reduce the payroll tax burden. If this were the case, there would be bunching around the threshold. We ran a regression to check if workers were more likely to report earnings around 10 MWs around the time of the reform. Appendix Table 4 show the probability of reporting wages between 8 and 12 MWs, 8.5 and 11.5 MWs and 9 and 11 MWs. Column 1 shows a negative though very small impact of the reform on the likelihood of reporting wages between 8 and 12 MWs. Columns 2 and 3 narrow this window by looking at reported wages closer to 10 MWs. We find significant, but barely detectable, effects of one tenth of one percent on the likelihood of reporting wages between 8.5 and 11.5 and between 9 and 11 MWs, which for practical purposes we could denominate negligible.

sectorial effects are captured by  $l_s$  and  $f_t$ , respectively, and the year and month effects are captured by  $\tau_t$  and  $\mu_m$ . All of the regressions estimate clustered standard errors at the individual level.

Table 9 shows the effects on transitions into registered jobs for the full sample and by firm size. Columns (1) and (2) show the coefficients for the interaction terms in regressions using the full sample. Columns (3) and (4) show the estimates for firms with fewer than 3 employees, Columns (5) and (6) show the estimates for firms between 3-10 employees; Columns (7) and (8) show the estimates for firms between 10-50 employees and Columns (9) and (10) show the estimates for firms with more than 50 employees. The overall results in Column (1) show an increase in the probability of transitioning into formal sector employment of 3.5 percentage points among employees with less than 10 minimum wages and of 16.3 percentage points among self-employed workers employing more than 2 employees. The specification in Column (2) allows for differential effects for those earnings less than 2 MW, those earnings between 2 and 5 MW and those earning between 5 and 10 MW. As expected, these results show that the impact is greatest on those earning close to the MW and smaller for those with higher wages. The probability of transitioning into formal employment increases by 5.1 percentage points for those earning less than 2 MW, by 2 percentage points for those earning between 2-5 MW and by 1 percentage point for those earning between 5-10 MW. During the 1990s, the higher payroll taxes could not be passed on as lower wages for workers for whom the minimum wage was binding and they could not remain or become formally employed (see Kugler and Kugler, 2009). Therefore, it is likely that a reduction in payroll taxes due to the 2012 reform had the greatest impact in terms of formal employment for this group of workers.

Columns (2)-(10) of Table 9 show the effects on entry into registered jobs for firms of different sizes. Columns (3) and (5) show that the likelihood of transitioning into registered



employment increases by 39.4 and 29.7 percentage points for those in firms with fewer than 4 employees and in firms with 4 to 10 employees who earn less than 10 MW after the reform. Also, Columns (4) and (6) show that the effects are bigger for those earning less than 2 MW, somewhat smaller for those earning between 2-5 MW and even smaller, though still positive and significant, for those earning between 5 and 10 MW. The effects are negative for those in larger firms. Likewise, the likelihood of transitioning into registered employment increases by 11.7, 6 and 7.5 percentage points for self-employed workers with 4 to 10 employees, with 10-50 employees and with more than 50 employees.

### 4.3. Results from the Manufacturing Survey

We estimated the following model to calculate the impact of the reform on the level and composition of employment using the monthly manufacturing sample:

$$E_{jst} = \alpha K_{jst} + l_s + f_r + \Psi_t + \delta_0 \text{Less 10 MW}_{jst-1} + \delta_1 \text{Post}_t \times \text{Less 10 MW}_{jst-1} + v_{jst}$$

where  $E_{jst}$  is employment in establishment  $j$  for permanent production and non-production employees, as well as the percentage of permanent production and non-production employees.  $\text{Less 10 MW}_{jst-1}$  is a dummy variable that equals one if the establishment pays average wages that are less than ten minimum wages before the reform.  $\text{Post}_t$  is an indicator for whether employment at the company occurs after May 2013. The geographic, sectorial, and temporal effects are captured by  $l_s$ ,  $f_r$ , and  $\Psi_t$ .  $K_{jst}$  represents installed capital. All standard errors are clustered by state.

The coefficients of interest are those for the interaction between the variable for less than 10 minimum wages and the variable for after 2013 for the different types of workers. Panel A in Table 10 shows the results for the entire sample, while Panels B, C, D, and E in the same table show the results for establishments with up to 3 employees, 4-10 employees, 11-50 employees,

and more than 50 employees, respectively. Columns (1) and (2) in Table 10 report the impacts on the number of permanent non-production and production employees, Columns (3) and (4) reports impacts on the percent of non-permanent and permanent production workers. For establishment that pay on average less than 10 minimum wages, we observed an increase in the number of permanent workers and employees after 2013. In particular, Columns (1) and (2) in Panel A show that there is an increase of 46.2 permanent non-production employees and of 254 permanent non-production employees in establishments that pay less than 10 minimum wages after the reform. This by itself suggests increased job creation in the manufacturing sector. In addition, Columns (3) and (4) of Panel A show an increase of 10% in the share of permanent non-production employees, though no effect on the share of permanent production employees.

Columns (5) and (6) in Table 10 also show the effects on regular and extraordinary hours for all permanent workers. The results in Column (5) show substitution in working hours for permanent employees. There is a reduction of 279 regular hours or a reduction of 1.5% in regular hours for this group of workers, though no effect for extraordinary hours.

Panels B-E in Table 10 show effects by establishment size. The results show that even though the effects regarding additional permanent workers are naturally smaller in smaller establishments, the effects are clearly larger for smaller companies when looking at the shares of permanent workers. Panels B and C in Table 10 show that the percentage of permanent nonproduction employees increases by 85.8 and 55.5 percent, respectively, in establishments with fewer than 4 employees and in companies with 4 to 10 employees and that pay less than 10 minimum wages on average. Likewise, for small companies that pay less than 10 minimum wages on average, there is an increase in the percentage of permanent production workers. Also, there is a reduction in the regular and extraordinary working hours of permanent employees in

establishments with less than 4 employees and a reduction in regular hours in establishments with 4-10 employees. By contrast, Panels D and E Table 10 show that while there is a positive effect on the number of permanent non-production and production employees, there are no effects on the shares of permanent non-production and production employees or on regular and extraordinary permanent hours among bigger establishments with 10 to 50 employees and with 50 or more employees.

Thus, consistent with the data using the Household Surveys and the Social Security records, we find bigger effects on smaller employers. This is likely because the smaller employers are more likely to face higher labor costs due to their inability to pass these costs to their employees, whose wages tend to be lower. Also, the equity income tax (CREE) introduced by the 2012 Tax Reform likely had a higher incidence on larger employers.

As with the Household Surveys, we carried out regressions with a placebo group using the MMS data. Table 11 shows the results of this placebo using as a threshold 20 minimum wages on average at the establishment-level. The results show no significant effects in the regressions that use 20 MW as a threshold.

## **5. Conclusions**

The results of estimations using data from Household Surveys, the Social Security records, and the Monthly Manufacturing Sample are consistent with an increase in the creation of formal employment in response to the Tax Reform that eliminated payroll contributions for training, family services and health benefits.

In the case of regressions using data from the Household Surveys and the Social Security records, there is strong evidence indicating a greater propensity towards formality among the two

groups who experienced payroll tax reductions due to the reform, i.e., those with less than 10 MW and self-employed with more than 2 employees.

The analysis with the data from the Household Survey (GEIH) and the data from the Social Security records (PILA) show similar effects on formal employment with contributions to pension funds. The Household Survey results show an impact of 6.9 percentage points on the likelihood of being employed jobs with contributions to pension funds for those with less than 10 minimum wages. The Social Security data shows an increase of 3.5 in the likelihood of transitioning to employment registered in a pension fund. The results from the two databases also show positive effects on formal employment among self-employed workers with more than two employees. The Household Survey estimations also show an increase of 1.6 percentage point in the likelihood of being employed in a job with contributions to both health and pension plans for self-employed workers with more than 2 employees. Likewise, the Social Security data results shows an increase of 16.3 in the likelihood of transitioning into a job registered with pension contributions.

Moreover, the results using the Household Survey and Social Security record data show that small firms are the ones most likely to respond to the reform by creating formal jobs. Moreover, the results using the Social Security records are also stronger for those who earn lower salaries closer to the minimum wage. We also included placebo regressions to verify that the results were not driven by the reform and not by other factors. We do a placebos test including interactions with less than 20 MW instead of 10 MW and the results show no effects. The fact that the placebo group was not affected, and that the groups most likely to be affected are indeed the ones for which we find greater effects, confirms that the results are likely driven by the reform.

The Manufacturing Sample results confirm these results and show an increase in permanent employment. These results show an increase in the number and proportion of permanent production and non-production employees after the reform among establishments that pay less than 10 minimum wages on average. The Tax Reform also caused a substitution in the regular hours worked by permanent workers, as would be expected since the costs of hiring permanent workers decreased. As with the individual-level results, establishment-level results show that the Tax Reform had greater impact among companies with fewer than 10 employees.

These effects are larger in comparison to the reform from the mid-nineties in Colombia. Kugler and Kugler (2009) find a much smaller effect – a 10% percent increase in payroll taxes reduced employment by about 5%. The results from the MMS, which are closest to those used by Kugler and Kugler (2009), show that a decrease of 13.5% in payroll taxes introduced by the reform increased the share of permanent non-production workers by 46%.

At the same time, the effects are substantial compared to other reforms carried out in Colombia affecting both the supply and demand of labor. On the demand side, the deductions introduced by the First Employment Law for new hires from specific groups do not appear to be as effective as the exemptions introduced by the Tax Reform. On the supply side, the program Youth in Action (or Jóvenes en Acción in Spanish), which provided vocational training and internships to young individuals, increased formal employment among men and women by 6 and 7 percentage points, respectively. In this case, the cost per employee was \$770 dollars. In comparison, the tax reform probably generated fewer costs, since the funds lost due to the tax exemptions were recovered through the equity income tax. On the other hand, Kugler et al. (2015) find that the effects of the Youth in Action program were permanent. It is too early to know if the

effects of the Tax Reform are long-term, but it is possible that entering the formal sector can generate positive hysteresis and increase the probability of remaining in the formal sector.

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Table 1: Descriptive Statistics for Household Survey, 2010-13

	2010	2011	2012	2013
	(1)	(2)	(3)	(4)
Employer or Employee contributes to Pension Fund	.697 (.46)	.706 (.456)	.721 (.448)	.737 (.44)
Employer or Employee contributes to Health System	.747 (.435)	.758 (.428)	.768 (.422)	.78 (.414)
Workers' Compensation	.683 (.465)	.696 (.46)	.717 (.451)	.734 (.442)
Employer or Employee contributes to Pension/Health Fund	.753 (.431)	.763 (.425)	.774 (.418)	.785 (.411)
Self-Employed	.176 (.381)	.183 (.387)	.197 (.398)	.202 (.401)
Employee	.812 (.391)	.805 (.396)	.791 (.407)	.787 (.41)
Works for the same Company that Pays	.807 (.395)	.861 (.346)	.864 (.343)	.863 (.344)
Written Contract	.716 (.451)	.721 (.449)	.729 (.444)	.742 (.437)
Self-Employed with More than 3 People Hired	.137 (.344)	.141 (.348)	.156 (.363)	.162 (.368)
Firm with less than 10 Employers	.298 (.457)	.292 (.455)	.282 (.45)	.272 (.445)
Female	.477 (.499)	.474 (.499)	.473 (.499)	.482 (.5)
Cohabitants for Less than 2 years	.031 (.173)	.033 (.179)	.036 (.186)	.036 (.187)
Cohabitants for More than 2 years	.261 (.439)	.266 (.442)	.267 (.443)	.272 (.445)
Married	.265 (.442)	.253 (.435)	.249 (.432)	.245 (.43)
Other Marital Status	.443 (.497)	.447 (.497)	.448 (.497)	.447 (.497)
Less than High School	.022 (.146)	.021 (.143)	.02 (.141)	.02 (.139)
High-School Degree	.524 (.499)	.523 (.499)	.512 (.5)	.49 (.5)
Training College Degree	.186 (.389)	.199 (.399)	.216 (.411)	.238 (.426)
University Degree or more	.268 (.443)	.257 (.437)	.252 (.434)	.252 (.434)
Illiterate	.012 (.108)	.011 (.103)	.011 (.105)	.011 (.102)
Observations	83,310	88,058	91,096	91,422

Notes: Table reports means and standard deviation of all socio-economic and work characteristic from 2010 to 2013.

Table 2: Differences in outputs and controls for those with less than 10 MW

	2010	
	More than 10 MW	Less than 10 MW
	Mean (sd) (1)	Effect (sd) (2)
Employer or Employee contributes to Pension Fund	.958	-.212*** (.017)
Employer or Employee contributes to Health System	.986	-.194*** (.01)
Workers' Compensation	.977	-.236*** (.011)
Employer or Employee contributes to Pension/Health Fund	.994	-.196*** (.006)
Self-Employed	.106	.052** (.023)
Employee	.894	-.064*** (.023)
Works for the same Company that Pays	.952	-.168*** (.016)
Written Contract	.983	-.23*** (.01)
Self-Employed with More than 3 People Hired	.106	.02 (.023)
Firm with less than 10 Employers	.021	.241*** (.011)
Female	.244	.216*** (.034)
Cohabitants for Less than 2 years	.018	.018 (.011)
Cohabitants for More than 2 years	.077	.179*** (.02)
Married	.66	-.4*** (.038)
Other Marital Status	.245	.204*** (.034)
Less than High School	0	.023*** (.001)
High-School Degree	.045	.486*** (.015)
Training College Degree	.046	.15*** (.015)
University Degree or more	.909	-.659*** (.021)
Illiterate	0	.009*** (0)
Observations	83,310	

Notes: Table reports the difference between treatment and control groups for all socio-economic and work characteristics from 2010 to 2013. 10 Minimum Wages without missing by report. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3: Descriptive Statistics for Social Security Records, 2008-2014

	Full Sample (1)	Firms < 3 Employees (2)	Firms 4-10 Employees (3)	Firms 11-50 Employees (4)	Firms > 50 Employees (5)
Firm Size	840.3 (4,121.2)	1.33 (0.59)	6.57 (2.05)	26.4 (11.42)	3,259.9 (7,625.3)
Average wages / Minimum wages	0.52 (1.94)	0.33 (1.24)	0.70 (1.90)	0.89 (2.11)	1.67 (3.30)
Probability of Transition from Non-employment to Employment	0.23 (0.42)	0.50 (0.54)	0.56 (0.50)	0.55 (0.50)	0.53 (0.50)
Observations	368,310,936	32,240,555	9,402,418	20,038,184	94,741,231

Notes: This table shows the mean and standard deviation in parenthesis. Full Sample estimated using a 25% randomized sample of the universe of Social Security records from January 2008 to December 2014. Firm size estimations using a 12.5% randomized sample of the universe of Social Security records from January 2008 to December 2014. Firm size is estimated as the number of people who report their payment for the same company.

Table 4: Descriptive Statistics for the Monthly Manufacturing Sample, 2007-2014

	Mean (1)
Share of Permanent Non-production Employees	52.2 (109.0)
Share of Permanent Production Employees	99.5 (171.4)
Regular Hours Permanent Non-production Employees	19587.1 (34,327.25)
Extra Hours Permanent Non-production Employees	1725.0 (4,599.4)
Salary of Permanent Non-production Employees	160799.1 (387,913.7)
Salary of Permanent Production Employees	150674.0 (307,710.6)
Observations	120,770

Notes: This table reports the mean and standard deviations in parenthesis of the share of production and non-production employees, and their regular and extraordinary hours as well as their salaries.

Table 5: Effects of the Payroll Tax Reform on Formality, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
Panel A. Full Sample (353,886 Observations)					
Less than 10 Minimum Wages X Reform	0.060*** (0.008)	0.062*** (0.017)	0.069*** (0.018)	0.068*** (0.014)	0.057** (0.025)
Self-employed with More than 3 Workers X Reform	0.011* (0.006)	0.019*** (0.003)	0.020*** (0.002)	0.016*** (0.003)	0.020*** (0.002)
Panel B. Women (168,589 Observations)					
Less than 10 Minimum Wages X Reform	0.123*** (0.008)	0.096*** (0.033)	0.105*** (0.034)	0.105*** (0.030)	0.086* (0.047)
Self-employed with More than 3 Workers X Reform	0.021*** (0.003)	0.023*** (0.004)	0.015*** (0.003)	0.021*** (0.004)	0.022*** (0.005)
Panel C. Men (185,297 Observations)					
Less than 10 Minimum Wages X Reform	0.029*** (0.009)	0.040*** (0.012)	0.046*** (0.012)	0.044*** (0.010)	0.038* (0.018)
Self-employed with More than 3 Workers X Reform	0.008 (0.008)	0.018*** (0.004)	0.024*** (0.004)	0.014*** (0.004)	0.021*** (0.003)

Notes: The table reports coefficients and clustered standard errors by department in parenthesis of linear probability models of different measures of formality on the interaction terms of the post-reform dummy with indicators of whether the worker earns less than 10 MW or the workers is self-employed and hires more than 3 employees. The formality measures include: a Written Contract dummy; an indicator of whether the employer or employee pay Health and Pension Contributions; an indicator of whether the employee is covered by Workers' Compensation. To estimate the share of workers paid less than 10 MW, wages (deflated to their real value at 2013 prices) were divided by the Colombian Minimum Wage of 589,500 pesos in 2013 pesos. All regressions control for age, age squared, years of education, education squared, a female dummy, dummies for marital status, the number of MW the individual earns, the worker's type, firm size, the interaction between firm size and worker type and fixed effects for industry and year. \*\*\* p<0.01, p<0.05, \*p<0.1.

Table 6: Effects of the Tax Reform on Formality by Firm Size, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
Panel A. Full Sample (353,886 Observations)					
Less than 10 Minimum Wages X Reform	0.060*** (0.008)	0.062*** (0.017)	0.069*** (0.018)	0.068*** (0.014)	0.057** (0.025)
Self-employed with More than 3 Workers X Reform	0.011* (0.006)	0.019*** (0.003)	0.020*** (0.002)	0.016*** (0.003)	0.020*** (0.002)
Panel B. 10 and less employees (101,062 Observations)					
Less than 10 Minimum Wages X Reform	1.088*** (0.321)	0.818 (0.521)	0.698 (0.467)	0.896* (0.497)	0.601 (0.486)
Self-employed with More than 3 Workers X Reform	0.073*** (0.011)	0.084*** (0.009)	0.078*** (0.006)	0.082*** (0.008)	0.068*** (0.009)
Panel C. 11 - 49 employees (61,666 Observations)					
Less than 10 Minimum Wages X Reform	0.177*** (0.057)	0.206** (0.078)	0.215*** (0.065)	0.205** (0.077)	0.178* (0.087)
Self-employed with More than 3 Workers X Reform	0.002 (0.019)	0.013 (0.009)	0.024*** (0.008)	0.010 (0.009)	0.018* (0.010)
Panel D. 50 and more employees (191,158 Observations)					
Less than 10 Minimum Wages X Reform	0.005 (0.005)	0.010* (0.005)	0.018* (0.010)	0.013*** (0.004)	0.012 (0.015)
Self-employed with More than 3 Workers X Reform	-0.004* (0.002)	0.002 (0.001)	0.002 (0.002)	-0.001 (0.001)	0.006** (0.003)

Notes: The table reports coefficients and clustered standard errors by department in parenthesis of linear probability models of formality on interactions of Less than 10 MW and Self-Employed who hire more than 3 Workers by firm size. The following measures of formality are used: a Written Contract Dummy; an indicator of whether the employer or employee contributes to Health and Pension funds; an indicator of whether the worker is covered by Workers' Compensation. All regressions include controls for: age, age squared, year of education, education squared, a male dummy, marital status dummy, the share of wages out of the MW, firm size, type of worker indicators and interaction of firm size with type of worker and fixed effects by industry. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 7: Placebo Effects of Less than 20 MW on Formality, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
Panel A. Full Sample (1,404 Observations)					
Less than 20 Minimum Wages X Reform	-0.001 (0.008)	-0.013 (0.009)	-0.013 (0.009)	-0.009 (0.011)	-0.008 (0.018)
Self-employed with More than 3 Workers X Reform	-0.005 (0.005)	0.017 (0.013)	0.030 (0.038)	0.018 (0.013)	-0.017 (0.020)
Panel B. Women (401 Observations)					
Less than 20 Minimum Wages X Reform	-0.000 (0.000)	0.004 (0.004)	-0.020 (0.024)	0.000 (0.001)	0.030 (0.026)
Self-employed with More than 3 Workers X Reform	0.000 (0.000)	0.020 (0.023)	-0.113 (0.073)	0.004 (0.004)	-0.181** (0.071)
Panel C. Men (1,003 Observations)					
Less than 20 Minimum Wages X Reform	0.009* (0.004)	-0.003 (0.004)	-0.003 (0.020)	0.003 (0.005)	-0.000 (0.009)
Self-employed with More than 3 Workers X Reform	0.004 (0.021)	0.019 (0.019)	0.035 (0.057)	0.022 (0.018)	0.007 (0.006)

Notes: The table reports coefficients and clustered standard errors by department in parenthesis of linear probability models of different measures of formality on the interaction terms of the post-reform dummy with indicators of whether the worker earns less than 20 MW or the worker is self-employed and hires more than 3 employees. The formality measures include: a Written Contract dummy; an indicator of whether the employer or employee pay Health and Pension Contributions; an indicator of whether the employee is covered by Workers' Compensation. To estimate the share of workers paid less than 20 MW, wages (deflated to their real value at 2013 prices) were divided by the Colombian Minimum Wage of 589,500 pesos in 2013 pesos. Sample contains observations with more than 10 MW. All regressions control for age, age squared, years of education, education squared, a male dummy, dummies for marital status, the number of MW the individual earns, the worker's type, firm size, the interaction between firm size and worker type and fixed effects for industry and year. \*\*\* p<0.01, p<0.05, \*p<0.1.

Table 8: Effects of Payroll Tax Reform and First Employment Reform on Formality, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
Less than 10 Minimum Wages X Reform	0.064*** (0.010)	0.063*** (0.018)	0.061*** (0.016)	0.070*** (0.015)	0.054** (0.026)
Self-employed with More than 3 Workers X Reform	0.011* (0.006)	0.019*** (0.003)	0.020*** (0.002)	0.016*** (0.003)	0.020*** (0.002)
Less than 29 Years Old X 2010	0.006** (0.003)	0.008* (0.004)	0.023*** (0.006)	0.012** (0.005)	0.014*** (0.003)
Women older than 40 Years Old X 2010	-0.017** (0.007)	-0.010 (0.008)	-0.004 (0.009)	-0.010 (0.008)	-0.008 (0.010)
Less than 1.5 Mminimum Wages X 2010	0.000*** (0.000)	0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)	-0.000** (0.000)
Times Real Minimum Wage	0.001*** (0.000)	0.001 (0.001)	0.001** (0.000)	0.001** (0.001)	0.002* (0.001)
Observations	353,886	353,886	353,886	353,886	353,886

Notes: The table reports coefficients and clustered standard errors by department in parenthesis of linear probability models of different measures of formality on the interaction terms of the post-reform dummy with indicators of whether the worker earns less than 10 MW or the workers is self-employed and hires more than 3 employees. The formality measures include: a Written Contract dummy; an indicator of whether the employer or employee pay Health and Pension Contributions; an indicator of whether the employee is covered by Workers' Compensation. To estimate the share of workers paid less than 10 MW, wages (deflated to their real value at 2013 prices) were divided by the Colombian Minimum Wage of 589,500 pesos in 2013 pesos. All regressions control for age, age squared, years of education, education squared, a male dummy, dummies for marital status, the number of MW the individual earns, the worker's type, firm size, the interaction between firm size and worker type and fixed effects for industry and year. \*\*\* p<0.01, \*\*p<0.05, \*p<0.1.



Table 9: Effects of Payroll Tax Reform on Transitions to Registered Employment by Firm Size, Social Security Records

	Full Sample		Firms < 3 Employees		Firms 4-10 Employees		Firms 11-50 Employees		Firms > 50 Employees	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Less than 10 MW X Reform	0.035*** (0.001)		0.394*** (0.006)		0.297*** (0.007)		-0.102*** (0.003)		-0.058*** (0.001)	
Self-empl. w/ More than 3 Workers X Reform	0.163*** (0.001)	0.168*** (0.001)			0.142*** (0.001)	0.117*** (0.001)	0.059*** (0.002)	0.060*** (0.002)	0.075*** (0.002)	0.074*** (0.002)
0-2 Minimum Wages X Reform		0.051*** (0.001)		0.457*** (0.008)		0.228*** (0.007)		-0.106*** (0.003)		-0.053*** (0.001)
3-5 Minimum Wages X Reform		0.020*** (0.001)		0.393*** (0.007)		0.363*** (0.006)		-0.102*** (0.003)		-0.073*** (0.001)
6-10 Minimum Wages X Reform		0.010*** (0.001)		0.267*** (0.005)		0.255*** (0.006)		-0.091*** (0.003)		-0.052*** (0.001)
Reported Wages / Minimum Wages	0.001*** (0.000)	0.001*** (0.000)	0.023*** (0.000)	0.026*** (0.000)	0.017*** (0.000)	0.014*** (0.000)	-0.005*** (0.000)	-0.005*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)
Reform	-0.038*** (0.001)	-0.051*** (0.001)	-0.367*** (0.006)	-0.423*** (0.007)	-0.341*** (0.006)	-0.299*** (0.006)	0.098*** (0.003)	0.102*** (0.003)	0.061*** (0.001)	0.059*** (0.001)
Observations	78,200,257		16,125,810		4,717,052		10,005,116		47,352,279	

Notes: The table reports coefficients and clustered standard errors by individual in parenthesis of linear probability models of the transition to registered employment. All regressions control for the ratio of reported wages (deflated real values at 2015 prices) to the Colombian Minimum wage in 2015 which was 644,350 pesos. All specifications control for industry, state, year and month fixed effects. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 10: Effects of the Payroll Tax Reform on Manufacturing Employment, Monthly Manufacturing Sample

	Number of Permanent Non-Production Employees (1)	Number of Permanent Production Employees (2)	Ratio of Permanent Non-production Employees (3)	Ratio of Permanent Production Employees (4)	Regular Hours for All Permanent Employees (5)	Extraordinary Hours for All Permanent Employees (6)
Panel A. Full Sample (98,953 Observations)						
Average Wages Less than 10 MW X Reform	46.164*** (12.299)	253.904*** (36.251)	0.104** (0.041)	-0.073 (0.113)	-278.551* (146.293)	-37.942 (27.730)
Average Wages / Minimum Wages	4.696*** (0.913)	17.510*** (4.765)	0.004 (0.004)	-0.012* (0.007)	1.020 (0.806)	0.097 (0.178)
Panel B. Less than 4 employees (5,169 Observations)						
Average Wages Less than 10 MW X Reform	2.363** (0.897)	5.961*** (1.177)	0.858*** (0.199)	0.294 (0.202)	-2,545.175*** (95.998)	-29.745** (12.110)
Average Wages / Minimum Wages	0.157*** (0.053)	0.633*** (0.107)	0.110*** (0.028)	0.041* (0.023)	33.558*** (8.607)	3.138*** (1.079)
Panel C. More than 4 and less than 10 employees (7,844 Observations)						
Average Wages Less than 10 MW X Reform	3.077*** (0.932)	9.482*** (2.152)	0.555*** (0.198)	0.439** (0.188)	-1,830.071* (942.582)	-31.833 (27.470)
Average Wages / Minimum Wages	0.283*** (0.078)	0.817*** (0.187)	0.048*** (0.015)	0.022* (0.012)	10.135*** (3.687)	0.830** (0.344)
Panel D. More than 10 and less than 50 employees (21,205 Observations)						
Average Wages Less than 10 MW X Reform	4.839*** (1.708)	17.002*** (4.961)	0.020 (0.103)	0.171 (0.172)	-437.734 (308.641)	-75.621 (69.687)
Average Wages / Minimum Wages	0.363*** (0.102)	0.714 (0.452)	-0.000 (0.006)	0.025* (0.014)	-0.255 (2.564)	0.221 (0.488)
Panel E. More than 50 employees (64,777 Observations)						
Average Wages Less than 10 MW X Reform	35.356*** (11.132)	168.972*** (54.994)	0.030 (0.029)	0.006 (0.136)	-88.831 (66.200)	-16.047 (11.642)
Average Wages / Minimum Wages	3.180*** (1.129)	10.364** (4.831)	-0.007* (0.004)	-0.013* (0.007)	-0.772 (1.406)	-0.230 (0.270)

Notes: The table reports the coefficients and robust standard error in parenthesis by firm size. The regressions include controls for average (deflated in real 2015 values) divided by the minimum wage of 2015 (644.350 Colombian pesos). All specifications control for industry, state, year and month fixed effects. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 11: Placebo Effects of Less than 20 MW on Manufacturing Employment, Monthly Manufacturing Sample

	Number of Permanent Non-Production Employees (1)	Number of Permanent Production Employees (2)	Ratio of Permanent Non-production Employees (3)	Ratio of Permanent Production Employees (4)	Regular Hours for All Permanent Employees (5)	Extraordinary Hours for All Permanent Employees (6)
Average Wages Less than 20 MW X Reform	10.877 (9.613)	7.833 (4.998)	-0.065 (0.071)	0.171** (0.064)	-174.418*** (57.207)	-15.042** (5.406)
Average Wages / Minimum Wages	-3.560*** (1.216)	-0.043 (0.188)	-0.007** (0.003)	-0.006*** (0.002)	-2.783 (1.609)	-0.239 (0.141)
Observations	4,358	4,358	4,358	4,358	4,358	4358

Notes: The table reports the coefficients and robust standard error in parenthesis by firm size. The regressions include controls for average (deflated in real 2015 values) divided by the minimum wage of 2015 (644.350 Colombian pesos). All specifications control for industry, department, year and month fixed effects. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table A1: Effects of Payroll Tax Reform on Formality for those with Less than 10 MW, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
	Panel A. Full Sample (353,886 Observations)				
Less than 10 Minimum Wages X Reform	0.060*** (0.009)	0.063*** (0.017)	0.069*** (0.018)	0.069*** (0.014)	0.058** (0.025)
	Panel B. Women (168,589 Observations)				
Less than 10 Minimum Wages X Reform	0.123*** (0.008)	0.096*** (0.033)	0.105*** (0.033)	0.105*** (0.030)	0.087* (0.047)
	Panel C. Men (185,297 Observations)				
Less than 10 Minimum Wages X Reform	0.030*** (0.010)	0.041*** (0.012)	0.048*** (0.012)	0.045*** (0.010)	0.039** (0.018)

Notes: The table reports coefficients and clustered standard errors by department (in parenthesis) of linear probability models of different measures of formality on the interaction terms of the post-reform dummy with indicators of whether the worker earns less than 10 MW or the workers is self-employed and hires more than 3 employees. The formality measures include: a Written Contract dummy; an indicator of whether the employer or employee pay Health and Pension Contributions; an indicator of whether the employee is covered by Workers' Compensation. To estimate the share of workers paid less than 10 MW, wages (deflated to their real value at 2013 prices) were divided by the Colombian Minimum Wage of 589,500 pesos in 2013 pesos. All regressions control for age, age squared, years of education, education squared, a female dummy, dummies for marital status, the number of MW the individual earns, the worker's type, firm size, the interaction between firm size and worker type and fixed effects for industry and year. Sample of all workers with income and industry. \*\*\* p<0.01, \*\*p<0.05, \*p<0.1.

Table A2: Effect os Payroll Tax Reform on Formality for Self-Employed with More than 3 Workers, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
	Panel A. Full Sample (67,167 Observations)				
Self-employed with More than 3 Workers X Reform	0.144*** (0.015)	0.166*** (0.012)	0.152*** (0.006)	0.163*** (0.009)	0.146*** (0.007)
	Panel B. Women (26,230 Observations)				
Self-employed with More than 3 Workers X Reform	0.168*** (0.026)	0.172*** (0.037)	0.136*** (0.022)	0.178*** (0.033)	0.122*** (0.021)
	Panel C. Men (40,937 Observations)				
Self-employed with More than 3 Workers X Reform	0.127*** (0.013)	0.158*** (0.009)	0.160*** (0.006)	0.150*** (0.013)	0.159*** (0.007)

Notes: The table reports coeficients and clustered standard errors by department (in parenthesis) of linear probability models of different measures of formality on the interaction terms of the post-reform dummy with indicators of whether the worker earns less than 10 MW or the workers is self-employed and hires more than 3 employees. The formality measures include: a Written Contract dummy; an indicator of whether the employer or employee pay Health and Pension Contributions; an indicator of whether the employee is covered by Workers' Compensation. To estimate the share of workers paid less than 10 MW, wages (deflated to their real value at 2013 prices) were divided by the Colombian Minimum Wage of 589,500 pesos in 2013 pesos. All regressions control for age, age squared, years of education, education squared, a female dummy, dummies for marital status, the number of MW the indiviudal earns, the worker's type, firm size, the interaction between firm size and worker type and fixed effects for industry and year. Sample of all Self-Employed with income and industry. \*\*\* p<0.01, p<0.05, \*p<0.1.

Table A3: Effects of the Payroll Tax Reform on Formality -Exclusion 10% around 1 MW-, Household Surveys

	Written Contract (1)	Health Contribution (2)	Pension Contribution (3)	Health and Pension Contribution (4)	Workers' Compensation (5)
Panel A. Full Sample (330,330 Observations)					
Less than 10 Minimum Wages X Reform	0.061*** (0.008)	0.062*** (0.016)	0.069*** (0.017)	0.067*** (0.014)	0.058** (0.025)
Self-employed with More than 3 Workers X Reform	0.009 (0.007)	0.016*** (0.003)	0.017*** (0.003)	0.013*** (0.003)	0.018*** (0.003)
Panel B. Women (159,604 Observations)					
Less than 10 Minimum Wages X Reform	0.124*** (0.007)	0.095*** (0.032)	0.106*** (0.033)	0.104*** (0.029)	0.087* (0.046)
Self-employed with More than 3 Workers X Reform	0.016*** (0.004)	0.017*** (0.003)	0.005 (0.006)	0.015*** (0.003)	0.015*** (0.005)
Panel C. Men (170,726 Observations)					
Less than 10 Minimum Wages X Reform	0.030*** (0.009)	0.039*** (0.012)	0.045*** (0.013)	0.044*** (0.009)	0.037* (0.018)
Self-employed with More than 3 Workers X Reform	0.006 (0.009)	0.017*** (0.004)	0.025*** (0.004)	0.014*** (0.005)	0.021*** (0.003)

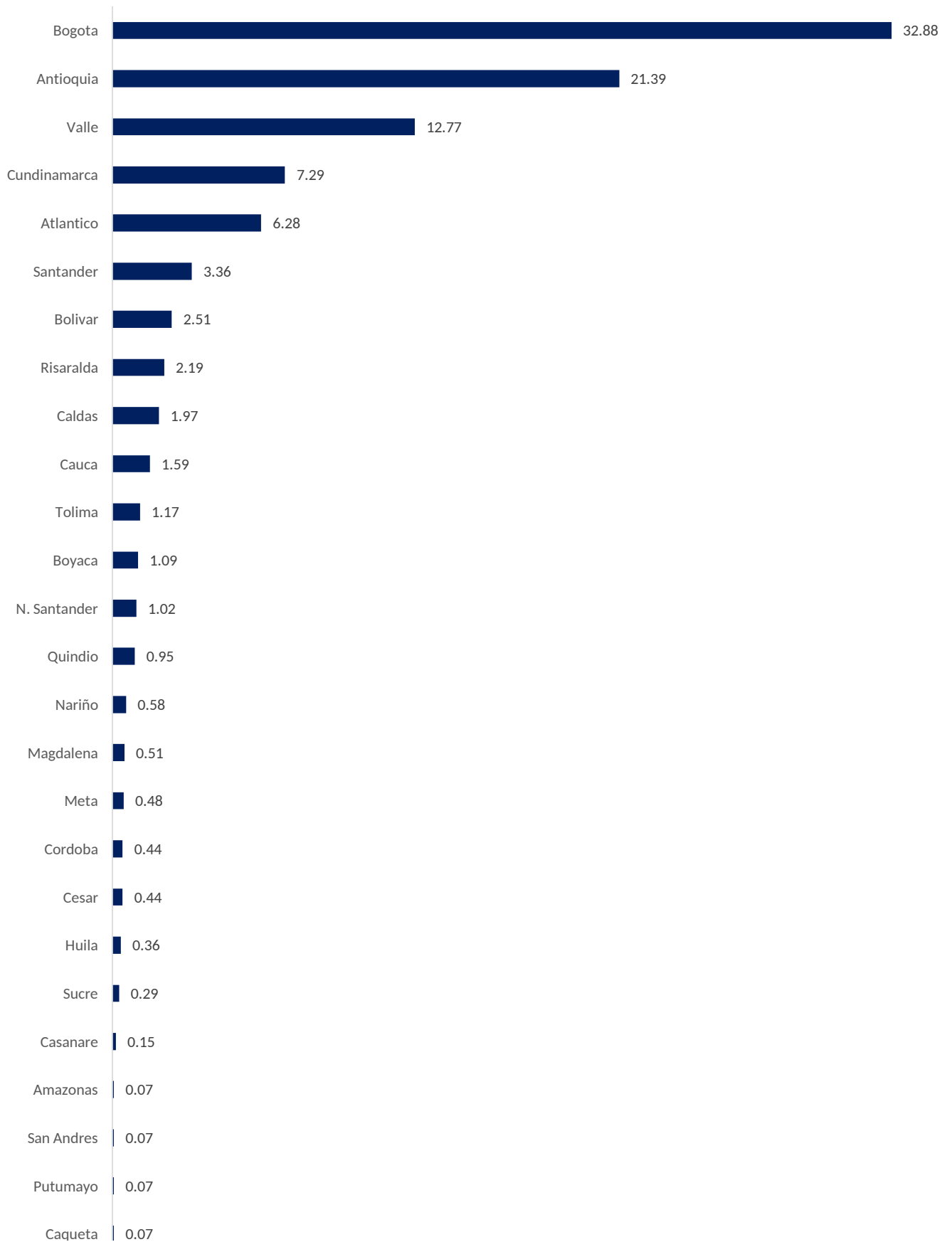
Notes: The table reports coefficients and clustered standard errors by department (in parenthesis) of linear probability models of different measures of formality on the interaction terms of the post-reform dummy with indicators of whether the worker earns less than 10 MW or the workers is self-employed and hires more than 3 employees. The formality measures include: a Written Contract dummy; an indicator of whether the employer or employee pay Health and Pension Contributions; an indicator of whether the employee is covered by Workers' Compensation. To estimate the share of workers paid less than 10 MW, wages (deflated to their real value at 2013 prices) were divided by the Colombian Minimum Wage of 589,500 pesos in 2013 pesos. All regressions control for age, age squared, years of education, education squared, a female dummy, dummies for marital status, the number of MW the individual earns, the worker's type, firm size, the interaction between firm size and worker type and fixed effects for industry and year. Sample excludes population with 5% above and below 1 MW \*\*\* p<0.01, \*\*p<0.05, \*p<0.1.

Table A4: Bunching effect

	From 8 to 12 MW (1)	From 8.5 to 11.5 MW (2)	From 9 to 11 MW (3)
Reform	-0.001*** 0	0.001*** 0	0.001*** 0
Observations	5,030,925	3,195,775	2,116,038
R-squared	0.032	0.018	0.022

Robust standard errors in parentheses. \*\*\* p<0.01, \*\*p<0.05, \*p<0.1.

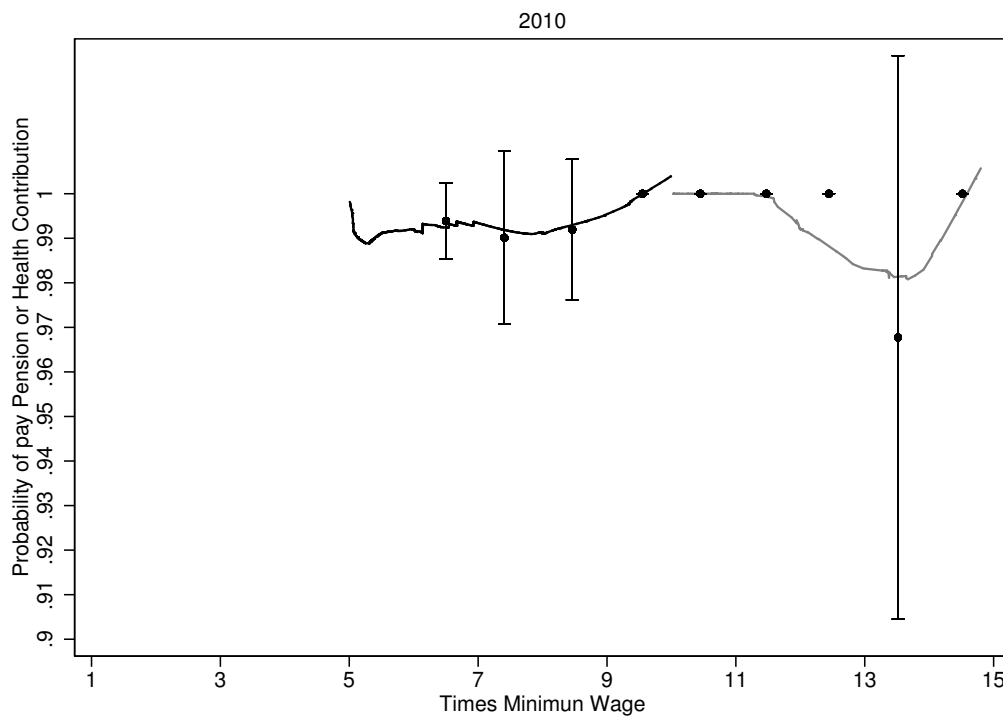
Figure 1: Share of firms by State in the MMS



Notes: This figure reports share of establishments in each department from MMS data for the years 2008-2014.



Figure 2: Contribute to Pension or Health Fund



Notes: This figure reports the probability of get a formal job by contribute to Pension and Health Funds in 2010.