



Unintended consequences of maternity leave legislation: The case of Colombia

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ABSTRACT

We estimate the impact on female labor outcomes of the extension in maternity leave period from 12 to 14 weeks, an amendment to the Colombian labor law in 2011. To identify this impact, we compare labor market outcomes of different groups of individuals with women of child-bearing age. First we compared two groups of women with different fertility rates (low elasticity of substitution), finding that, as result of the extension, women in the high-fertility age group experience an increase in inactivity, informality, and self-employment. When comparing high-fertility age women with men in the same age group (high elasticity of substitution), we find that the extension increases the probability of unemployment, informality and self-employment and decreases wages of women compared with men.

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1. Introduction

The legislation on maternity leave is as a variety of accommodation mandates, where the beneficiaries are entitled to a set of adjustments to facilitate their participation in a given social or economic setting. The characteristic of these mandates is that they apply to a clearly identifiable group. Generally, this type of legislation is combined with anti-discrimination rules, and its consequences for labor market outcomes depend on the effect on labor demand and supply and the incentives imposed by anti-discrimination rules. Therefore, when evaluating the efficiency of these policies, their effect on wages as well as on employment must be considered.¹

In this paper, we evaluate the effects on women's labor market outcomes of the most recent maternity leave legislation reform in Colombia, which extended the leave period from 12 to 14 weeks, a 17% increase².

Currently, Colombian labor law includes a package of protection for pregnant women comprising the following benefits, within the general social security system: (i) prohibition against dismissal of the worker on account of pregnancy during the pregnancy and maternity leave periods;³ (ii) a paid leave of 14 weeks around the time of birth;⁴ (iii) the reinstatement of the employee in the previous post at the end of maternity leave, and (iv) two breaks of 30 min each for feeding the child during the first six months of the infant's life. During leave, the total amount of the woman's salary is paid by the health insurance system to which the worker is affiliated, out of

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¹ Summers (1989) provides a seminal contribution in the literature relating the effects of mandates directed to workers as a whole on labor outcomes. An important contribution is found in Jolls (2000), which adapts the Summers framework to the case of accommodation mandates.

² Law 1468 from 2011.

³ A pregnant worker may be dismissed if there is fair cause for termination of the employment contract and if authorization from a Labor Inspector has previously been granted.

⁴ Colombian law mandates that the worker must take one of the 14 weeks before the birth of the child and the next 13 weeks after the birth. In the case of premature births, the 14 weeks may be increased by the difference between the initial due date and the date that the child is born. In the case of multiple births, the length of maternity leave is increased by two weeks.

the contributions periodically made by the worker and her employer as per the employment contract.⁵ The employer still has to cover payroll taxes and other social security contributions for this worker during the leave period. In contrast to this protection package, men rely exclusively on a paid leave of eight working days after the birth of the child.⁶

To quantify the direct costs of maternity leave paid by employers in Colombia, Espino and Salvador (2014) use information from household surveys in 2012,⁷ shown in Table 1, and take into account current labor legislation. They find that the annual extra cost for the firm of providing paid maternity leave is 6.73 percent of the average annual female wage.⁸ This extra cost is directly associated with providing maternity leave and hiring a replacement worker during the leave period. There are, however, other important costs assumed by the employer that are not taken into account in this calculation. Those are related to the necessary adjustments in the organization due to the absence of the worker on leave, including the costs of posting the job, searching for an appropriate replacement, and productivity losses either during the training and adjustment period or throughout the leave period if the replacement is not as productive as the worker on maternity leave. Unfortunately, measuring these costs is very difficult due to lack of appropriate data.

However, these additional costs associated to female workers if they get pregnant would affect the decision of employers when hiring, changing the probability of a woman being hired as well as her salary. In a general equilibrium setting, this could end up altering female labor participation, unemployment rate, and other labor market results for women.⁹

To estimate the effect of the extension in the maternity leave period from 12 to 14 weeks in Colombia, our identification strategy consists in comparing the differential outcomes of a group of women directly affected by the legislation to those outcomes of a group not affected by the legislation (a difference in difference approach). To define those groups to be compared, we exploit the change in fertility rates throughout a woman's life cycle. Because of the strong correlation between a woman's fertility rate and her age, individuals tend to use the woman's age as a predictor of her probability of becoming pregnant in the near future. Regardless of the woman's own preferences and decisions, a potential employer could attribute to her a high probability of getting pregnant (or not) just because of her age.

We exploit this widespread social perception to estimate the effect on female labor outcomes of the recent change in the Colombian maternity leave legislation. The women affected by the legislation would be those of an age associated with high fertility (between 18 and 30). The comparison group corresponds to women in ages associated with low fertility (between 40 and

Table 1

Labor Cost Associated with Maternity Leave Take.

Labor Cost	Percentage
Nominal wage	73.06
Cost of a replacement worker	30.31
Nursing license	3.37
Total Cost	106.73

Note: Annual labor costs assumed by the employer for each female worker with maternity leave and nursing leave (Values refer to a basic salary of 100). Adapted by authors from Espino and Salvador (2014).

55), using the difference-in-differences approach. Our results show that because of the extension in the maternity leave period, women of childbearing age (the treatment group) experience worse labor market outcomes in any given month than the group of women associated with low fertility rates (the comparison group). Women in the treatment group are more likely to enter into inactivity, informality, and self-employment after 2011 relative to women in the comparison group.

We also compare results for women between 18 and 30 years old with men of the same age. We find that a woman in childbearing age experiences an increase in her probability of unemployment, informality, and self-employment, as well as a reduction of wages, relative to men in the same age, after the implementation of the law.

We show that our results are robust across demographic groups and time periods, suggesting a causal effect of the increase in the maternity leave period.

We want to emphasize that these results are applicable to *all women in high-fertility ages* simply for being the subject of the social perception that they will get pregnant in the very near future; these results do not apply only to pregnant women, or women who have recently had kids. Additionally, we stress that our paper does not attempt to provide an overall assessment of maternity protection laws. We do not evaluate the benefits of such laws to workers or society in general. The fact that there are some effects on the labor market for high-fertility women underscores the fact that legal protections do not come without cost. We make public policy recommendations that could correct the distortions created by the legislation, so that women can enjoy their maternity leave period without being punished by the labor market.

This document is divided into five sections. Section 2 reviews the relevant literature. Section 3 outlines the empirical methodology and describes the data. Section 4 presents the results. Finally, we conclude and give some policy recommendations in Section 5.

2. Literature review

Literature shows that enjoying maternity leave substantially reduces the deaths of infants and young children and increases the likelihood that babies will visit the pediatrician regularly and receive their immunizations on time, reduce the risk of infants getting infections, the likelihood of having asthma and obesity (Berger, Hill, & Waldfogel, 2005; Heymann, Raub, & Earle, 2011; Ruhm, 2000). Maternity leave promotes breastfeeding and prolongs the time that the baby is breast-fed. For mothers, it also represents a benefit since it reduces the likelihood of having breast and ovarian cancer, type 2 diabetes and heart problems, according to a meta-analysis by the Agency for Healthcare Research and Quality.¹⁰ In addition, regarding the return to work after childbirth, some studies reveal that women are more likely to return to work,

⁵ The general rule was that the above-described measures benefited formal sector workers tied to an employer by an indefinite-term employment contract. However, after finding that employers were offering women short-term contracts to circumvent the protection of workers during pregnancy, the Constitutional Court extended similar protections for workers with fixed-term contracts, beginning in 1997. Unless there is authorization from a Labor Inspector, the employment relationship cannot be terminated (Colombian Constitutional Court, T-326 of 1998). Similar arguments have been put forth in the following Court decisions: T-426/98; T-375/00; T-764/00; T-664/01; T-206/02; T-113/03; T-895/04; T-1236/04.

⁶ Law 755 of 2002.

⁷ Specifically, they use Gran Encuesta Integrada de Hogares (monthly household surveys) and Encuesta Nacional de Calidad de Vida (quality-of-life household surveys), both administered by DANE, the national institution responsible for collecting statistics in Colombia.

⁸ The annual cost for a worker with no maternity leave is 100. For a woman with maternity leave, the employer must cover 73.06 percent of her annual salary (remaining wages are covered by the social security system). 30.31 percent corresponds to the salary of the replacement worker, and 3.37 percent corresponds to the value of one paid hour per day for nursing for three months after woman returns from maternity leave.

⁹ We present a theoretical model in Appendix I.

¹⁰ See Ip et al. (2007).

either with the previous employer or another, if they have maternity leave. (Baker & Milligan, 2008, Rossin-Slater, Ruhm, & Waldfogel, 2013, Ruhm, 1998; Baum & Ruhm, 2016).

Nevertheless, other authors find negative effects. Lai and Masters (2005) review the effect of introducing compulsory maternity leave on the demand for female labor in Taiwan. They conclude that, in the short term, maternity leave worsens the economic situation of women because it reduces the probability of them being employed as well as their salary. Gruber (1994) studies the effects on the labor market of legislative changes in the United States that occurred between 1975 and 1978 requiring companies to include the costs of maternity and delivery in employee health insurance plans. The study found that there was a significant decrease in wages but not in employment levels. About this, literature from psychology explains that in general, employers choose not to hire or promote women because having a child in conjunction with longer maternity leaves decreases women's agency perceptions thus causing them to be negatively evaluated in the work domain (Hideg et al., 2018; Morgenroth & Heilman, 2017). Estevez-Abe (2006), Glass and Fodor (2007, 2011), Hofferth and Curtin (2006), Mandel (2010), Mandel and Semyonov (2005), Chang (2004), Evertsson and Duvander (2010) and Blau and Kahn (2013) find how maternal leave reduces mothers' participation in the workforce, creates barriers to entry into competitive markets and pushes women into low-wage sectors of the economy, where staff turnover is less costly for employers. This way, employers implement statistical discrimination against women because they are looking for more stable and productive employees, especially for high-ranking positions requiring high qualification and long periods of training.

Some authors also find that in general, the relationship between the length of the leave and the increase in salary and the one between the length of the leave and labor market participation of women are shaped as an inverted U (Akgunduz & Plantenga, 2012; Budig, Misra, & Boeckmann, 2012; Pettit & Hook, 2005). This U takes on greater values if cultural support for maternal employment is greater.¹¹

Research on labor and maternity in Colombia suggests a connection between motherhood costs and a female wage penalty or lower labor force participation of women. Molinos (2012) evaluated the effect of a judicial decision (C-470 1997) on female labor force participation in Colombia. This Constitutional Court ruling established the invalidity of dismissal and requires reinstatement of all pregnant workers within three months after delivery. She finds that female labor force participation declined, especially among women between 15 and 29 years of age.

Among the literature that studies the effects of accommodation mandates on labor markets, Acemoglu and Angrist (2001) find that the Americans with Disabilities Act (ADA) had a negative effect on the employment of disabled men of all working ages and disabled women under age 40. Moreover, they find little evidence of an impact on the nondisabled, suggesting that the adverse employment consequences of the ADA have been limited to the protected group. Jolls and Prescott (2004) evaluate various aspects of the impact of the ADA on labor markets. Their findings support a causal relationship between the ADA and declines of 10 percent in employment of the disabled in the years immediately following the law's enactment in states in which the law's reasonable accommodations requirement was an innovation, compared to states in

which a similar requirement existed at the state level prior to the ADA's enactment.¹²

3. Empirical methodology and data

Our empirical strategy to disentangle the effect of the increase in the maternity leave period on labor market outcomes is to compare outcome differences in the post-legislation period with those in the pre-legislation period between a group affected by the legislation (the treatment group) and a group not affected by it (the comparison group). It is important to mention that the change of the law applies to the entire national territory; therefore, finding geographically delineated treatment and control groups posed a challenge during this whole project. However, we are convinced that these comparison groups are the best available to be able to understand the differentiated effects that women of child-bearing age experience.

To determine the group affected by the legislation, we expect legislation on maternity leave to have a greater effect on women in the high-fertility age group than women in the low-fertility age group. This is due to a generalized social perception that a woman in the high-fertility age group is very likely to become pregnant in the near future. Employers would tend to take that perception into consideration when calculating the expected value of hiring a woman from that group.

Table 2 shows the fertility rates for different age groups as reported by DANE.¹³ There are groups with clear differences in their fertility rates (e.g. 25–29 vs. 45–49), while there are other groups for which their differences are not so clear cut (e.g. 25–29 vs. 30–34). Because our strategy relies on having two comparable groups where one is affected by the legislation while the other is not, we choose as treatment group women whose ages are between 18 and 30, and as comparison group women whose ages are between 40 and 55.¹⁴ On average, during the period analyzed—2009 to 2013—fertility rates for the treatment group hover around 11.5 percent, while those for the comparison group are approximately 1.18 percent. This difference in fertility rates allows us to have two comparable groups, only one of which is affected by the changes in legislation.

To address differential effects in labor demand coming from differences in the elasticities of substitution between inputs, we also consider as a comparison group those men in the same age group as our treatment group (18–30 years old). This group of men is not affected by the change in legislation and, leaving gender discrimination aside, have similar work experience and other characteristics that would make them a close substitute with women in our treatment group.

In order to understand the impact of the extension of the maternity leave period on the group of women in the high-fertility age group, we propose the following empirical model:

$$y_i = \gamma_0 + \gamma_1 \text{treated}_i + \gamma_2 \text{law2011} + \gamma_3 \text{treated} * \text{law2011} + \Gamma X_i + \theta_t + \varepsilon_i \quad (1)$$

where y_i are labor market outcome variables such as labor inactivity, unemployment, informality, etc. treated_i is a dummy variable

¹² Related literature studies the effects of laws that provide employment security to incumbent workers. Autor et al. (2006) look at the effects of employment protection in the United States and find that wrongful-discharge regulations reduce employment rates by between 0.8 and 1.7 percent and that the initial impact is larger for less educated workers and female employees. That paper finds that laws protecting employees must be accompanied by other laws designed to mitigate distortions in the market.

¹³ National Department of Statistics (Departamento Administrativo Nacional de Estadística - DANE).

¹⁴ In addition to the difference in fertility rates, the selection of these treatment and comparison groups ensures that women in the comparison group were not part of the treatment group at any time during the period analyzed.

¹¹ Cultural support was measured in different countries by analyzing the level of support to statements such as: "Preschool children suffer if mother works", "Family suffers if woman works full-time", "A man's job is to earn money, a woman's job is to look after home and family".

Table 2
Fertility Rates by Age.

Period	Age Groups						Global Rate
	20–24	25–29	30–34	35–39	40–44	45–49	
1985–1990	0.17	0.15	0.12	0.08	0.03	0.00	3.34
1990–1995	0.16	0.14	0.11	0.07	0.03	0.00	3.14
1995–2000	0.15	0.13	0.10	0.06	0.02	0.00	2.86
2000–2005	0.14	0.12	0.09	0.05	0.02	0.00	2.60
2005–2010	0.13	0.11	0.08	0.05	0.02	0.01	2.45
2010–2015	0.12	0.11	0.08	0.05	0.02	0.01	2.35
Average 2005–2015	0.12	0.11	0.08	0.05	0.02	0.01	2.40

Source: DANE and calculations by the authors.

Table 3
Distribution of labor market variables between the treated and comparison groups. Period 2009–2013.

Pre Treatment Period (Jan. 2009 – June 2011)			
	Comparison Groups		
	Women 18–30 y.o.	Women 40–55 y.o.	Men 18–30 y.o.
Employed (%)	51.21	64.44	68.52
Informal (% from employed)	59.51	65.64	59.09
Self-employed (% from employed)	27.80	46.09	30.73
Unemployed	17.58	7.37	14.8
Inactivity	31.21	28.19	16.68
Post Treatment Period (July 2011 – Sep. 2013)			
	Comparison Groups		
	Women 18–30 y.o.	Women 40–55 y.o.	Men 18–30 y.o.
Employed (%)	54.42	67.16	71.05
Informal (% from employed)	57.22	64.31	56.08
Self-employed (% from employed)	27.66	46.19	29.86
Unemployed	15.86	6.50	12.88
Inactivity	29.72	26.34	16.07

Note: Source: DANE and calculations by the author.

that takes the value of 1 if the person is a woman between 18 and 30 years old, and 0 if the person belongs to the comparison group. *law2011* is a variable that takes the value of 1 for all months starting in July 2011, when the legislation on maternity protection was introduced, and controls for common shocks affecting the labor market outcomes of both the treatment and the comparison groups after July 2011.

To control for differences in characteristics between the two groups that could explain differences in participation and occupational decisions, we include regressors in the model that allow us to control for observable characteristics and help solve this problem. In the vector of regressors X_i we include age, age squared, three indicator variables (whether the individual has a high-school education or less, whether she lives with a partner or not, and whether she is the head of household), the number of children in the household, the total number of household members, and the household's economic stratum according to the household's energy bill. We also control for fixed effects by area of residence, year, and month. Additionally, in light of the possibility that seasonal shocks affect treated women differently than comparison individuals (e.g. younger workers differently than older workers; or young women differently than young men), we include an interaction between month and the indicator of belonging to the treatment group (*treated*). All estimates are weighted by the share of area residents age 18–65 in the year. For the regression on real wages, we also control for sector of employment.

We are interested in the coefficient of the interaction (γ_3), which indicates whether the legislation considered differentially affected women in the treatment group.

We estimate the equations using probit regression analysis, except for wages, for which we use OLS regression. We use robust estimation of the standard errors.¹⁵

We use monthly, cross-sectional, data from the Integrated Household Survey (Gran Encuesta Integrada de Hogares – GEIH) for the period between January 2009 and September 2013. The survey is conducted by DANE, which is the main source of information about the labor market in Colombia. This survey provides data on the size and structure of the labor force as well as household and individual characteristics such as gender, education, age, marital status, and others. The baseline period for our analysis is January 2009 through June 2011 (pre period), and July 2011 through September 2013 (post period). The population we study consists of respondents in the 13 metropolitan areas covered by the GEIH.¹⁶

In Table 3, we report the distribution of job market variables for our treatment and comparison groups, and for the pre-treatment and post-treatment periods, separately. In general, the rate of unemployment is higher for the treatment group (around 17.6% during the pre-treatment, and 16% in the post-treatment). The rate of employment is lower for the treatment group (51% pre-

¹⁵ Following Bertrand, Duflo and Mullainathan (2004), we collapsed the data into just two periods: “before” implementation of the law and “after” the implementation of the law in order to address the severe serial correlation problem present in Differences-in-Differences estimation. We decide to use this procedure since we have few clusters. All the results presented in this paper are quantitatively and qualitatively similar to those which obtain when collapsing the data, suggesting that the standard deviation of the estimators are not severely understated. Results are available from the authors upon request.

¹⁶ The 13 metropolitan areas are: Barranquilla, Bogotá, Bucaramanga, Medellín, Cali, Cartagena, Cúcuta, Ibagué, Manizales, Montería, Pasto, Pereira, and Villavicencio.

Table 4

Characteristics of the treatment and comparison groups. Period 2009–2013.

Pre Treatment Period (Jan. 2009 – June 2011)					
	Women			Men	
	18–30	40–55	Difference in means test	18–30	Difference in means test
Education	11.115	8.819	–2.296***	10.701	–0.414***
Economic Strata	2.249	2.435	0.186***	2.221	–0.028***
Marital status	0.404	0.582	0.177***	0.308	–0.096***
Number of children	1.101	0.680	–0.421***	0.793	–0.308***
Log Real Wages	8.440	8.634	0.195***	8.589	0.149***
Post Treatment Period (July 2011 – Sep. 2013)					
	Women			Men	
	18–30	40–55	Difference in means test	18–30	Difference in means test
Education	11.471	9.108	–2.363***	10.993	–0.478***
Economic Strata	2.232	2.401	0.169***	2.210	–0.022***
Marital status	0.398	0.583	0.186***	0.301	–0.097***
Number of children	1.029	0.628	–0.400***	0.728	–0.301***
Log Real Wages	8.497	8.661	0.163***	8.642	0.144***

Note: Source: DANE and calculations by the authors.

treatment, and 54.4% post-treatment) than for the comparison groups (around 65 percent for women ages 40–55, and around 69 percent for men ages 18–30). Also, the percentage of inactivity is higher for the treatment group (around 30 percent).

In Table 4, we report some descriptive statistics for high-fertility women, women in the comparison group, and men in ages between 18 and 30 years, for both the pre-treatment and the post-treatment periods. Women in the treatment group report having higher levels of education and more children compared with people in the comparison groups. Women in the treatment group report living with a partner at lower rates than women in the comparison group, but at higher rates than men ages between 18 and 30. Finally, women between 18 and 30 years of age are more likely to live in a house with lower economic strata than women between 40 and 55 years of age, but are less likely than men between 18 and 30 years of age. In summary, it can be inferred that differences in individual characteristics are present in our analysis so we address these differences by including all these observable characteristics as controls.

4. Results

In this section we report the results from our estimation exercises. We report the corresponding marginal effects for the interaction *treated*law2011*.¹⁷ The marginal effects reported in the main text are calculated for a woman in the treatment group who lives in Bogotá on June 2012, does not live with a partner, is not the head of household, and either (i) has more than a high school education, or (ii) her level of education is high school or lower.¹⁸

4.1. Baseline

In our baseline scenario, the treatment group corresponds to women ages 18–30, and the comparison group to women ages

40–55. The pre-reform period is January 2009 – June 2011, and the post-reform period is July 2011 – September 2013.

In column (1) of Table 5, we report the results when analyzing the probability of inactivity. The dependent variable is a dummy that takes the value of 1 if the person indicates that she is not in the labor force, and 0 otherwise.¹⁹ The results show that the probability of inactivity significantly increases for women in the high-fertility age group after the increase in the maternity-leave period. The marginal effects estimation²⁰ indicates that for a woman with less than a high school education, the probability of inactivity in any given month increases by 0.9 percentage points. If the same woman had more than a secondary school education, her probability of inactivity increases by 0.7 percentage points. In general, all other things being equal, the increase in the probability of inactivity is greater for women (i) with low educational attainment, (ii) living with a partner, and (iii) who are not heads of household.

Column (2) of Table 5 reports the results for the probability of unemployment. There is no evidence that the increase in the maternity leave period had affected the probability of unemployment in any given month for women in the high-fertility age group relative to women in the low-fertility age group. None of the marginal effects is significantly different from zero.

Column (3) of Table 5 reports the results for the probability of informality. Informal workers are defined as those workers who do not satisfy one of two conditions: (i) contributing to health insurance system; or (ii) contributing to a pension plan. It shows that the increase in the maternity-leave period resulted in a significant increase in the probability of informality for women in the high-fertility age group relative to women in the low-fertility age group. The marginal effects estimation indicates that the probability of informality in any given month increases by 0.8 percentage points for a woman with more than a high school education and by 0.6 percentage points for a woman with low levels of education.

¹⁷ We report the probit (or OLS, in the case of wages) coefficients in the Appendix.

¹⁸ The marginal effects are estimated for a woman in the treatment group, using sample means, whose age is 23.87, who lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, and who lives in Bogotá on June 2012. The woman could be either living with a partner or not, be the household head or not, and have high or low educational attainment. The combination of all these possibilities gives us a total of eight marginal effects. The two marginal effects reported in the main text plus the remaining six of all other possible combinations are reported in tables in the Appendices. The calculation and interpretation of marginal effects for interactions in non-linear models must take into account the cross-derivatives of the predicted probabilities. See Puhani (2012), Ai and Norton (2003) and Norton, Wang, and Ai (2004) for a discussion of this issue.

¹⁹ A person is classified as inactive if on the survey she or he replies affirmatively to at least one of the following six statements: 1. Handicapped. 2. Doesn't want to get paid work or set up a business. 3. Wants to work but has not made steps to search for a job or set up a business because: a. Self-reported as too young/old for work. b. Family responsibilities. c. Health problems. d. Full-time student. e. Other. 4. After his last job he or she hasn't taken any action to find a job or set up a business. 5. During the last 12 months has not done anything to find work or set up a business. 6. He or she was not available for work.

²⁰ These and the remaining six marginal effects are reported in Appendix A. In Appendix B, we report the estimated marginal effects for the 13 metropolitan areas. All of the results are quantitatively and qualitatively similar.

Table 5

Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Women. Baseline Scenario and Alternative Timings.

Marginal Effect	(1)		(2)		(3)		(4)		(5)
	Inactive		Unemployment		Informality		Self-employment		Log real wages
	Low	High	Low	High	Low	High	Low	High	
	Education	Education	Education	Education	Education	Education	Education	Education	
treated * Law2011	0.009*** (0.002)	0.007*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.006* (0.003)	0.008* (0.004)	0.005* (0.003)	0.004* (0.002)	−0.010 (0.007)
Panel A. Eliminating two months before and two months after implementation of the law									
treated * Law2011	0.009*** (0.002)	0.007*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.006* (0.003)	0.008* (0.004)	0.006* (0.003)	0.005* (0.002)	−0.009 (0.007)
Panel B. Eliminating two months before and four months after implementation of the law									
treated * Law2011	0.010*** (0.002)	0.008*** (0.002)	−0.005 (0.003)	−0.005 (0.003)	0.005* (0.003)	0.007* (0.004)	0.006* (0.003)	0.004* (0.002)	−0.008 (0.007)
Panel C. Eliminating two months before and six months after implementation of the law									
treated * Law2011	0.012*** (0.002)	0.010*** (0.002)	−0.005 (0.003)	−0.005 (0.003)	0.006* (0.003)	0.008* (0.004)	0.006* (0.003)	0.005* (0.002)	−0.009 (0.007)

Note: The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.87, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, does not live with a partner, is not head of household and lives in Bogotá on June 2012. The marginal effects were estimated for two scenarios described by her educational level. "Education level" is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Ceteris paribus, the probability of informality is greater for women who are more educated and who are not living with a partner.

The results with respect to the effect on the probability of self-employment are reported in column (4) of Table 5. We conclude that there is an increase in the probability of self-employment for women in the high-fertility age group after the increase in the maternity-leave period. A woman with low educational attainment faces a 0.6 percent increase in the probability of self-employment in any given month, and a 0.4 percent increase if she has high educational attainment. In general, keeping everything else constant, the increase in the probability of self-employment is larger for women who are (i) less educated, (ii) living with a partner, and (iii) not heads of household. Olarte and Peña (2010) find that the occupations reported as self-employment for Colombian mothers are mainly low quality. Therefore, it is possible that women in the treatment group who are affected by the law are forced into low-paid, low-quality self-employment, where maternity legislation is not enforced.

Column (5) of Table 5 reports the results on the effect on the real wage. We conclude that there is no evidence that the increase in the maternity-leave period has affected the real wages of high-fertility-age women relative to those of low-fertility-age women.²¹

4.2. Comparison group are men ages 18–30

Next, we extend our analysis to using men between 18 and 30 years old as a comparison group. This group can be seen as similar to women of childbearing age, if there were no gender dis-

crimination. In general, companies look for a person with certain specific experience, but not a specific gender, to fill a vacancy. In that case, the most substitutable group for women ages 18–30 is men in the same age group. The results are reported in Tables 6.²² We observe that high-fertility women experience an increase in the probability of unemployment and a reduction in their real wages relative to men in the same age bracket.

Table 6, column (2), shows that women are more likely to be unemployed relative to men after the law took effect. The probability of unemployment in any given month increases by 0.5 percentage points for young women relative to young men. *Ceteris paribus*, the probability of unemployment is higher for high-fertility women who (i) do not live with a partner and (ii) are not heads of household.

Column (3) of Table 6 shows that after the implementation of the longer maternity leave period, women in the age group associated with high fertility faced a significantly higher probability of being in the informal sector relative to men in the same age group. It increases by 1.4 percentage points in any given month for women with low educational attainment and by 1.3 percentage points for women with high educational attainment. All other characteristics being equal, the probability in any given month of women working in the informal sector relative to men in the same age bracket is higher for high-fertility women with low educational attainment. This probability is not affected by marital status or head-of-household condition.

The results in Table 6, column (4) show that, after 2011, women in the high-fertility group are more likely to be self-employed. Specifically, after the extension of the leave period, being a woman in the treatment group increases the probability of being self-employed in any given month by 0.6 percentage points for women with low educational attainment, and by 0.5 percentage points for women with high educational attainment. *Ceteris paribus*, the probability of self-employment is higher for high-fertility women who (i) have low educational attainment, (ii) are living with a partner, and (iii) are not heads of household.

²¹ To check the parallel trend assumption, we estimate a dynamic difference and difference model for each of the variables, where the treatment dummy is interacted with the dummy of each year, omitting the interaction corresponding to the year preceding the reform. We expected no significant differences before the reform, but significant differences after the reform. Inactivity seems to fulfil the identifying assumption of parallel trends for fertile and non-fertile women. The regression for informality and self-employment shows the expected signs, this is an evidence of a change of trajectory for the group of fertile women compared with non-fertile women after the reform. Nevertheless, the coefficients post reform are not significant which prevents us from being conclusive about these variables and lends caution when analyzing the results. For unemployment and wages the dynamic difference and difference model doesn't change the significance after the reform in line with the main model. Tables available upon request.

²² These marginal effects plus the remaining six of all other possible combinations are reported in Appendix C.

Table 6

Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: Comparison group Are Men Ages 18–30.

Marginal Effect	(1) Inactive		(2) Unemployment		(3) Informality		(4) Self-Employment		(5) Log Real Wages coefficients
	Low Education	High Education	Low Education	High Education	Low Education	High Education	Low Education	High Education	
treated * Law2011	–0.001 (0.001)	–0.001 (0.001)	0.004 [*] (0.002)	0.004 [*] (0.002)	0.014 ^{***} (0.004)	0.013 ^{***} (0.003)	0.006 [*] (0.003)	0.005 [*] (0.003)	– 0.014 ^{**} (0.006)

Note: The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.87, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, does not live with a partner, is not head of household and lives in Bogotá on June 2012. The marginal effects were estimated for two scenarios described by her educational level. "Education level" is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

The results in Table 6, column (5) indicate that the real wages in any given month for women in the treatment group decrease in 1.4 percentage points relative to men in the same age bracket.²³

4.3. Alternative timing assumptions

In Table 5, panels A, B, and C, we explore the sensitivity of our findings to alternative choices of pre and post periods. These exercises serve two main purposes: (i) they allow us to take into account the possibility that firms and workers had adjusted their behavior in expectation of the change in maternity leave legislation, or it is possible that it would take some period after implementation for workers and firms to grasp the real impact of the legislation; (ii) they allow us to test the possibility that the legislation was adopted at cyclical labor market peaks, leading us to falsely attribute post-peak changes to the legislation rather than the business cycle. Additionally, as in Autor, Donohue, and Schwab (2006), these exercises allow us to explore some short-term impacts of the increase in the maternity-leave period.²⁴ In panels A, B, and C, the two months immediately prior to adoption are removed from the estimations; additionally, in panel A, the two months immediately following adoption are removed; in panel B, the four months following adoption are removed; and in panel C, the six months following adoption are removed.

All of our baseline results are robust to alternative choices of pre and post periods.²⁵ There are significant increases in the probability of inactivity, informality, and self-employment, and there are no significant effects on unemployment or wages. The changes in the comparison windows do not substantially affect the magnitude or the precision of the main results.²⁶

4.4. Comparing younger men with older men

Because in our strategy of identification we compare younger women with older women, there is a concern that the results

may be driven by contemporary changes in the economic and institutional environments that affect younger workers relative to older workers. If that were the case, we should find similar results when comparing younger men with older men. In order to check for this possibility, we replicate our estimation of Table 5 but using as treatment group men ages 18–30, and as comparison group men ages 40–55. The marginal effect results are reported in Table 7.

In general, the results for younger men versus older men are not significant and have the opposite sign of those for women. The only exception is the result for the probability of informality (column (3)), where the marginal effect of relevance is significant.²⁷ The exercise of changing the comparison windows, as reported above in our baseline case for women, does not affect the results for men.²⁸

The results from comparing younger men with older men give us additional evidence that the results found for high-fertility age women relative to low-fertility age women are not driven by cohort effects and are instead driven by the increase in the maternity-leave period that took effect in July 2011. With respect to the result on informality, in Table 6 we show that the increase in the probability of informality for women ages 18–30 was relatively greater than for men in the same age group.²⁹

4.5. Placebo pre and Post-treatment period

As another robustness check to discard the possibility that our baseline results are attributed to differences in age profiles between the treatment and the comparison group, we estimate placebo treatment effects using data from pre-reform years.

Specifically, we define the period January – June 2009 as the placebo pre-reform period, and July – December 2009 as the placebo post-reform period. The results are reported in Table 8.³⁰ None of the effects is significant except for the coefficient of the interaction when analyzing the effect on unemployment, but it is of the opposite sign.³¹

In summary, the results of our empirical exploration are consistent with our hypothesis that employers perceive the increase in

²³ To check the parallel trend assumption, we estimate a dynamic difference and difference model for each of the variables as in the analysis between fertile and non-fertile women. The regression for unemployment show evidence of parallel trends before the reform and a significant increase in unemployment after the reform for women in childbearing age compare with men in the same age. We also find evidence of parallel before the reform and a significant decrease in wages the years after the reform. The regression for informality and self-employment shows the expected signs, this is an evidence of a change of trajectory for the group of fertile women and men after the reform. Nevertheless, the coefficients post reform are not significant which prevents us from being conclusive about these variables and lends caution when analyzing the results. For inactivity the dynamic difference and difference model shows non-conclusive and eclectic results, in line with the results above. Tables available upon request.

²⁴ Autor et al. (2006) is able to explore long-term impacts as well by removing up to six years of adoption given the availability of data.

²⁵ These and the remaining six marginal effects, for each alternative timing, are reported in Appendix D.

²⁶ We do not report here the results when using as comparison group of men ages 18 to 30, but they are all robust to the choice of alternative timings. These results are available from the authors upon request.

²⁷ All the marginal effects for the estimation with information for men are reported in Appendix E.

²⁸ These results are available from the authors upon request.

²⁹ We also run a regression comparing fertile women with a control group that includes non-fertile women as well as young and older men. For that regression we are interested in the coefficient of the triple interaction between the dummy for the law 2011, a dummy for young and a dummy for sex. It is important to mention that the comparison group is very heterogeneous with several differences among the subgroups that conform it. In general, we find that women of childbearing age experience an increase in unemployment, inactivity and informality with respect to the individuals in the comparison group after the reform. We also find evidence of the salary decrease for young women before the reform. Results are available upon request.

³⁰ The complete set of marginal effects for the placebo experiment is reported in Appendix F.

³¹ The coefficients of the placebo exercise when using men ages 18 to 30 as the comparison group are not significant for inactivity, unemployment, informality or self-employment. The coefficient for wages is significant at the 10% level, but it is positive. These results are available from the authors upon request.

Table 7
Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Men.

Marginal Effect	(1) Inactive		(2) Unemployment		(3) Informality		(4) Self-Employment		(5) Log Real Wages coefficients
	Low Education	High Education	Low Education	High Education	Low Education	High Education	Low Education	High Education	
treated * Law2011	–0.002 (0.003)	–0.002 (0.004)	0.004 (0.003)	0.004 (0.003)	0.007** (0.003)	0.009** (0.003)	–0.001 (0.003)	–0.001 (0.002)	–0.0002 (0.006)

Note: The marginal effects are estimated for a man in the treatment group for whom, using sample means, age is 23.79, lives in a household composed of 4.48 members and 0.77 children, whose economic stratum is 2.24, does not live with a partner, is not head of household and lives in Bogotá on June 2012. The marginal effects were estimated for two scenarios described by his educational level. “Education level” is high or low according with the years of education: the individual is considered to have a high education level if he has more than 11 years of education. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Table 8
Marginal Effect of Labor Market Outcomes for Women: Placebo Experiment.

Marginal Effect	(1) Inactive		(2) Unemployment		(3) Informality		(4) Self-Employment		(5) Log Real Wages coefficients
	Low Education	High Education	Low Education	High Education	Low Education	High Education	Low Education	High Education	
treated * Random Law	0.001 (0.006)	0.001 (0.005)	–0.020** (0.009)	–0.019** (0.003)	0.005 (0.009)	0.006 (0.010)	0.001 (0.007)	0.001 (0.005)	0.011 (0.016)

Note: The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.79, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, does not live with a partner, is not head of household and lives in Bogotá on August 2009. The marginal effects were estimated for two scenarios described by her educational level. “Education level” is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education. Placebo pre-treatment period: January 2009–June 2009. Placebo post treatment period: July 2009 – December 2009. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

the maternity leave period in Colombia as an added cost of hiring women. Consequently, women in the high-fertility age group, who are perceived as having a very high probability of becoming pregnant in the near future, are penalized in the labor market. Their probability of being inactive increases compared with women in less-fertile ages, and the probability of being unemployed rises compared with men in the same age bracket. In general, we find that women of childbearing age have a higher probability of being self-employed in low-paid, low-quality activities or in the informal sector.³²

5. Conclusions and public policy recommendations

Our research explores the impact of extending the maternity leave period from 12 to 14 weeks (a 17 percent increase) on female labor outcomes in Colombia. Our results show that this extension increases the probability of being inactive for all and every women ages 18–30 (the treatment group) relative to women ages 40–55 (the comparison group). We also show that the probability of informality and self-employment increases for high-fertility women relative to low-fertility women. Our results are robust across demographic groups and time periods, suggesting a causal effect of the increase in the maternity leave period. When comparing results for women in high-fertility ages with those of men between 18 and 30 years old, we find that the probability of unemployment for women in high-fertile ages increases and their wages decrease when compared with men ages 18–30 after the implementation of the law.

As in Autor et al. (2006), our paper does not attempt to provide an overall assessment of maternity protection laws. The fact that

there are some effects on the labor market for women of childbearing age indicates that legal protections come with a cost. Therefore, the law must be tied to other regulations that prevent employers from excluding the beneficiary group from the labor market. We believe that this could be done by addressing the costs associated with parenthood which, as we have explained and research shows, affect primarily women, especially those in the most fertile age group. In addition, we propose a set of legislative and policy actions that would address cultural perceptions on parenting and childcare.

First, one way of socializing the cost of maternity leave is by removing the extra cost of social security, now paid by the employer of the women in leave. This cost should be transferred to the health insurance system that is currently paying the salary during the leave period.

Second, the State and the private sector should provide facilities to support women balancing their return to work with their needs as mothers of young children, such as child care accommodations at or near the workplace and lactation rooms in the workplace.

Third, the design of a parental leave policy that can be enjoyed by both parents in equal or very similar proportions could create incentives for fathers to take time off upon the birth of a child.³³ This policy should be accompanied by programs to promote cultural changes that highlight the importance of both fathers and mothers

³² As an anonymous referee suggested, there could be a concern about potential heterogeneity on the effect of the extension in maternity leave; for example, that the effect decreases as the number of children increases because it decreases the perception about the probability of having more children. We run a regression with a triple interaction between law2011, the indicator for treated, and the number of children. We find no evidence of heterogeneities in the effect of the increase in maternity leave period by number of children for any of the labor market outcomes that we study in the paper. These results are available from the authors upon request.

³³ Such a policy should be mindful of the fact that fathers are unlikely to take the allotted time as leave if left to their own devices. This is why countries such as Denmark have designed a take-it-or-leave-it period of 12 weeks for parental leave reserved for fathers. If they do not take it, the family loses it. Similar “use it or lose it” parental leave policies for fathers have been implemented in Finland, Norway, and Sweden (Gornick & Meyers, 2003). This is the path that some countries, such as Sweden, Finland, and Canada, have successfully chosen. In the case of Sweden, the government’s interest was to provide parents with incentives to increase their participation in childcare and to promote gender equality and women’s participation in the labor market. According to the Swedish government: “It is important that fathers take parental leave. An increased use of parental leave by fathers should contribute to a change in attitudes among managers; they will view parental leave as something natural to consider when planning and organizing the work. This change in attitudes is necessary for both men and women to dare to take parental leave without a feeling of jeopardizing their career or development opportunities at work”. (Eriksson, Eriksson, & Friebe, 2013, pp. 132).

taking an active role in similar proportions in the care and upbringing of children and in domestic chores in general.

Declaration of Competing Interest

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Appendix I. Theoretical model

In this study, we closely follow the model by [Acemoglu and Angrist \(2001\)](#) to explore the consequences of requiring the employer to provide maternity leave to female employees. This is a standard competitive model with two types of workers: men and women. The objective is to discuss how maternity leave could reduce the level of employment of women by increasing the cost of hiring them.

The female labor supply function is given by the function $n_f(w_f)$ and the one for men is given by $n_m(w_m)$, where w_i is the wage received by worker type i , $i = f, m$. The functions $n_i(\cdot)$ are increasing in wages. All workers are infinitely lived, risk neutral, and exhibit a discount factor $\beta < 1$.

There are Z firms in the labor market that never exit, and a sufficiently large number of potential firms that could enter if they pay the cost Γ .³⁴ This assumption allows us to characterize a market with free entry of firms (when $Z \rightarrow 0$) as well as one where the number of firms is fixed ($Z > 0$ y $\Gamma \rightarrow \infty$). Every firm is risk neutral and discounts the future at the rate β . Each firm has access to the production function $G(M_t, e * F_t)$, where M_t is the number of male workers at time t , F_t is the number of female workers at time t , and $e \leq 1$ is the relative efficiency of female workers as perceived by the firm. This characteristic includes the case in which firms discriminate against women because of preferences (taste), as in [Becker \(1971\)](#). The function $G(\cdot)$ exhibits decreasing returns to scale.

In each period t , there is a probability s that the productivity of a worker in its current firm falls to zero. These are shocks for the specific combination worker-firm that we call compatibility shocks. Therefore, quantities F_t and M_t in G include only those workers that do not receive the compatibility shock. A female worker who gets fired could sue the firm with probability q_f for compensation that implies for the firm a cost ϕ_f . For a male worker,

the values are q_m and ϕ_m , respectively. Therefore, the expected value of firing a worker is $f_i = q_i * \phi_i$. We are going to consider the simple case in which the cost f_i is paid by the firm, but it is not received by any other economic agent. We assume that $(1 - \beta)f_i < w_i$ so that it is optimal for the firm to fire the fraction s of its employees that receive the negative compatibility shock.

Following the current legislation in this economy, firms must provide maternity leave. This leave is given only to female workers who are pregnant and give birth, which occurs with probability δ per female worker. This probability captures information about the percentage of female workers who are fertile, as well as about fertility rates per age.³⁵ The firm has to pay a cost C per female worker who takes maternity leave. This assumption intends to capture the costs of recruiting and training a person to replace the woman on maternity leave, as well as adjustments in organization and production and other costs incurred during the leave period.

However, providing maternity leave also generates benefits for the firm. The literature that studies the effects of providing maternity leave on the labor decisions of women find that those who have taken maternity leave are more likely to return to work after the maternity leave period. Retaining an employee who already has specific knowledge about the firm is beneficial to the firm. Furthermore, there is a hypothesis that firms that provide maternity leave are able to attract women who are more qualified and more committed to remaining in the labor market.³⁶ In this model, we capture these benefits by assuming that each female worker (regardless of her pregnancy status) increases the firm's revenue in the amount B .

Legislation mandates that employers must provide maternity leave. If it were the case that $C < B$, firms would provide it voluntarily even in the absence of such legislation. The fact that government regulation is required suggests that in general $C > B$.

The maximization problem for a firm at time $t = 0$ can be written as

$$\max_{\{F_t, M_t\}} \pi \equiv \sum_{t=0}^{\infty} \left\{ \beta^t [G(M_t, eF_t) - w_{f,t}F_t - w_{m,t}M_t] - \delta CF_t + BF_t - sf_f F_{t-1} - sf_m M_{t-1} \right\},$$

where $F_{-1} = M_{-1} = 0$. The first line of the maximization problem is revenues minus wage costs. The second line introduces the costs of maternity and of terminating contracts.

When $F_t = F_{t-1}$ and $M_t = M_{t-1}$, the number of workers is stable over time, and the firm hires sF_{t-1} women and sM_{t-1} men to replace those that got fired in the previous period.

Given that costs are linear, and that there is no aggregate uncertainty, firms adjust immediately to steady state levels. For each period, $M_t = M$, $F_t = F$, $w_{m,t} = w_m$, and $w_{f,t} = w_f$.

Equilibrium levels of employment and wages must satisfy:

$$\frac{\partial G(M, eF)}{\partial F} = w_f + \delta C - B + \beta sf_f$$

$$\frac{\partial G(M, eF)}{\partial M} = w_m + \beta sf_m$$

To determine the equilibrium, we impose the condition that the market for men empties: $n_m^{-1}(zM) = w_m$ where z is the number of firms in equilibrium. This number is determined by the conditions $\pi \leq \Gamma$ and $z \geq Z$, which are satisfied either because profits are equal to entry costs or because there is no entry and the number of firms, z , is equal to the minimum, Z . Wages perceived by women

³⁴ Z is the minimum number of active firms in the market that would have non-negative benefits in equilibrium, such that the entry cost for a potential firm is higher than the profits if enters.

³⁵ In our empirical exercise, this probability would be determined by the percentage of women between the ages of 18 and 30, with their respective fertility rates, relative to the population of women between 40 and 55 years old with their fertility rates.

³⁶ See, among others, [Berger and Waldfogel \(2004\)](#); [Desai and Waite \(1991\)](#); and [Leibowitz, Klerman, and Waite \(1992\)](#).

are given by $w_f = \max\{\eta_f^{-1}(zM), \eta w_m\}$, where η is a parameter equal to one if the mandates about equality of wages between men and women are effectively enforced. When there are no restrictions about women's wages, $\eta = 0$, so that they are on their supply curve. Most likely, in reality $\eta \in (0, 1)$.

From the equilibrium conditions, we obtain the following conclusions:

1. Legislation on maternity leave seems to have increased f_f considerably more than f_m , first, because the probability of the firm's being sued when terminating the contract of a pregnant worker increases, and it has to incur costs to prove that the worker was not fired because of her pregnancy; and second, because the legislation increases the amount of compensation if the court rules in her favor. Furthermore, the costs of hiring women increase by $\delta C - B$. Therefore, in reality, it is more likely that legislation on maternity leave decreases women's employment and wages.
2. The mandate of wage equality between men and women³⁷ (i.e., $\eta > 0$, and probably very close to 1) could have resulted in women's wages higher to the one that would equilibrate their market, generating involuntary unemployment of women (they are outside of their supply curve). The mandate of wage equality also interacts with costs of dismissal and of maternity leave by preventing wages from decreasing in order to offset those costs, which has the effect of further decreasing levels of female employment.

The theoretical discussion concludes that the net effect of maternity leave legislation depends on which mandates are more important: maternity leave or equal pay. The costs of maternity leave and the costs of dismissal most likely reduce employment. If the mandate on wage equality is not effectively enforced, the equilibrium would be on the supply curve of both men and women, and the decrease in employment would be accompanied by a decrease in wages for women. In practice, however, the mandates on maternity leave would generate involuntary unemployment of women.

In this simplified model, there are only two types of workers: those affected by the maternity leave legislation (F: women from 18 to 30 years old) and those not affected by maternity legislation (M: all men and women from 40 to 55). In a richer context, however, the cross-elasticity of substitution between different types of workers enhances the consequences of increasing the maternity leave period. In particular, it is very likely that women between the ages of 18 and 30 are close substitutes of men in that same age bracket, because they would exhibit very similar characteristics in terms of level of education, experience, and so on. In that case, an increase in the perceived cost of hiring women 18–30 years old results in an increase in the relative employment of men of the same age, and a reduction in the relative wage paid to those women. Moreover, it is very likely that women 18–30 years old are less of a substitute for older workers. In that case, the relative employment of women 18–30 years old does not change, nor their relative wage.

Table A5. Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: Baseline Scenario and Alternative Timings: Beta Coefficients.

Dependent variable	(1) Inactive	(2) Unemployment	(3) Informality	(4) Self-employment	(5) Log real wages
treated * Law2011	0.028*** (0.008)	−0.015(0.012)	0.022*(0.011)	0.018*(0.011)	−0.010(0.007)
Panel a. Eliminating two months before and two months after implementation of the law					
treated * Law2011	0.029*** (0.009)	−0.014(0.012)	0.022*(0.011)	0.022*(0.011)	−0.009(0.007)
Panel b. Eliminating two months before and four months after implementation of the law					
treated * Law2011	0.033*** (0.009)	−0.019 (0.012)	0.020* (0.012)	0.021* (0.011)	−0.008 (0.007)
Panel c. Eliminating two months before and six months after implementation of the law					
treated * Law2011	0.039*** (0.009)	−0.018(0.012)	0.022*(0.012)	0.022*(0.011)	−0.009(0.007)
R ²	0.080	0.073	0.170	0.068	0.459
Observations	409.055	290.662	240.285	241.409	127.780

Note: The coefficient on *treated* * Law2011 is the estimated parameter γ_3 of Eq. (1) which is the DD estimate of the effect of the reform in each of the outcomes. Columns (1) to (4) are probit estimates, column (5) is OLS estimate and includes controls by sector. All regressions control for personal and household characteristics, and include time fixed effects. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

³⁷ In Colombia, Código Sustantivo del Trabajo, Article 14, is a mandate of this sort (equal pay for equal work).

Appendix A. Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: Baseline Scenario.

Marginal Effect			(1)	(2)	(3)	(4)
Education Level	Marital Status	Head of Household	Inactive	Unemployment	Informality	Self-Employment
High	0	0	0.007*** (0.002)	−0.004 (0.003)	0.008* (0.004)	0.004* (0.002)
High	0	1	0.005*** (0.001)	−0.003 (0.003)	0.008* (0.004)	0.005* (0.002)
High	1	0	0.009*** (0.002)	−0.004 (0.003)	0.008* (0.004)	0.005* (0.003)
High	1	1	0.008*** (0.002)	−0.003 (0.003)	0.008* (0.004)	0.005* (0.003)
Low	0	0	0.009*** (0.002)	−0.004 (0.003)	0.006* (0.003)	0.005* (0.003)
Low	0	1	0.007*** (0.002)	−0.003 (0.003)	0.006* (0.003)	0.006* (0.003)
Low	1	0	0.010*** (0.003)	−0.004 (0.003)	0.005* (0.002)	0.006* (0.003)
Low	1	1	0.009*** (0.002)	−0.003 (0.003)	0.005* (0.002)	0.006* (0.004)

Note: The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.87, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, and lives in Bogotá on June 2012. The marginal effects were estimated for several scenarios described by the combination of three dummy variables: “Education level” is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education; “Marital status” takes the value of 1 when the individual lives with a partner and 0 otherwise; finally, the variable “Head of household” takes the value of 1 when the individual is the head of the household and 0 otherwise. ***Coefficients are significant at the 1% level. *Coefficients are significant at the 5% level. †Coefficients are significant at the 10% level. Standard errors are in parentheses.

Appendix B. Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: All Metropolitan Areas.

Marginal Effect	(1) Inactive		(2) Unemployment		(3) Informality		(4) Self-Employment	
	Low Education	High Education	Low Education	High Education	Low Education	High Education	Low Education	High Education
Barranquilla	0.010*** (0.003)	0.010*** (0.003)	−0.004 (0.003)	−0.004 (0.003)	0.003* (0.002)	0.007* (0.004)	0.006* (0.003)	0.005* (0.003)
Bogotá	0.009*** (0.002)	0.008*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.005* (0.003)	0.008* (0.004)	0.006* (0.002)	0.004* (0.002)
Cartagena	0.010*** (0.003)	0.010*** (0.003)	−0.004 (0.003)	−0.004 (0.003)	0.004* (0.002)	0.008* (0.004)	0.007* (0.003)	0.006* (0.003)
Manizales	0.010*** (0.003)	0.009*** (0.003)	−0.004 (0.004)	−0.004 (0.004)	0.006* (0.003)	0.008* (0.004)	0.005* (0.002)	0.004* (0.002)
Montería	0.010*** (0.003)	0.008*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.003* (0.002)	0.007* (0.004)	0.006* (0.003)	0.005* (0.003)
Villavicencio	0.010*** (0.003)	0.009*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.004* (0.002)	0.008* (0.004)	0.006* (0.003)	0.005* (0.003)
Pasto	0.010*** (0.003)	0.009*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.003* (0.001)	0.007* (0.004)	0.006* (0.003)	0.005* (0.003)
Cúcuta	0.010*** (0.003)	0.009*** (0.002)	−0.004 (0.004)	−0.004 (0.003)	0.003* (0.001)	0.007* (0.004)	0.007* (0.003)	0.006* (0.003)
Pereira	0.010*** (0.003)	0.009*** (0.002)	−0.005 (0.004)	−0.005 (0.004)	0.005* (0.002)	0.008* (0.004)	0.006* (0.003)	0.005* (0.003)
Bucaramanga	0.009*** (0.002)	0.007*** (0.002)	−0.004 (0.003)	−0.004 (0.003)	0.004* (0.002)	0.008* (0.004)	0.007* (0.003)	0.006* (0.003)
Ibagué	0.009*** (0.002)	0.007*** (0.002)	−0.005 (0.004)	−0.004 (0.004)	0.004* (0.002)	0.008* (0.004)	0.006* (0.003)	0.005* (0.003)
Cali	0.010*** (0.003)	0.008*** (0.002)	−0.004 (0.004)	−0.004 (0.003)	0.005* (0.002)	0.008* (0.004)	0.006* (0.003)	0.005* (0.003)

Note: The marginal effects for each metropolitan area are estimated for a woman in the treatment group for whom, using sample means, age is 23.87, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, on June 2012, and either the women has (i) a high level of education (12 years or more), or (ii) a low level of education (11 years of schooling or less). ***Coefficients are significant at the 1% level. *Coefficients are significant at the 5% level. †Coefficients are significant at the 10% level. Standard errors are in parentheses.

Table A6. Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: Comparison group Are Men Ages 18–30.

Dependent variable	(1) Inactive	(2) Unemployment	(3) Informality	(4) Self-Employment	(5) Log Real Wages
treated * Law2011	–0.009 (0.010)	0.019* (0.011)	0.038*** (0.011)	0.021** (0.011)	–0.014** (0.006)
R ²	0.137	0.061	0.138	0.034	0.342
Observations	401.423	305.607	243.601	243.741	152.947

Note: The coefficient on *treated*Law2011* is the estimated parameter γ_3 of Eq. (1) which is the DD estimate of the effect of the reform in each of the outcomes. Columns (1) to (4) are probit estimate, column (5) is OLS estimate and includes controls by sector. All regressions control for personal and household characteristics, and include time fixed effects. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Appendix C. Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: Comparison group Are Men Ages 18–30.

Marginal Effect			(1) Inactive	(2) Unemployment	(3) Informality	(4) Self-Employment
Education Level	Marital Status	Head of Household				
High	0	0	–0.001 (0.001)	0.004* (0.002)	0.013*** (0.003)	0.005* (0.003)
High	0	1	–0.0008 (0.000)	0.002* (0.001)	0.012*** (0.003)	0.005* (0.002)
High	1	0	–0.002 (0.002)	0.003* (0.002)	0.012*** (0.003)	0.006* (0.003)
High	1	1	–0.001 (0.001)	0.002* (0.001)	0.011*** (0.003)	0.006* (0.003)
Low	0	0	–0.001 (0.001)	0.004* (0.002)	0.014*** (0.004)	0.006* (0.003)
Low	0	1	–0.0007 (0.000)	0.002* (0.001)	0.014*** (0.004)	0.006* (0.003)
Low	1	0	–0.001 (0.002)	0.003* (0.002)	0.014*** (0.004)	0.006* (0.003)
Low	1	1	–0.001 (0.001)	0.002* (0.001)	0.014*** (0.004)	0.006* (0.004)

Note: The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.87, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, and lives in Bogotá on June 2012. The marginal effects were estimated for several scenarios described by the combination of three dummy variables: “Education level” is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education; “Marital status” takes the value of 1 when the individual lives with a partner and 0 otherwise; finally, the variable “Head of household” takes the value of 1 when the individual is the head of the household and 0 otherwise. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Appendix D. Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Women: Alternative Timings.

Marginal Effect			(1) Inactive	(2) Unemployment	(3) Informality	(4) Self-Employment
Education Level	Marital Status	Head of Household				
Panel A. Eliminating two months before and two months after implementation of the law						
High	0	0	0.007*** (0.002)	–0.004 (0.003)	0.008* (0.004)	0.005* (0.002)
High	0	1	0.005*** (0.001)	–0.003 (0.003)	0.008* (0.004)	0.005* (0.003)
High	1	0	0.009*** (0.003)	–0.004 (0.003)	0.008* (0.004)	0.006* (0.003)
High	1	1	0.008*** (0.002)	–0.003 (0.003)	0.008* (0.004)	0.006* (0.003)
Low	0	0	0.009*** (0.002)	–0.004 (0.003)	0.006* (0.003)	0.006* (0.003)
Low	0	1	0.007*** (0.002)	–0.003 (0.003)	0.006* (0.003)	0.007* (0.003)

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Appendix D (Continued)

Marginal Effect			(1)	(2)	(3)	(4)
Education Level	Marital Status	Head of Household	Inactive	Unemployment	Informality	Self-Employment
Low	1	0	0.011*** (0.003)	−0.004 (0.003)	0.005* (0.003)	0.007* (0.003)
Low	1	1	0.010*** (0.003)	−0.003 (0.003)	0.005* (0.003)	0.008* (0.004)
Panel B. Eliminating two months before and four months after implementation of the law						
High	0	0	0.008*** (0.002)	−0.005 (0.003)	0.007* (0.004)	0.004* (0.002)
High	0	1	0.006*** (0.001)	−0.005 (0.003)	0.007* (0.004)	0.005* (0.003)
High	1	0	0.011*** (0.003)	−0.005 (0.003)	0.007* (0.004)	0.005* (0.003)
High	1	1	0.009*** (0.002)	−0.004 (0.003)	0.007* (0.004)	0.006* (0.003)
Low	0	0	0.010*** (0.002)	−0.005 (0.003)	0.005* (0.003)	0.006* (0.003)
Low	0	1	0.008*** (0.002)	−0.005 (0.003)	0.005* (0.003)	0.007* (0.003)
Low	1	0	0.012*** (0.003)	−0.005 (0.003)	0.005* (0.003)	0.007* (0.004)
Low	1	1	0.011*** (0.003)	−0.005 (0.003)	0.005* (0.003)	0.007* (0.004)
Panel C. Eliminating two months before and six months after implementation of the law						
High	0	0	0.010*** (0.002)	−0.005 (0.003)	0.008* (0.004)	0.005* (0.002)
High	0	1	0.007*** (0.001)	−0.004 (0.003)	0.008* (0.004)	0.005* (0.003)
High	1	0	0.013*** (0.003)	−0.005 (0.003)	0.008* (0.004)	0.006* (0.003)
High	1	1	0.011*** (0.002)	−0.004 (0.003)	0.008* (0.004)	0.006* (0.003)
Low	0	0	0.012*** (0.002)	−0.005 (0.003)	0.006* (0.003)	0.006* (0.003)
Low	0	1	0.010*** (0.002)	−0.005 (0.003)	0.006* (0.003)	0.007* (0.004)
Low	1	0	0.014*** (0.003)	−0.005 (0.003)	0.005* (0.003)	0.007* (0.004)
Low	1	1	0.013*** (0.003)	−0.004 (0.003)	0.005* (0.003)	0.008* (0.004)

Note: The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.87, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, and lives in Bogotá on June 2012. The marginal effects were estimated for several scenarios described by the combination of three dummy variables: “Education level” is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education; “Marital status” takes the value of 1 when the individual lives with a partner and 0 otherwise; finally, the variable “Head of household” takes the value of 1 when the individual is the head of the household and 0 otherwise. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Table A7. Effect of Law 1468 of 2011 on Labor Market Outcomes for Men.

Dependent variable	(1) Inactive	(2) Unemployment	(3) Informality	(4) Self-Employment	(5) Log Real Wages
treated * Law2011	−0.010 (0.014)	0.017 (0.013)	0.025** (0.010)	−0.005 (0.010)	−0.0002 (0.006)
R ²	0.222	0.089	0.114	0.060	0.336
Observations	342.676	303.923	265.023	267.415	136.930

Note: The coefficient on treated*Law2011 is the estimated parameter γ_3 of Eq. (1) which is the DD estimate of the effect of the reform in each of the outcomes. Columns (1) to (4) are probit estimates, column (5) is OLS estimate and includes controls by sector. All regressions control for personal and household characteristics, and include time fixed effects. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Appendix E. Marginal Effect of Law 1468 of 2011 on Labor Market Outcomes for Men.

Marginal Effect			(1)	(2)	(3)	(4)
Education Level	Marital Status	Head of Household	Inactive	Unemployment	Informality	Self-Employment
High	0	0	−0.002 (0.002)	0.004 (0.003)	0.009** (0.003)	−0.001 (0.002)
High	0	1	−0.002 (0.001)	0.003 (0.002)	0.009** (0.003)	−0.001 (0.002)
High	1	0	−0.001 (0.002)	0.003 (0.002)	0.009** (0.003)	−0.001 (0.002)
High	1	1	−0.001 (0.002)	0.002 (0.001)	0.008** (0.003)	−0.001 (0.002)
Low	0	0	−0.002 (0.002)	0.004 (0.003)	0.007** (0.003)	−0.001 (0.003)
Low	0	1	−0.001 (0.002)	0.003 (0.002)	0.008** (0.003)	−0.001 (0.003)
Low	1	0	−0.001 (0.003)	0.003 (0.002)	0.008** (0.003)	−0.001 (0.003)
Low	1	1	−0.001 (0.002)	0.002 (0.001)	0.009** (0.003)	−0.001 (0.003)

Note: The marginal effects are estimated for a man in the treatment group for whom, using sample means, age is 23.79, lives in a household composed of 4.48 members and 0.77 children, whose economic stratum is 2.24, and lives in Bogotá on June 2012. The marginal effects were estimated for several scenarios described by the combination of three dummy variables: “Education level” is high or low according with the years of education: the individual is considered to have a high education level if he has more than 11 years of education; “Marital status” takes the value of 1 when the individual lives with a partner and 0 otherwise; finally, the variable “Head of household” takes the value of 1 when the individual is the head of the household and 0 otherwise. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Table A8. Labor Market Outcomes for Women: Placebo Experiment.

Dependent variable	(1)	(2)	(3)	(4)	(5)
	Inactive	Unemployment	Informality	Self-Employment	Log Real Wages
treated * Randomlaw	−0.004 (0.019)	−0.061** (0.026)	0.016 (0.025)	0.003 (0.024)	0.011 (0.016)
R ²	0.085	0.082	0.171	0.070	0.438
Observations	84.667	58.737	47.724	48.072	25.855

Note: The coefficient on *treated*RandomLaw* is the estimated parameter γ_3 of Eq. (1) which is the DD estimate of the effect of the placebo reform in each of the outcomes. Columns (1) to (4) are probit estimates, column (5) is OLS estimate and includes controls by sector. Placebo pretreatment period: January–June 2009. Placebo post-treatment period: July–December 2009. All regressions control for personal and household characteristics, and include time fixed effects. ***Coefficients are significant at the 1% level. **Coefficients are significant at the 5% level. *Coefficients are significant at the 10% level. Standard errors are in parentheses.

Appendix F. Marginal Effect on Labor Market Outcomes for Women: Placebo Experiment.

Marginal Effect			(1)	(2)	(3)	(4)
Education Level	Marital Status	Head of Household	Inactive	Unemployment	Informality	Self-Employment
High	0	0	0.001 (0.005)	−0.019** (0.008)	0.006 (0.009)	0.001 (0.005)
High	0	1	0.001 (0.004)	−0.017** (0.007)	0.006 (0.009)	0.001 (0.006)
High	1	0	0.001 (0.007)	−0.019** (0.008)	0.006 (0.009)	0.001 (0.007)
High	1	1	0.001 (0.006)	−0.016 (0.007)	0.006 (0.009)	0.001 (0.007)
Low	0	0	0.001 (0.006)	−0.020** (0.009)	0.005 (0.008)	0.001 (0.007)

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Appendix F (continued)

Marginal Effect			(1)	(2)	(3)	(4)
Education Level	Marital Status	Head of Household	Inactive	Unemployment	Informality	Self-Employment
Low	0	1	0.001 (0.005)	−0.018** (0.008)	0.005 (0.008)	0.001 (0.008)
Low	1	0	0.001 (0.007)	−0.019** (0.008)	0.004 (0.007)	0.001 (0.008)
Low	1	1	0.001 (0.007)	−0.017** (0.007)	0.004 (0.007)	0.001 (0.009)

Note: The placebo pretreatment period is January–June 2009. The placebo post treatment period is July–December 2009. The marginal effects are estimated for a woman in the treatment group for whom, using sample means, age is 23.79, lives in a household composed of 4.51 members and 1.07 children, whose economic stratum is 2.27, and lives in Bogotá on August 2009. The marginal effects were estimated for several scenarios described by the combination of three dummy variables: “Education level” is high or low according with the years of education: the individual is considered to have a high education level if she has more than 11 years of education; “Marital status” takes the value of 1 when the individual lives with a partner and 0 otherwise; finally, the variable “Head of household” takes the value of 1 when the individual is the head of the household and 0 otherwise. “”Coefficients are significant at the 1% level. “”Coefficients are significant at the 5% level. “”Coefficients are significant at the 10% level. Standard errors are in parentheses.

Appendix G. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.worlddev.2019.05.007>.

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