Men, women and capital Estimating substitution patterns using a size and gender-dependent childcare policy in Chile *

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Abstract

We test whether men and women have the same degree of complementarity to capital using a policy obligating firms to fund childcare for their female employees, if they employ more than 19 women. This policy generated bunching at the threshold, particularly when more enforced, in male-intensive industrial sectors and in larger firms. Firms that employ 19 women have a higher capital-to-men ratio than firms just above the threshold. Our framework suggests that the distortion in this ratio is consistent with women being less complementary with capital than men which is confirmed by our calibrated model.

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1 Introduction

In most models of production, female and male workers are treated as perfect substitutes. However, there is a large debate in other literature about the comparative advantage that each gender may enjoy in different activities. Acemoglu, Autor, and Lyle (2004) demonstrate that in the mid-20th century U.S., women were stronger substitutes for higher-skilled men than lower-skilled ones. However, if this is due to the fact that women lack the physical strength that men can display, we may also anticipate that other factors of production may also respond to a change in the workforce composition. To explore this question, this paper employs a policy in Chile that increases the cost of employing women but not men for some firms and measures how these firms respond in terms of capital. Intuitively, when firms want to avoid the additional cost of the policy, they can replace female workers with men or with capital, and the way they do so informs us about whether capital has different degrees of complementarity or substitution with each gender. If, when avoiding women as workers, firms switch to using more capital than men, this would indicate that capital is more complementary to male workers than female ones.

Capital could be differentially complementary to women versus men for three main possible reasons. First, women may have different types of educational skills than men, and these skills may be more or less complementary to capital. In this case, our result should align with the estimates of capital-skill complementarities. In the Chilean manufacturing sector, we find that women are more educated than men, with 31 percent of women working in that sector having some tertiary education compared to less than 15 percent for men.[1] This would suggest that women should be more complementary with capital if there is capital-skill complementarity (see Lewis, 2013, for the modern manufacturing sector).[2]

The second reason why capital could be differentially related to men than women would be linked to the activities they perform within the firm. If women perform different tasks than men and these tasks are more or less complementary with capital, we could thus find a difference in complementarity. In our data, women are much more likely to perform administrative, sales, or personal service tasks, while men are more likely to be employed in the production process, either as "qualified" or "specialized" and "non-qualified" workers. If capital is particularly complementary to production tasks instead of tasks that are more secondary to manufacturing activities, we could find that women would be less complementary to capital than men.

Finally, there could be a differential relationship between capital and workers of distinct

[1] Authors' calculations using *Encuesta de Caracterización Socioeconómica Nacional* (CASEN) 2009.

[2] Nevertheless, Lafortune, Lewis, and Tessada (2019) show that capital-skill complementarity only arose with the Second Industrial Revolution in the United States while capital and skill may have been substitutes previously, thus suggesting that the relationship between capital and workers of a given gender could also differ depending on contexts or that it may have evolved over time.

genders because of some other biological or cultural differences that would differentiate men and women above their educational level and the tasks they perform. This has been related to physical strength, psychological traits, or even hormonal differences (Hooven, 2021). Men could be more aggressive, competitive, or more able to exert physical effort than women. If any of these biological and/or cultural characteristics for a fixed set of tasks and educational skills are more or less complementary to capital, we could observe a difference in how capital and workers of a different gender complement each other in the production function.

Irrespective of which of these three reasons are at play, as long as we think that men and women continue to share some of these differences, understanding this relationship may be highly relevant in developing economies where formal female labor supply is still, in general, much below that of developed countries. Chile is no exception to this, with a female labor force participation of 54 percent in 2021, about the same rate as Italy and much lower than the OECD average. Our work is thus helpful in understanding how the expansion of the female labor force in these contexts may influence the demand for capital and vice-versa. It also informs us about the potential effect of a fall in capital prices on the demand for female labor vis-a-vis male labor and the eventual wages they can obtain. Already, some studies suggest that new technologies may not be neutral with respect to gender. Chuan and Zhang (2021) show that technological change since World War II has disproportionately replaced female non-college routine occupations. Brussevich, Khalid, and Dabla-Norris (2019) also suggests that future technological change would be more likely to replace women than men in the workforce. Finally, since most family-friendly policies are often gender-biased, our work also provides important insights into whether these policies may affect not only the employment of women by firms but also capital use.

The policy we studied aimed to improve how women can combine their work and family lives. However, some of its particular characteristics generate perverse incentives for women's employment.[3] Established in 1917, the law requires some firms to provide childcare for children of their female employees. The law has evolved over time in many ways and has become more binding as more and more women enter the labor force. In its current form, any firm that employs more than 19 *female* workers must either provide child care on-site or reimburse the expenses related to child care for any child below the age of 2 of any female employees. This policy establishes a mandated benefit like those studied by Gruber (1994) but with the added twist that firms can avoid it by limiting to 19 their employment of women. An estimate of the cost of providing such a service is about US$200 per month, almost equal to the minimum wage and around 1/4 of the average wage in our sample.

We set up a model where firms differ in an idiosyncratic productivity component, but all face

[3] The redistributive impacts of this policy were studied by Escobar et al. (2024).

the same factor prices and the same elasticities of the production function.[4] We show that this productivity will divide firms into three groups. One group will have such low productivity that they will never want to employ many female workers and will thus never be subject to the law. Another group will be so productive that they will employ many female workers and pay for childcare costs because it is too costly for them to avoid the policy. But there will also be a group of intermediate productivity values for which it will be profit-maximizing to use male workers and capital instead of female workers to avoid paying for the childcare policy. We then show that firms in that latter group will always use more capital and men compared to women than firms who become subject to it, as long as they are not perfect complements. However, we also show that the ratio of capital to male workers will behave differently around the discontinuity depending on the relative elasticity of substitution between men, women, and capital. If men and women were equally complementary to capital, firms that avoid the legislation should substitute women in a way that keeps the capital-to-men ratio constant. However, if men are more complementary to capital than women, firms who avoid employing 20 women should use capital more intensively as they are skewing their employment towards male workers and, because of the higher complementarity, favor the use of capital. By contrasting the capital intensity of firms just subject to the law and those just avoiding it, we can estimate the relative degree of substitution and complementarity between this factor and men and women. In that sense, we employ the fact that there is bunching to estimate underlying elasticities as in Kleven and Waseem (2013). This is akin to using exogenous shocks created by immigration on factor ratios to estimate their complementarity, as in Lewis (2013) and Lafortune, Lewis, and Tessada (2019). Our analysis focuses on the manufacturing sector because of data constraints but also because manufacturing is a sector where capital is highly relevant to production and, thus, where its response may be stronger.

To implement this empirical strategy, we first show that firms avoid being subject to this unconventional policy by exploring the degree of bunching at exactly 19 female employees. We conclude that there is strong evidence that, in the manufacturing sector, firms avoid being subject to the law by employing just 18 or 19 women instead of 20 or more. We obtain similar results whether we use a polynomial to construct a counterfactual distribution as in Chetty et al. (2011) or if we use the most traditional test of McCrary (2008) for distributions. This is particularly marked for the most recent period (where enforcement and rules have become tougher), for sectors that employ few women (where the cost could be bigger), and in firms of more than 100 employees (where compliance is higher).

Next, we test whether capital ratios vary around the threshold in a way that is indicative of a relative complementarity between capital and workers of a given gender. This analysis reveals that firms with fewer women have a larger capital stock per male worker than those just above

[4]We show that firms can also differ in other attributes, such as their taste for discrimination, without affecting the conclusions of our model.

the threshold. Thus, firms who abstain from employing women to avoid the law substitute women more intensively with capital than with men. This is consistent with capital being more complementary to men than to women. This appears to be equally visible for machinery and equipment than for other types of capital and for capital using electricity but not fuel. We do not see discontinuities in a large set of alternative firm characteristics, suggesting that the pattern we observe is linked to the absence of women and not to other differences. Thus, we argue that our strategy can validly estimate the degree of complementarity between each type of labor and capital.

While the data we have at hand is limited, we find scarce evidence that the occupational distribution of workers around the discontinuity also changes, suggesting that the restriction on the number of women is not accompanied by a change to less skilled workers. This leads us to hypothesize that the differential complementarity may be due to other differences than skills or occupations between men and women.

Finally, we calibrate our model and obtain estimates of the policy's actual cost for firms and the parameters of the production function. We find that discontinuities in capital ratios are consistent with women and capital having an elasticity of substitution close to 1, but men and the combination of women and capital having a much lower degree of substitution. We also document that the cost of the policy appears to be the main difference between subsamples, although there are also differences in the parameters of the production function we estimate.

Few papers have estimated the relative complementarity between capital and workers of different genders. One of the few exceptions is Juhn, Ujhelyi, and Villegas-Sanchez (2014), who use NAFTA as a trade shock in Mexico to show that firms that faced a demand shock were incentivized to modernize their production and that this new technology led them to replace male blue-collar workers with female blue-collar workers. Instead, we wish to explore the relative complementarity of men, women, and capital for a given technology. Since a demand shock may involve other changes that would influence labor demand, we instead employ a difference in factor price ratios that firms can face. We believe we are the first to use such variation to estimate complementarity between workers of different genders and capital.

Our study is also related to the papers by Prada, Rucci, and Urzúa (2015) and Rojas, Sánchez, and Villena (2016) that analyze the same policy as we do but use an administrative individual workers' database. They find no evidence of bunching and strong evidence of wage penalty for women when firms cross the threshold and also for men in the second case, akin to Gruber (1994). Although they look at the same policy, they analyze all sectors of the economy and focus on firms that cross the policy threshold, rather than looking at the discontinuity. In our data, we see much less evidence of bunching when we look at firms that have switched over the years from being exempt to subject to the law. We thus see our paper as complementary rather than critical of their work, suggesting that some firms systematically avoided the legislation by maintaining themselves below the threshold and substituting female workers for capital. In contrast, firms that moved around the threshold may be able to pass most of the costs on to female employees themselves.

We are not the first to study how regulatory tiering may distort firm size decisions.[5] However, we see this paper as the first to use this bunching type to estimate the relative complementarity of production factors. We do so first in a reduced-form way and then use the size of the bunching to inform the model, as in Garicano, Lelarge, and Van Reenen (2016).

Finally, we do contribute to the literature on the provision of childcare. Increasing childcare access may facilitate labor force participation (see for example Baker, Gruber, and Milligan, 2008), although the evidence for Chile is more mixed (Encina and Martinez, 2009; Aguirre, 2011; Manley and Vásquez, 2013). Here, we study the possible disincentives that the policy generates for the employment of female workers and the eventual response of capital to this decision.

The rest of the paper is organized as follows. Section 2 describes in more detail the legal background of the legislation we use and presents a framework that will be the basis for our empirical analysis. The following section describes our data and empirical strategy, while Section 4 presents the results of our analysis. Section 5 compares firms at the threshold to derive conclusions regarding the substitutability or complementarity of factors within the production function, while Section 6 performs a calibration of our model. Finally, the last section concludes.

2 Legal and Theoretical Framework

2.1 Legal background

The first law regulating child care payment by firms in Chile was promulgated in 1917, called *Ley de Salas Cuna*, and forced every factory, workshop, or industrial establishment that employed fifty or more women over eighteen years old to offer a child care facility, properly conditioned to receive female employees' children under one year old during working hours.[6] Since then, the law has been modified in several opportunities, first diminishing the required amount of female workers from 50 to 20 in 1931[7] and, in 1966, raising the coverage period from 1 to 2 years[8].

[5] Brock and Evans (1985) argue they could be Pareto-superior to unique norms in some contexts. Amirapu and Gechter (2015) show that firms can respond to these types of legislation by remaining artificially small in terms of employment. Other forms of regulatory tiering have been shown to alter industrial structure (Becker and Henderson, 2001), lower investment amounts, and increase dividends (Gao, Wu, and Zimmerman, 2009) or report lower revenues (Almunia and Lopez-Rodriguez, 2018).

[6] Law 3,186, (1917), Chile.

[7] DFL 178, (1931), Chile.

[8] Law 16,511, (1966), Chile.

A series of modifications have also been introduced since 1990, as can be seen in Table 1. Among these modifications, the most relevant ones related to manufacturing are those implemented in 1998 and 2002. The first one expanded the coverage of the regulation, extending the unit over which a number of workers are counted from "establishment" to "firm" [9], reducing the possibility of avoiding the law by splitting the production in different locations. The 2002 modification was made along the same line. Those two changes are likely to have increased the number of firms susceptible to being forced to provide childcare. Additionally, it is possible that the supervision was enhanced during the period next to the reform, as it usually occurs after legal modifications (at least temporarily).

As a result, the Chilean labor code, in its article 203, currently says that all firms that employ 20 or more women are subject to the policy. In order to fulfill their legal obligations, firms have three options: offer on-site child care, share child care facilities with other neighboring establishments, or pay directly for external daycare centers. Workers who are not provided with this service (or anybody who knows that a firm is not fulfilling their obligation) can make a confidential report to the supervising agency ("Dirección del Trabajo" or Labor Directorate), which would trigger an inspection visit by authorities to the reported firm.

In practice, external child care is the main way firms comply with the law, and this mode has increased over time, as can be seen in Table 2. The table also evidences the increasing compliance over the years based on employers' report.[10] Compliance with the law is much higher among large firms in both employer and employee surveys, while manufacturing appears to have a compliance rate similar to other sectors.

The cost of providing childcare for two years is relatively important for a firm. According to Aedo (2007), the monthly average cost of registering a child in daycare was CLP$100,000 per month (in 2002), around US$200 at the time. This is only slightly lower than the legislated minimum wage of CLP$111,200 that same year. As a comparison, the average wage (for men and women) in the manufacturing sector in that same year was about CLP$218,000 per month. In our sample of firms with more than 10 workers, the wages are above that level, but the childcare cost would still correspond to at least 20 percent of wages. This suggests that this cost is relatively high compared to wage levels.[11]

[9] According to Chilean labor laws, a firm is "every organization of personal media, material and immaterial, ordered under a direction for the achievement of economic, social, cultural or benefic goals, endowed with a legal individuality".

[10] Data for the year 1995 does not fully satisfy this. However, it is constructed using a different data source than the following years because the National Labor Survey was implemented for the first time in 1998, so it is not fully comparable.

[11] A similar value is obtained by Rau (2010) who measures the cost of daycare in 2008 by calling 30 establishments and obtains an average value of CLP$137.438 for a full-day daycare. Data from the National Labor Survey (*ENCLA*) also confirms these numbers. In the years 1998, 2002, and 2004, where the question was included, on average, firms reported an annual cost of CLP$1,190,404, which is roughly US$200 per month.

It is worth mentioning that the law does not distinguish between permanent and fixed-term contracts when calculating whether a firm has more than 19 female workers. Moreover, female workers count the same toward the quota whether they are working full or part-time. Lastly, it should be noted that firms are not directly forced to pay daycare to the children of their subcontracted workers, although they are considered when counting total employees. The obligation then lies with the subcontractor company, which in turn probably transfers the cost to the principal firm.

This law coexists with a few additional measures implemented to improve women's labor force participation rates. In November 2009, an equal pay law was implemented, which subjected firms to fines if a female worker found that a male colleague was performing the same tasks as her and earning a higher salary. This law is restricted to firms with more than 10 employees and has increasing fines and compliance procedures as the number of employees increase to 50 and past 200 (see Cruz and Rau, 2022, for more details.). A program to provide childcare after school hours has been implemented as well, but the selection is dependent on the female worker's earnings and demographics and not something related to the size of her firm (Martínez A. and Perticará, 2017). There is no other affirmative employment policy in the country.

There are other laws that increase the costs of employing women, but they are independent of firm size, either in total or in terms of women employees. There is an obligatory maternity leave policy of 6 weeks before a woman's due date and 24 weeks post delivery (12 of those must be taken full-time; the other 12 can be taken as part-time leave over the subsequent 18 weeks). This maternity leave policy has been in place since 2011, while it was restricted to 12 weeks post-delivery before. Although the leave is paid by health insurance and government subsidies, the employment status of the women is protected during the period. Finally, a woman employee must also be granted a 1-hour break to feed her baby as long as the child is less than two years old and can also use paid sick leave in case her child has health problems. While all these may make employing a woman who is a mother of a young child less attractive to employers, these costs are irrespective of the firm size, which will be key for our empirical strategy.

2.2 Theoretical framework

Having described the legal framework in place, we now model the expected behavioral response of firms to that regulation. A firm i can produce an output Y_i using a production function

$$Y_i = \alpha_i F^{\sigma} = \alpha_i \left(\left(K^{\theta} + W^{\theta} \right)^{\frac{\rho}{\theta}} + M^{\rho} \right)^{\frac{\sigma}{\rho}}$$

where W represents the number of women, M represents the number of men and K, the capital. As is common in the literature, we may think of $\alpha_i > 0$ as the managerial ability of the entrepreneur. $\sigma \in (0, 1)$ represents the returns to scale of the firm and it is assumed to be common for all firms. We assume that the parameters of the CES production function are such that $\rho, \theta < 1$.[12] Under our assumption we will have capital neutrality when $\theta = \rho$, and capital will be more complementary to men's than women's labor when $\theta > \rho$. This is a typical approach in the literature on immigration (Lewis, 2013) and capital-skill complementarity (Krusell et al., 2000; Lafortune, Lewis, and Tessada, 2019).[13]

The firm sells Y in a competitive market where the price is p. Denote the unit cost of each factor as w_W, w_M, and r, respectively. However, the costs differ depending on whether $W \leq 19$ or $W > 19$. In the latter case, the firm faces an additional cost that it must pay for all women it employs, which we denote by τ. This should be considered the *expected net* cost faced by the firm since not all female workers will have a child below the age of 2 at any point in time, and the firm may also be able to transfer part of that cost to its female employees if they value it.

Given that the production function is homothetic, factor ratios will be entirely determined by factor prices, as long as firms do not distort their decisions to avoid becoming subject to the policy.[14] Furthermore, as α_i increases, all factor uses will be multiplied by $\alpha_i^{\frac{1}{1-\sigma}}$

Proposition 1 *The childcare policy, which increases the cost of employing women by τ, will distort factor choices, except if factors are perfect complements. M/W and K/W will be higher in firms subject to the policy than in those that are not. K/M will be increasing in w_W if $\theta \geq \rho$ and decreasing otherwise.*

Proof. From the first order conditions:

$$K/W = \left(\frac{w_W}{r}\right)^{\frac{1}{1-\theta}}$$

and

$$M/W = \frac{w_W^{\frac{1}{1-\theta}} \left(r^{\frac{\theta}{\theta-1}} + w_W^{\frac{\theta}{\theta-1}}\right)^{\frac{\theta-\rho}{\theta(1-\rho)}}}{w_M^{\frac{1}{1-\rho}}}$$

[12]This assumption is not very restrictive since we include the Leontief (as $\theta, \rho \rightarrow -\infty$), perfect substitutes (as $\theta, \rho \rightarrow 1$) and Cobb-Douglas (as $\theta, \rho \rightarrow 0$).

[13]We can also model the production function with both types of labor being nested together and capital having a unique elasticity with both types of labor. We show this case in Appendix A.5 and discuss when the conclusions differ in the model. While the algebraic results are similar, we acknowledge that the policy conclusions would differ under this alternative.

[14]The full model is derived in Appendix A.

which are increasing in w_W. Finally, we have that

$$K/M = \frac{w_M^{\frac{1}{1-\rho}}}{r^{\frac{1}{1-\theta}}\left(r^{\frac{\theta}{\theta-1}} + w_W^{\frac{\theta}{\theta-1}}\right)^{\frac{\theta-\rho}{\theta(1-\rho)}}}$$

which is increasing in w_W when $\rho < \theta$, namely when capital is more complementary to men's than women's labor. ∎

Thus, the policy would decrease the relative use of women's work compared to that of men and capital if it was applied to all firms.[15] When capital is more complementary to men's than women's labor, it would also increase the capital-to-male workers ratio.[16]

This would be the conclusion if the policy applied to all firms. However, in our context, some firms may find it optimal to remain artificially small in terms of women employees to avoid being subject to the policy. Let us define as $\underline{\alpha}$ the level of productivity where $W(\underline{\alpha}) = 19$. Thus, all firms with $\alpha_i < \underline{\alpha}$ will not be subject to the policy. For α_i above $\underline{\alpha}$, firms will continue to set $W = 19$ if their profits from restricting their employment of female workers are higher than that of becoming subject to the law. They will continue to do so until the profits when paying for child care exceed that of avoiding the policy, which we will denote as occurring when $\alpha = \bar{\alpha}$.

Figure 1 shows this graphically. At $\underline{\alpha}$, costs for firms that decide to cross the threshold and employ more than 19 women would increase discontinuously. Firms can instead continue to employ 19 women, but this comes at a higher and higher cost as α increases until at $\alpha = \bar{\alpha}$, where firms jump at employing a larger number of women and pay for childcare.

What is useful for our empirical strategy is that we can further discuss what happens to factor use around the threshold, as indicated in the following proposition.

Proposition 2 *Over the range $\alpha_i \in [\underline{\alpha}, \bar{\alpha}]$, K/W and M/W are increasing such that there is a discontinuity at $\bar{\alpha}$ where firms with $\alpha_i < \bar{\alpha}$ have substantially higher K/W and M/W ratios than those with $\alpha_i > \bar{\alpha}$. K/M will be increasing over that range as well if $\theta > \rho$ and be decreasing when $\theta < \rho$. K/M will also jump discontinuously at $\bar{\alpha}$ with firms with $\alpha_i < \bar{\alpha}$ having a larger (smaller) K/M ratio than those with $\alpha_i > \bar{\alpha}$ when $\theta > \rho$ ($\theta < \rho$).*

We present a more detailed proof of this proposition in Appendix A.3. Intuitively, within the

[15] While in our model, men and women do not differ in their skills so as to better focus on the main comparative statics, it is easy to show that if female workers differed in terms of skills, the fact that the added cost τ is a constant would lead firms to also distort their factor choices more strongly away from low-skill than high-skill women since τ would represent a higher fraction of the wages of low- than high-skill women, as long as the elasticities of substitution between skill-level allow for substitution.

[16] This conclusion is symmetric when we nest both types of labor together in terms of algebra. The capital-to-male-workers ratio increases when both types of workers are more complementary to each other than to capital.

range $[\underline{\alpha}, \bar{\alpha}]$ the firms expand production using only M and K while keeping female employment fixed. This explains why M/W and K/W are increasing over the range. Firms will overshoot their use of M/W and K/W compared to firms that are subject to the policy because, at the point where K/W and M/W are equal to the one used by the firms subject to the policy, profits are still larger when avoiding the policy than when being subject to it.

Within this range, the relative use of K and M depends on whether K is more or less complementary to M than to W, as determined by θ and ρ. The ratio K/M is also discontinuous, and the direction of the change depends on the level of complementarity with both types of labor. Intuitively, if K is more complementary to W, as firms in the range $[\underline{\alpha}, \bar{\alpha}]$ keep W constant, higher α firms will use relatively more M than K to produce more output. At $\alpha = \bar{\alpha}$ more women are employed and there will be a larger downward adjustment for M than for K, thus explaining the change in the ratio (and the reverse argument holds when K is more complementary to M).

A graphical representation of this proposition is provided in Figures 2 and 3. The x-axis represents the productivity parameter α.[17] If we were instead to represent Figure 2 with the number of women on the x-axis, we would find a constant factor ratio for all firms with fewer than 19 employees. The factor ratio would then jump when firms employ exactly 19 women as it would correspond to the average factor ratios for firms with $\alpha_i \in [\underline{\alpha}, \bar{\alpha}]$. It would then decrease back for firms that would employ more than 20 women, and there would be a hole in the distribution with few firms employing 20 or 21 women. In the case of Figure 3, if we were to use women employees on the x-axis, we would find constant K/M for firms that employ less than 19 employees which would rise (fall) at exactly 19 women and then fall (rise) back at 21 or 22 women when male workers are more (less) complementary with capital.[18] Note that while it would be possible if the distribution of α within $[\underline{\alpha}, \bar{\alpha}]$ is very close to $\underline{\alpha}$, we could observe a fall in K/M at the discontinuity when $\theta < \rho$ but then we should also observe a positive jump at K/W and M/W. Our empirical test should thus focus on cases where there is a fall in K/W and M/W to properly identify the relative magnitude of ρ and θ.

Finally, we can also derive conclusions regarding the extent of "bunching" around $W = 19$ and how it depends on the elasticities of substitutions of factors.

Proposition 3 *The set of firms that chose to employ exactly 19 women, those with $\alpha_i \in [\underline{\alpha}, \bar{\alpha}]$, will be increasing in τ and, when $w_w > r$, in θ.*

[17] While we do not include variation in skills, we should observe that to the left of the discontinuity, firms would skew female employment towards high-skill women as these are more productive than low-skill as long as there is some substitution possible between high- and low-skill women. They would overshoot until they select to become subject to the policy and go back to a lower H/L ratio amongst women but still higher than that of firms with $\alpha_i < \underline{\alpha}$ since the cost is fixed. So the pattern would look similar to that of the left panel of Figure 3.

[18] Conclusions would be symmetric if women and men labor were nested together. What would change is an increasing K/M until the discontinuity and then a fall would be consistent with both types of labor being more complementary to each other than with capital.

Proof. See Appendix A.4. ∎

The degree of bunching will depend on how costly avoiding the policy is compared to how profits of firms paying for child care are negatively affected by the policy. As τ increases, the range over which the firm benefits from avoiding the penalty increases, thus leading to more bunching. A higher θ, implying higher substitutability between capital and women, will also increase the range over which firms will avoid the policy as it is less costly for them to do so than firms with a higher degree of substitutability. In the Leontief case, it will be impossible for firms to alter factor ratios and thus few firms will avoid the policy. In the perfect substitute case, firms may switch to using only capital and employing no women, leading them to avoid the policy at all levels of productivity.

This will direct the rest of our empirical analysis. We will focus on sectors, firm sizes and periods where firms may have been either facing a higher τ, or on firms where the elasticities of substitutions may be higher. Based on the legal changes that have been detailed in Section 2, τ is likely to have increased over time. Costs are likely to be higher in larger firms as these are much more subject to the scrutiny of the Labor Directorate.[19] Finally, we will proxy higher elasticities of substitutions with sectors that are more male-intensive since those firms appear to be more able to avoid employing female workers. As proof of this, we find much higher variation in the fraction of workers who are women in female-intensive sectors than in male-intensive ones.[20] Finally, τ may also be larger in male-dominated sectors if there are economies of scale in providing childcare services or if firms can more easily transfer part of the cost to their workers when there is a larger share of women in the workforce.

2.3 Robustness to other types of differences across firms

Up until now, we have assumed that firms differ only in α_i. We now explore whether our conclusions would be different if firms in the economy differed in other dimensions than their linear productivity. Proofs are provided in Appendix A.6.

2.3.1 Heterogeneity in returns to scale

We first discuss what would happen if firms differed only across σ_i. We can show that W^* is increasing in σ_i. Thus, there will be again three sets of firms in the economy. Firms with low σ_i are not subject to the policy, firms that have very high σ_i prefer to pay for childcare, and

[19] The confidential nature of the reporting also makes it more likely to be used in larger firms than in smaller ones.

[20] Specifically, sectors that are female-intensive according to our calculations have a standard deviation of 0.19 in the share of workers who are women across firms while the standard deviation is only 0.12 for sectors that are more male-intensive.

those with middle values may avoid the policy by employing exactly 19 women. We would still observe a discontinuous jump at a threshold value. Factor ratios are independent of σ_i as they were for α_i and thus factor ratios will be constant for firms below and above the threshold. For firms that are avoiding the law, we would generate a very similar pattern to the one discussed with only variation in α_i as these firms would see their capital-to-man ratio be higher on the left of the discontinuity when $\theta > \rho$. Our capacity to derive conclusions about the relative elasticities from the jump in factor ratios around the discontinuity will be unaltered.

2.3.2 Heterogeneity in discrimination

Assume that some firm owners dislike employing women and that this discrimination is independent of α_i. We can represent this taste-based discrimination as a higher cost of employing female workers. This is thus akin to an increase in the wage paid to females by some firms, irrespective of the number of women employed.

In this case, firms that discriminate will avoid employing women at every single point of the distribution, leading them to have larger K/W and M/W ratios. They will also have higher K/M irrespective of the policy when $\rho < \theta$.

Firms that bunch at the threshold will be more likely to be discriminatory than those that employ more than 19 women. The fact that they are more discriminatory will imply that they will have higher K/W and M/W than those who are subject to the policy. However, crucially for our story, those firms will only have K/M being larger than those who are less discriminatory and are thus more likely subject to the policy if $\theta > \rho$. This implies that finding a discontinuity in K/M around the discontinuity would still be indicative of the relative elasticity of substitution between capital and both types of workers.

2.3.3 Heterogeneity in policy cost

Another type of variation across firms that could be added to the model is that firms differ in how costly the policy is for them, τ_i. This could be because of the age structure of their female workforce (which would imply that few or many women would use childcare services), because of differences in the cost of providing childcare, or even distaste for its provision.

In this case, a higher τ_i does not alter factor ratios on the left of $\underline{\alpha}$, nor $\underline{\alpha}$ itself. However, firms with lower τ_i will have lower $\bar{\alpha}$. For τ_i low enough, some firms may not see a discontinuity in their employment of women, which would allow us to explain why we observe a positive number of firms who employ 20 and 21 women.

Firms that employ 19 women will have higher τ_i, but since this does not affect factor ratios on the left of the discontinuity, the analysis described in the main model will continue to hold. In particular, the switch in K/M around the discontinuity will still be indicative of the elasticities of substitution.

2.3.4 Heterogeneity in the elasticities of substitution

What if firms differed fundamentally in their production function and did not share a common set of elasticities of substitution? This is more difficult to model as this would imply that we would not identify a parameter in our production function but rather the "average" elasticities in the sample of firms observed.

Imagine that firms differ only in their parameters of elasticity. If w_W is lower than w_M and $\theta > 0$, as ρ increases, firms will employ fewer women. This will imply that there will be a threshold $\bar{\rho}$ where firms who have a higher elasticity than this point employ less than 19 women while those with lower ρ wish to employ more than 19 women without the policy. For a given elasticity, being subject to the policy reduces the number of women each firm will want to employ. It will thus be profitable for firms in a range of ρ to choose to employ only 19 women and not be subject to the policy. This will distort factor ratios, in particular, K/W will be above the observed value if the firm was not restricting its employment of women. When ρ crosses the threshold where it becomes more optimal to be subject to the policy, the ratio will discontinuously fall back to the value it would have if the firm had not avoided the policy.

In the range of ρ where the firm avoids the policy, K/W will rise and this will lead to the capital-to-men ratio to increase as long as $\theta > \rho$ in an argument similar to the one in the main model. When K/W will fall and the firm will become again subject to the policy, K/M will fall discontinuously as before when $\theta > \rho$.

What is new in this form of heterogeneity is that firms that bunch will also have different values of ρ, which in turn will impact factor ratios. However, this should not discontinuously affect factor ratios but rather do so smoothly around the threshold where the firm becomes subject to the policy. Said differently, if $\theta = \rho$, K/M will not be higher for firms that bunch and nor when firms become subject to the policy because K/W increases. The only reason it would be higher or lower is because of the direct impact that a larger or smaller ρ would have on factor ratios. However, this would be a smooth derivative at the cut-off value of ρ, thus not affecting our comparison across that threshold.

3 Empirical strategy and data

We now use the context generated by this law and our theoretical framework to explain the empirical strategy that will be used. We then present the data employed in our analysis.

3.1 Empirical strategy

We first used the method suggested by Chetty et al. (2011) and used by Kleven and Waseem (2013) and by Ito and Sallee (2018), which estimates a counterfactual density using a polynomial approximation. This method involves estimating a counterfactual distribution that ignores the bunching to then compare the predicted values with the ones observed in the data. Following Ito and Sallee (2018), we denote C_j the quantity of firms that employ j female workers. To estimate the counterfactual distribution, we run the following regression

$$C_j = \sum_{s=0}^{S} \beta_s \cdot j^s + \sum_{j=18}^{19} \gamma_j^0 D_j^0 + \epsilon_j \tag{1}$$

where S is the degree of the polynomial estimated, D_j^0 is a dummy that takes, initially, the value of 1 for each point where we suspect bunching, namely 18 and 19 female workers. The superscript 0 indicates the fact that this process is iterative, and this constitutes the first iteration. Using the estimates of that regression, we can compute an initial counterfactual distribution as $\hat{C}_j^0 = \sum_{s=0}^{S} \hat{\beta}_s \cdot j^s$. Then, the excess of firms that employ j female workers with respect to the counterfactual distribution is given by $\hat{B}^0 = \sum_{j=18}^{19} C_j - \hat{C}_j^0 = \sum_{j=18}^{19} \hat{\gamma}_j^0$. However, this measure is inappropriate because it does not take into account that the bunching comes from lower density in other parts of the distribution, in our case, for firms with more than 19 female workers. To correct for this, we adopt the methodology of Kleven and Waseem (2013) and recursively include firms with one more female worker in our value of D_j. In other words, we first set D_{20} to also be equal to 1 and then include firms with 21, 22, and 23 female workers at each iteration. We can then calculate, in addition to the extra bunching at iteration k, $\hat{B}^k$, the area missing to the right of the cut-off at this same iteration, which we denote as $\hat{M}^k$. In Kleven and Waseem (2013)'s example, they continue to expand the range of D_j until iteration k where $\hat{B}^k = \hat{M}^k$ since their running variable is continuous. However, since our running variable is discrete, we must stop at the iteration k where $\hat{B}^k$ is closest to $\hat{M}^k$. We explored this and, almost always, $\hat{B}^k$ is smaller than $\hat{M}^k$ at the iteration when we include up to 21 workers and becomes larger than $\hat{M}^k$ in the iteration when we include 22 workers. We will thus present both sets of results. Also, since in our case $\hat{B}^k \neq \hat{M}^k$, we will present both estimates. One measures the excess bunching at values slightly below the discontinuity ($\hat{B}^k$) while the second measures the lack of firms above the threshold ($\hat{M}^k$). We think that in this context both estimates may be relevant. Following Kleven and Waseem (2013), we use residual bootstrap to obtain a distribution for the parameters β_s and then construct an empirical distribution for $\hat{B}$ and $\hat{M}$. We use a polynomial of order 5 since this appeared to fit best the distribution of firms.

As an alternative, we use McCrary (2008)'s methodology based on a regression discontinuity design. However, we need to adjust it since the use of local linear regression may not be best with a discrete running variable. Instead, it is usually recommended to use a polynomial approximation, see for example Card and Shore-Sheppard (2004), Kane (2003) and DiNardo and Lee (2004).[21] So, we run a regression where the dependent variable is the log of the number of firms with j women, and the regressors include a polynomial in the number of women in each firm and its interaction with a dummy for being above the threshold.

Following Lee and Lemieux (2010), we use the following specification:

$$\ln C_j = \alpha + \beta(j \geq 20) + \gamma f(j-20) + \delta(j \geq 20) * f(j-20) + \epsilon \tag{2}$$

where we use a window of 10 or 15 above and below the threshold and the polynomial f is of degree 2 in the baseline specification. We check this specification using graphical analyses and robustness checks. We then extend the use of this equation for looking at how other variables like factor ratios change around the cut-off.

3.2 Data

The data employed to conduct these empirical specifications are from the *Encuesta Nacional Industrial Anual* (ENIA), which is a panel of manufacturing firms. We use years 1995 through 2007, which includes the years in which the legal obligations to the firms have become more binding. The survey includes all manufacturing firms with 10 or more workers that operate in the manufacturing sector of Chile.[22]

The survey includes, at the level of an establishment, key variables regarding sales, employment, costs, etc. We will focus in particular on the number of workers (men and women), total earnings, and various measures of capital and output. These variables are all self-reported and could thus suffer from measurement error. Furthermore, if firms round their responses, answer-

[21] Frandsen (2017) develops a different methodology to analyze bunching, which in our example, proxies the observed distribution to a binomial with probability 1/3 for each of the 3 points around the discontinuity. However, this method does not work well in distributions that are decreasing (instead of "flat") like the one we have.

[22] The survey also includes establishments with less than 10 workers because they are part of a multi-unit firm with more than 10 workers. However, these are not included in our sample since we cannot determine the total number of workers in that firm using the survey.

ing mostly multiples of 5 or 10, we may underestimate the bunching we find since many firms will round 18 or 19 female workers to 20.

The sample includes more than 70,000 firm-year observations. From that sample, 50 percent have less than 5 women employed and 85 percent of the sample has less than 20 women employed. By restricting our sample to either those within a window of 10 or 15 women around the threshold, we focus on 17 and 35 percent of the population, respectively. Since many firms are surveyed multiple times, some firms remain within the sample each time they are surveyed, while a majority are sometimes within our sample and sometimes outside. About a third of the firms that are subject to the law have always been so in the sample, while the remaining have been some years below and some years above the threshold.

Table 3 compares firms above and below the threshold within a window of 15 female employees. It also separates the sample according to years, firm sizes, and sectors. We denote as female-intensive the seven sectors with the highest ratio of female per male workers for firms outside our main estimation window (i.e., excluding firms that employ between 10 and 30 women), comprising 48 percent of the firms in our sample.[23] Specifically, this corresponds to the manufacturing of food products and beverages, textiles, wearing apparel, dressing, and dyeing of fur, tanning, and dressing of leather, manufacture of luggage, handbags, saddlery, harness and footwear, chemical products, medical, precision and optical instruments, and recycling. Low female-intensive sectors include the remaining sectors.[24]

We also observe that the number of women employed in each type of firm appears to have been stagnant over the years while men employment, in particular in firms that employ more than 20 women, has been increasing. The fast economic growth experienced by Chile is visible in the increase in average salaries and labor productivity over the period of the study. The most female-intensive sectors do not employ many more women than other sectors, but they employ much fewer men; they also pay lower wages and face weaker labor productivity. Finally, firms with less than 100 employees have slightly fewer female workers, but they have much fewer male workers. This suggests that large firms are the ones where female workers are particularly scarce. Small firms are also paying lower wages and tend to have lower labor productivity. It is worth noting that only in small firms do we see firms with fewer than 20 women having higher labor productivity than those who are above the threshold.

We must recognize that a major disadvantage of this database is the fact that we have extremely limited information regarding the characteristics of the employees except their gender. We will explore the little disaggregation there is by occupation later on in the paper.

[23]This corresponds to sectors 15, 17, 18, 19, 24, 33, and 37 of the ISIC classification Rev. 3

[24]While one may be worried because we used our own data to classify industries into female and less female-intensive sectors, the United States' manufacturing sector, for example, shares 5 out of the 7 sectors we use here as their most female intensive when using 2000-2017 Census and American Community Survey answers.

4 Empirical results

Having described our empirical strategy and the data we will employ, we now turn to empirically testing whether there is evidence of bunching in response to the law.

4.1 Graphical evidence

Figure 4 shows a histogram where we display the number of firms that employ a given number of women, within 8 women of the policy threshold, for the full sample of year-firm observations from the ENIA. We find some weak evidence that firms appear to be more numerous just below 20 firms than at 21 and 22 firms, but in the overall sample bunching is weak.

Figure 5 shows the same histogram but this time divided into three time periods. We see that as the legal framework became more and more binding, the bunching becomes clearer and clearer. Already, in 1999-2002, there seemed to be a much smaller number of firms employing more than 20 female workers than in the previous years and some additional mass between 15 and 19 employees. However, there were also a large number of firms with exactly 20 female employees, suggesting either rounding bias or simply a fair number of firms who do not avoid the legislation altogether despite their best efforts. By 2003, the histogram seems to visually indicate much more bunching below 20 women.

We then present histograms by the industrial sector where the firm is operating in Figure 6. While the histogram in female-intensive sectors shows little evidence of bunching, the one in male-intensive sectors shows a very striking change in the number of firms above and below 20 female employees. There are about 33 percent fewer firms with 20 female workers than firms with 19 workers of that gender. In this case, firms clearly seem to avoid the threshold of 20. This is even more marked if we only look at firms in male-intensive sectors in the later period.[25]

We then separate our sample by firm size in terms of employment. Figure 7 shows that there is no evidence of bunching in firms of less than 100 employees. However, in firms with more than 100 employees, 20 percent fewer firms have 20 female workers than 19. The graph shows that large firms are relatively successful at avoiding employing any number of women above 20 since the number of firms above 20 remains equally stunted.[26]

We finally separate our sample according to the exercise performed by Prada, Rucci, and Urzúa (2015) in Figure 8. In their study, they use firm fixed effects, which is equivalent to using only firms that switched over time between being subject to and not to the law. It is clear that these firms may be different than firms that purposefully avoid the cut-off. We thus split

[25] Available upon request.

[26] Using a different cut-off for large and small firms does not strongly affect the results.

our sample of years-firms into those that include firms that switched from being subject to not subject to the law and those that have always been on one side of the threshold. It is a matter of statistics that the graph of switching firms would have a hump shape while the graph of those who never switched would be hollowest exactly at the cut-off. However, it is telling that while in both cases, we find evidence that firms seem to dislike having more than 20 female workers, it is only within non-switching firms that a jump can be observed exactly at 20. This seems to indicate that firms that pass the threshold from time to time appear to pass it mostly at 20 or 21, while firms that have managed to avoid being subject to the law have carefully bunched below the threshold. This may explain why the aforementioned paper cannot reject the hypothesis that there is no strategic positioning on each side of the discontinuity, but we find evidence of it in various sub-samples.

4.2 Polynomial approximation method

While the previous histograms may be indicative of a difference around the cut-off, no statistical significance is provided. We now turn to formal tests to quantify the magnitude of the bunching. We start with the polynomial approximation of the distribution as suggested by Chetty et al. (2011). These results are presented in Table 4. For each column, we present the "excess bunching", which is the mass at 18 and 19 workers that is above what the polynomial would have predicted and the "missing mass" at 20, 21 and 22 (only in Panel B) workers which is below what the polynomial would have predicted. As we indicated before, we present both measures since, given that we are in a discrete setting, they are not equal to each other. We include in brackets the standard deviation of the distribution of bootstrapped parameters. The "randomness" in the parameter comes from the fact that our polynomial is estimated and not exact.

Our results suggest that there is strong evidence of missing mass above 20 female workers. A large number of estimates are significantly different from 0. However, the evidence of excess bunching is weaker. We only find statistically significant evidence of excess bunching for the 2003-2007 period and for large firms. We find that, in general, the patterns we identified graphically are confirmed by this methodology such that the largest bunching is found for recent periods, sectors with few female workers and large firms. The magnitudes are not small. We find that, in total, some 100 firms may be "missing" compared to what the counterfactual polynomial would predict. We find excess bunching in 18-19 female workers of about 20-40 firms. When we include all years, sectors, and firm sizes, we have about 1100 firms with 18-19 female workers and 900 (1300) firms with 20-21 (20-22) female workers, which suggests that this corresponds to about 10 percent of missing mass and about 3 percent of excess bunching. However, the results also indicate that this method is relatively fragile in predicting whether the graphical evidence we presented before is indicative of bunching, and this may be because the distribution of firms is far from smooth.

4.3 Test of McCrary

We thus turn to McCrary (2008) test as an alternative. This method allows for the distribution of firms below and above to have a different pattern, which would then potentially provide us with a different result than the ones with the polynomial approximation. It also directly measures whether there is a discrete jump at the point of the threshold instead of comparing the masses to a counterfactual distribution. The results of the test are presented in Table 5 using the same divisions as the previous table.

The results suggest that we observe a discrete jump in the log number of firms around the legal threshold. The magnitudes are relatively large. For our larger window, on average, we find 23 percent fewer firms above 20 than below that threshold. For our smaller window, we find an even bigger estimate (26 percent). However, exactly as before, we also find heterogenous patterns in these results. Before 1998, the law barely appears to have affected the employment decisions of firms. However, by 2003, when the law became even stricter, we observed a very large and significant difference in the log number of firms above and below the threshold. Similarly, we find strong evidence of an effect for more male-intensive sectors than for female-intensive ones. Finally, we find evidence that only large firms alter their employment decisions around the threshold. Because we conduct a large number of hypothesis testing, we also provide sharpened q-values (as suggested by Anderson, 2008) and p-values correcting for multiple hypothesis testing as proposed by Romano and Wolf (2005). We find that the results are relatively robust to that adjustment for the larger window and a bit more fragile for the smaller one.

Appendix Table B.1 shows that we do not find the same discontinuity at 15, 18, or 22 female workers. This suggests that what we identify is actually an impact of the policy and not just something related to other salient numbers of female workers. We also show that there is no evidence of a discontinuity in the number of male workers at 19 to show that this is not something related to the report of a round number of workers at some threshold, irrespective of the legal context.

We could also be worried that we capture the impact of other legislations. In particular, as referenced before, the anti-discrimination law has thresholds of 50 and 200 total workers. We show, in Appendix Table B.1, that there is no discontinuity in the number of firms around these thresholds. We do not decompose the data by large and small firms in those exercises as we do not have variation in that threshold there.

Finally, one could be afraid that what we are capturing is just the avoidance of firms having low levels of female participation in their workforce. They wish to avoid being a firm with only a small fraction of women. Since what a small fraction is is not clear, we use 10 and 20 percent as thresholds. We show, in Panel G and H of Appendix Table B.1 that we see no avoidance of being at these thresholds for any of the subgroups analyzed. This really emphasizes that what seems to be happening in the data is that firms avoid having 20 female employees and not a specific fraction of female workers.

Appendix Figure B.1 shows that our results are robust to different definitions of male-intensive sectors, as long as we consider sectors that are above the median in terms of male intensity. Appendix Figure B.2 shows that our results are robust to different definitions of what is a "large" firm, as long as we consider firms above 50 employees.

Although not reported, the test of McCrary shrinks but remains significant if we measure the log number of years a given firm has a given number of female worker as our dependent variable and include firm fixed effects, that is to say, we ask instead if there is a discontinuity in the number of years in our sample where a firm reports a given number of female worker. This suggests that even within switchers, we continue to find evidence of a discrete jump around 20 female workers.

5 Adjustment mechanisms

We then turn to studying in particular how firms on each side of the threshold differ in other input choices than only women to derive some conclusions regarding the relative complementarity of capital and women/men labor. To do this requires the additional assumption that after the controls we include in the regression, firms are using the same production function on each side of the threshold. This is the case in our model predicts as the only source of heterogeneity is the productivity parameter α_i. We can also allow for firms to be sorting above or below the threshold for factors that are uncorrelated with their production function (for example, owners' taste for discriminating against women), as shown in our extension of the model. We include sector fixed effects in all regressions to avoid distortions arising from comparing firms in different sectors with different production technologies, as well as year fixed effects. What must assume that, within a given manufacturing sector and year, firms that avoid employing 20 female workers combine men, women, and capital using the same production function as those who employ more than 20 women. We will show that firms are indeed similar in a large number of other characteristics, suggesting that this assumption holds true. If this is true, then we can use the framework we presented above to derive how each type of labor may be substitute or complementary to capital. Moreover, our results are not sensitive to including different aggregations of sectors fixed effects, suggesting that differences in production technology are not related to firms crossing the threshold of 19 women employees. We conduct all analyses in log terms.

We first show that when comparing firms below and above the threshold, we observe a substantial change in the ratio of males to females in their workforce. Table 6 shows that firms that have just above 20 female workers have, on average, 7-8 percent fewer men per women than firms just below that threshold. When computed in levels, this implies about 0.4 fewer males per woman at the threshold. Once we split our sample into sub-groups as we have done earlier, we find that the same subgroups where we noticed irregular bunching are the points where we are able to find also evidence of a jump in the male-to-female ratio within workers, although the evidence is stronger for our smaller window than the larger one. For the most recent period, for example, we observe that there were 20 percent fewer men per women for firms above the threshold than those right below. For firms in low female-intensive sectors, the fall is 17 percent.[27] This suggests that firms that elect to employ more than 20 women in part replace male with female workers. This is consistent with our theoretical framework which indicates that we should observe a discontinuous jump in the number of men per woman in the firm's workforce but only where bunching is most salient because of the cost of the policy or the capacity to substitute to other factors. We show these results graphically in Figure 9 for all observations and for the sub-groups where we observed significant differences across the threshold.

We now turn to evaluating how measures of capital ratios differ above and below the threshold. For this, we use 5 different measures, each presented in a different panel of the following tables. One is the value of capital, as this is the most comprehensive measure we have access to. We are able to decompose it between machinery and equipment and other forms of capital, which we do to explore the importance of each category. We then use two alternative measures that involve complementary inputs to machinery and equipment capital, namely expenditures on electricity and expenditures on fuel. We think that their combination should provide us with a more complete picture than any of them separately, allowing us to judge whether there are differences in complementarity between types of capital.

Table 7 shows the difference we observe in capital per woman between firms that are above and below the threshold. We show the results for our smaller window of firms between 10 and 30 workers. Results when using a larger window are weaker in that case for the value of capital but similar for the other measures. Table 7 shows that in the case where capital is measured by the value of the capital stock, we observe very marked decreases in that ratio as firms become subject to the policy. On average, the results suggest a fall of about 20 percent in the capital per female worker ratio when firms employ at least 20 women. This increases when we focus only on the

[27] We once more present the corrections for multiple hypothesis testing. We find that our results are not robust to that adjustment.

most recent period. It is also more marked again for sectors where we observed bunching, mainly those less intensive in female workers and the largest firms. When we divide the capital stock between machinery and equipment and other capital, we find that both types of capital seem to react in the expected fashion. The results for electricity expenditure are also relatively consistent with our hypothesis, showing, in the cases of the sub-sample where we observed bunching and shifts in male/female ratios, negative and significant coefficients. This would thus imply that capital, as proxied by electricity usage, is responding in the expected fashion. For expenditures on fuel, we find in general positive coefficients, suggesting that capital using fuel does show the same type of response to the policy. We confirm graphically the validity of these results in Figure 10 and also show that in general, coefficients that are statistically significant remain so when correcting for multiple hypothesis testing.

We then present, in Table 8, the difference in terms of capital per male worker for firms just above and below the threshold. Our framework suggested that if we observe a decrease in the capital per male worker around the threshold, this would be indicative that capital is more strongly complementary to men's labor than women's labor. We find in Table 8 negative coefficients that are economically relevant, suggesting that the log of capital per male worker is smaller in firms just above the threshold than in firms just below it. Interestingly, we find again that these are much stronger (only statistically significant) in sub-samples where we saw a significant decrease in male per female worker, namely more recent and more male-intensive sectors. In those samples, we observe a difference in the capital to male workers of around 24 to 29 percent. This suggests that as firms above the threshold employ more women, they substitute away from capital more strongly than they do so with male workers. This is an indication that capital complements more strongly men's than women's work.[28] We confirm graphically the validity of these discontinuities in capital per male worker in Figure 11. When dividing the capital into machinery and equipment and other types of capital, we observe negative coefficients for all sub-samples with bunching was observed but they are larger and more statistically significant for non-machinery capital. Once more, we see a similar pattern for electricity expenses but not for fuel expenses. We thus see this as evidence that in this particular setting, capital complements much more strongly the work of men than that of women, particularly when looking at capital that uses electricity rather than fuel. Results are weaker when correcting for multiple hypothesis testing.

This could be because male and female workers have different skills, perform different activities, or have biological/cultural differences that influence their substitution pattern with capital. We unfortunately do not have information regarding the educational level of workers in the ENIA but from CASEN, we know that female workers in the manufacturing sector are actually

[28]In the alternative nesting, this would be consistent with men and women being more complementary to each other than with capital.

more educated than their male counterparts. Since the existing evidence (Lewis, 2013, for example) suggests that capital is complementary to education in modern data, this would actually suggest capital would be more complementary to women than men, except if the capital-skill complementarity is different in this context.

Men and women could also differ in the activities they perform within each firm, and these activities may have different patterns of complementarity with capital. The ENIA reports the number of female and male workers by occupation. We classify as high-skill workers the following categories provided by the database: owners, directors, specialized workers and administrative personnel. The corresponding categories for low-skill are commission workers, unskilled direct workers, unskilled indirect workers, and personal service workers. While clearly not ideal divisions, they should help us identify if the type of occupations performed by workers changes discontinuously around the cut-off as the firm changes its capital choice. Table 9 presents the test of discontinuity in the log of the high per low skill worker for all workers (in Panel A), and for men and women in the subsequent panels.[29] These results indicate no statistically significant change in the skill ratio around the cut-off of the law for the sub-groups where we observed the most bunching (large and more male-intensive industries). We do observe an increase in the ratio of high- to low-skill workers for the middle period, particularly for women. This suggests that the avoidance of female workers was not, at least based on our coarse definition of skills, accompanied by a deskilling of the workforce. It may, in the recent period, have led to an increase in the skill ratios, but this does not appear to be due to the fact that women and men have different skills but rather because firms who avoid the law tended to employ more women in skilled occupations. We also redid this exercise using 3 skills group instead of 2 to try to approach more the "automatizing tasks" but found limited evidence of a change in this case as well.

This would thus suggest that the differential pattern of substitution may be due to other characteristics that differ by the gender of workers or to differences in activities that cannot be captured by our broad categories.

We confirm that capital is key to the puzzle we display by also dividing sectors between those intensive in capital and those less intensive in capital. To obtain a definition that is as far as possible from the Chilean context, we use definitions from either the US capital share by manufacturing industries (from the Bureau of Labor Statistics Multifactor Productivity Tables) or from Manova (2013)'s physical capital intensity measure.[30] While not reported here, we find that the difference between firms above and below the threshold are most marked when we remove sectors with a physical capital intensity of less than 0.05 (compared to an industry average of 0.07) in the case of Manova and sectors with capital shares below 10 percent (in the case of the

[29] They use the smaller window but results are extremely similar when using firms between 5 and 35 workers.

[30] We obtain similar results if we rank, within our data, the industries by K/L and drop the least capital-intensive sectors from the analysis.

BLS). This suggests that sectors that are more intensive in physical capital were more likely to experience bunching and much more likely to show a pattern of higher complementarity between men and capital than women, which we presented above.

As we explained above, our strategy is valid if firms do not have a difference in their production function above and below the threshold. While we cannot test this directly, we use other outcomes to evaluate whether this is likely to hold. We present, in Appendix Table B.2, other types of variables that could indicate differences between firms that elect to be above or below the cut-off. We include a variety of types of expenses, the number of days per year the firm is closed, and the type of owners. We find that most coefficients in that table are not significant, indicating no discontinuity in these other variables.

Our model presents some particular predictions regarding other outcomes, which are presented in Table 10. We first estimate whether there is a discontinuity in the log average wages around the threshold. We find some weak evidence that firms that employ 20 female workers pay lower average wages than those who employ just 19 in sub-samples where we observed evidence of bunching. However, since we do not have wages by gender, it is very difficult to make any inferences from this result. It could be, for example, that by employing more women, if women have lower wages than men, that this would lower the average wage paid to workers. Finally, our framework suggests that if we are truly capturing firms that are indifferent between the two levels of hiring, we should observe that firms that employ more than 20 women and those that employ fewer should have similar profits since they must be indifferent. We use value added[31] and log revenues per worker as a measure of profits and find no evidence that this changed discontinuously around the cut-off of 20 women. Finally, we also show that the use of other inputs, such as materials, does not seem to observe a discontinuous shift in the log of factor ratio around the threshold, and so it appears to be specifically capital per worker that responds.

6 Calibration

Our model does not only suggest that the relative elasticities of substitutions would influence the sign of the discontinuity in the capital-to-men ratio but also its magnitude. We now combine the model and the data to obtain estimates of the production function parameters and of the costs perceived by the firms.

Our original production function is a bit simple for the complexity of the reality we face. We thus add productivity parameters that do not change the model's predictions in any way. The

[31] Some firms report extremely negative value-added, which renders the use of a logarithmic transformation for this problematic. We thus decided not to use a log transformation for this outcome.

production function we thus seek to calibrate is the following

$$\alpha_i \left((1-\delta) \left(\lambda K^{\theta} + (1-\lambda) W^{\theta} \right)^{\frac{\rho}{\theta}} + \delta M^{\rho} \right)^{\frac{\sigma}{\rho}}$$

To do the exercise, we need to obtain accurate factor prices. We use the Chilean household surveys, CASEN, from 1996 to 2006 to obtain wages by gender.[32] We restrict our attention to workers reporting working in the manufacturing sector and in firms above 10 workers since this is the sample for the ENIA. Given that the CASEN measures liquid wages, we inflate them by 30 percent to represent labor costs the firm faces. We find that in the overall sample, women earn about 85 percent of the wage of men although the gap shrunk over time.[33] Similarly, while women in female-intensive sectors had hourly wages within 10 percent of that of men, the gap increased to more than 20 percent for those in male-intensive sectors. We then use the same estimate of r as in Escobar et al. (2024) at 0.04.

Next, we set δ and λ so that the factor ratios for firms with fewer than 15 women match the observed values (at each combination of ρ and θ). We next set σ to 0.9 based on the existing literature (Basu and Fernald, 1997; Diewert and Fox, 2004).

We then use a grid of values for ρ and θ. For each combination, we solve the model and compute what would be the discontinuity in the capital-to-woman ratio for a fine grid of τ. We pick τ based on the value that approximate this the best forăeach combination of ρ and θ. Appendix Figure B.3 shows that there is a unique value of τ that typically satisfies this search as the problem is very smooth. We next compute the discontinuity in the capital-to-man ratio predicted for each pair of ρ and θ for which a proper match to the jump in K/W was previously found and pick the pair of parameters that better fit the observed jump in K/M. Appendix Figure B.4 shows that once more, the problem is typically monotonic and a single combination of ρ and θ approximates the jump in the capital to men ratio estimated in our data. To obtain confidence intervals, we bootstrap 100 times our RD estimations and compute the best parameters fit for each of these 100 estimates.

The algorithm to search for the right combination of parameters that replicate the patterns observed in the data functions relatively well in the case of K/W that have small or negative jumps. In the bootstrap iterations where the point estimate is large and positive (which occurs when the point estimate is far from being significant like in small firms or female-intensive

[32] This requires us to make a few approximations in terms of time periods (the first period includes the 1996 and 1998 survey, the second the 2000 survey and the last period includes the 2003 and 2006 surveys), industries (CASEN uses ISIC rev2 instead of rev3) and firm sizes (we classify firms above 50 as large) but we obtain similar results when using different approximations.

[33] This is more than what has been found in the overall economy: women with less than high school earned about 80 percent of their male counterparts over this period, while for those with more than high school this was about 65 percent (Instituto Nacional de Estadisticas, 2015).

sectors), the algorithm struggles to find a way to match this pattern as it needs to generate little bunching (so that the jump is positive) but large response in terms of factor ratios. We discard cases where the algorithm cannot match within 0.01 the jump in K/W.

The calibration results for each parameter and sub-sample are displayed in Table 11. Values of θ are small and positive, suggesting an elasticity of substitution close to 1 and a relationship that is similar to that of a Cobb-Douglas. There is slightly less evidence of substitution for the male-intensive sectors. Bounds are relatively tight. Estimates of ρ are negative and relatively large. This would suggest an elasticity of substitution well below 1. We do not find that those appear to be very different across sub-samples. For those sub-samples where we find a statistically significant negative jump in K/M, bounds also only include negative values. Finally, we find evidence that most of the differences across sub-groups appear to stem from differences in the cost faced by the firms for the policy. While for the full sample, we estimate that $\tau = 77,000$ CLP per year, that goes up to more than 450,000 for the late period and male-intensive sectors. Given that the annual cost of childcare is around 1,200,000 CLP and we calculate using the CASEN that the proportion of women who have children under the age of 2 and are employed is 6.3 percent, the cost estimated for the full sample roughly corresponds to the estimated cost of childcare that a firm would face. As the labor supply of women with young children has increased, the estimated cost could also increase over time. This computation also assumes that women cannot sort into specific firms. In particular, if women with children under two years old could sort into some types of firms, the cost would increase for those types of firms.

7 Conclusions

This paper documents the existence of a marked concentration of firms at or below the threshold of 19 women in the Chilean manufacturing sector, which appears to be a way for firms to avoid becoming subject to the mandated childcare policy in place. This is more evident in more recent periods (where enforcement appears to have increased) and in firms with higher substitution capacities (those in male-intensive industries and larger firms). We also document that this bunching has translated into distorted factor use ratio that favors capital and men over women around the threshold. The patterns suggest that in this context, capital is more complementary to men's labor than women's labor, which is also indicated by our calibrated production function parameters. Our calibration finally suggests that the main difference across sub-samples stems from enforcement and the cost that firms pay for the policy.

The fact that women are less complementary to capital than men can be due to the fact that women have different sets of skills, that they perform different tasks, or that they are intrinsically different because of biological or cultural differences. The only information we have available is based on large occupational groups and we do not see large differences around the threshold based on these groups. Women are also more educated than men in this sample which would actually lead to women being more complementary than men given the evidence available about capital-skill complementarity in the modern era. This may be indicative that it is something else that differs between men and women that plays a bigger role but we leave it to further research to evaluate what could be at play.

This result is policy-relevant. First, it suggests that as women around the world increase their participation in the labor market, the demand for capital may not expand as strongly as it would if more male workers were joining the labor force. Second, it suggests that as capital prices fall and new technologies are developed, this may be detrimental to the participation of women. Given the stagnation of the gender wage and labor force participation gap in many countries, this may be a reason to worry about future trends. Finally, it also means that policies that support the conciliation of work and family and may have gender components can expect not only to affect the labor market but also potentially firms' demand for capital.

This is the evidence from one given sector, namely manufacturing. We elected this setting because it was one of the only available contexts that would give us accurate measures of capital. However, our framework also suggests that the substitutability of factors is key for this type of policy to distort firm choices. In agreement with this, we have found limited evidence of bunching in sectors other than manufacturing or primary sectors, using a firm survey in Chile (ELE, Encuesta Longitudinal de Empresas). This would reinforce our point that the existence of capital as a valid substitute for female workers is key to the pattern we document. We think that this has been mostly ignored in other studies of size-dependent labor policies and would be worth more analysis.

The evidence we suggest also implies that while this policy may benefit mothers who have employment in Chile, it may do so at the cost of limiting female employment. Given that Chile has a very low level of female participation, this type of policy should thus be reevaluated to remove the disincentives of the law in the employment of women. We explore this in a companion paper (Escobar et al., 2024).

8 Data availability

Code replicating the tables and figures in this article can be found in Escobar, Lafortune, and Tessada (2024) in the Harvard Dataverse, `https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi%3A10.7910%2FDVN%2FV0XQ3Z`.

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9 Tables and Figures

Table 1. Legal changes between 1900 and 2010

Year	Law	Summary
1993	19.250	Allows, during vacation periods, the use of schools to function as daycare centers
1995	19.408	Alters article 203, extending the daycare benefit to commercial centers or buildings administered under a single legal name or entity.
1998	19.591	Alters article 203, changing the term "establishments" for "firms".
2002	19.824	Extends the daycare benefit to industrial and service establishments administered under a single legal name or entity.
2007	20.166	Extends the right of working mothers to breastfeed their children during their work day even when there does not exist a daycare.
2009	20.399	Extends the right to daycare benefits to workers who are the legal guardian of children of less than 2 years old, to fathers if the mother has died and to working fathers who are the legal guardian of their children.

[1] *Source: Dirección del Trabajo, Ministerio del Trabajo, Chile.*

Table 2. Compliance with daycare law

	All	Year						Size		Sector	
	Years	1995	1998	1999	2002	2004	2006	Small	Large	Manuf.	Others
Employer Survey											
Own childcare	0.09	0.09	0.17	0.07	0.04	0.04	0.05	0.05	0.12	0.12	0.08
External childcare	0.47	0.58	0.42	0.42	0.52	0.57	0.69	0.38	0.53	0.51	0.46
Bonus to mother	0.15	0.17	0.09	0.20	0.19	0.17	0.15	0.14	0.16	0.12	0.17
No benefits	0.23	0.17	0.31	0.28	0.17	0.11	0.10	0.37	0.14	0.20	0.24
Other answer	0.05		0.00	0.04	0.09	0.11	0.02	0.06	0.05	0.04	0.06
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Employees Survey											
Own childcare	0.07		0.12	0.07	0.02	0.02	0.03	0.04	0.10	0.09	0.07
External childcare	0.34		0.32	0.33	0.32	0.37	0.15	0.25	0.41	0.33	0.34
Bonus to mother	0.17		0.16	0.24	0.15	0.12	0.06	0.16	0.19	0.19	0.17
No benefits	0.34		0.40	0.35	0.35	0.41	0.04	0.43	0.26	0.35	0.34
Other answer	0.08		0.00	0.00	0.15	0.08	0.13	0.12	0.04	0.03	0.09
Not needed							0.60				
Total	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Observations	1171	151	262	188	170	174	377	597	572	293	878

[1] *Source: info for year 1995 comes from Labor Inspection annual reports. Values for years 1998-2006 generated using National Labor Survey. Sample includes only firms that employ 20 or more women. Categories homogeneized across years. Comparisons beside 2006 excludes those who answer "Not needed" due to years compatiblity, since that option was not included in other versions of the survey. Comparisons by sector and size only cover years 1998 to 2004 due to availability.*

Table 3. Description of firms above and below the threshold

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
Female Workers								
Below	9.461	9.591	9.368	9.418	9.596	9.252	9.106	11.281
Above	25.973	25.934	25.912	26.056	26.069	25.767	25.809	26.254
Male Workers								
Below	53.567	55.910	50.568	53.862	32.713	85.950	24.019	204.996
Above	109.573	101.514	104.242	121.628	60.573	214.729	25.404	254.133
Fraction of female workers								
Below	0.321	0.316	0.334	0.316	0.404	0.193	0.371	0.064
Above	0.407	0.435	0.416	0.371	0.500	0.208	0.569	0.129
Wage per Worker								
Below	8.207	8.062	8.180	8.360	8.008	8.515	8.098	8.763
Above	8.365	8.188	8.352	8.555	8.211	8.695	8.089	8.837
Capital per Worker								
Below	1.628	1.609	1.655	1.623	1.251	2.207	1.370	2.984
Above	2.026	1.944	2.046	2.094	1.600	2.938	1.339	3.215
Electricity Consumption per Worker								
Below	-5.518	-5.475	-5.729	-5.388	-5.741	-5.174	-5.752	-4.323
Above	-5.319	-5.416	-5.549	-5.056	-5.699	-4.508	-5.919	-4.292
Fuel Consumption per Worker								
Below	-1.731	-1.979	-1.794	-1.487	-1.672	-1.819	-1.900	-0.991
Above	-1.856	-2.245	-1.962	-1.458	-2.088	-1.421	-2.391	-1.088
Production per Worker								
Below	296.019	194.915	262.629	414.859	145.405	529.904	85.485	1,374.918
Above	308.751	179.745	239.298	490.381	152.375	644.348	30.099	787.342
Observations								
Below	24,193	8,095	7,195	8,903	14,716	9,477	20,243	3,950
Above	4,329	1,617	1,131	1,581	2,953	1,376	2,736	1,593

[1] *High female intensity sectors are the top 50 percent of sectors by female to male ratio for firms outside our main estimation window of 10 to 30 women. Sectors are weighted by number of firms in the sample. All monetary units in millions of Chilean pesos of 2007.* Sample includes all firms in the manufacturing sector with 10 or more workers.

Table 4. Results of Counterfactual Polynomial

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Using up to 21 workers							
"Excess bunching"	40.234	-13.808	13.400	40.642***	15.841	24.392	0.120	40.113***
	(33.872)	(13.149)	(17.884)	(14.396)	(36.518)	(22.642)	(29.005)	(10.058)
"Missing mass"	99.180***	23.501*	28.636	47.043***	2.115	97.064***	48.274*	50.906***
	(34.474)	(13.935)	(17.438)	(15.536)	(36.398)	(23.806)	(29.363)	(10.991)
	Panel B: Using up to 22 workers							
"Excess bunching"	17.520	-19.208	6.125	30.602**	9.339	8.181	-13.260	30.779***
	(33.674)	(12.892)	(17.926)	(14.199)	(33.769)	(23.900)	(32.284)	(9.666)
"Missing mass"	200.529***	47.594***	61.095***	91.839***	31.128	169.401***	107.975***	92.554***
	(56.928)	(22.23)	(27.823)	(24.506)	(54.381)	(37.087)	(52.284)	(16.509)

Standard deviation of the bootstrapped distribution presented in parentheses. The regression included a 5th order polynomial in number of female workers and a dummy for firms with 18-21 workers in Panel A and with 18-22 workers in Panel B. The number of stars specify how much of the bootstrapped distribution is below 0. *: less than 5 %; **: less than 1%; ***: less than 0,1%.

Table 5. Results of McCrary's test

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
	Panel A: Using firms with 5 to 35 female workers (N=31)							
W $\geq$ 20	-0.223***	-0.063	-0.263*	-0.360***	-0.065	-0.490***	-0.150	-0.346***
	(0.078)	(0.074)	(0.146)	(0.107)	(0.080)	(0.117)	(0.105)	(0.095)
sharpened q-value	[0.011]	[0.188]	[0.073]	[0.006]	[0.188]	[0.003]	[0.124]	[0.005]
Romano and Wolf correction	[0.060]	[0.590]	[0.230]	[0.060]	[0.590]	[0.030]	[0.300]	[0.050]
	Panel B: Using firms with 10 to 30 female workers (N=21)							
W $\geq$ 20	-0.253**	-0.099	-0.267	-0.402***	-0.067	-0.587***	-0.166	-0.422***
	(0.100)	(0.082)	(0.171)	(0.130)	(0.093)	(0.141)	(0.124)	(0.104)
sharpened q-value	[0.031]	[0.166]	[0.126]	[0.016]	[0.287]	[0.005]	[0.154]	[0.005]
Romano and Wolf correction	[0.371]	[0.577]	[0.577]	[0.247]	[0.577]	[0.113]	[0.577]	[0.113]

Robust standard errors in parentheses. The regression includes a 2nd order polynomial above and below the threshold and the dependent variable is the log of the number of firms in each bin. *: significant at 10 %; **: at 5%; ***: at 1%.

Table 6. Discontinuity in the log of men per women

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
	Panel A: Using firms with 5 to 35 female workers							
$W \geq 20$	-0.076*	-0.131*	-0.036	-0.077	-0.060	-0.128*	-0.032	-0.081*
	(0.043)	(0.078)	(0.078)	(0.069)	(0.053)	(0.076)	(0.044)	(0.042)
sharpened q-value	[0.238]	[0.238]	[0.480]	[0.238]	[0.238]	[0.238]	[0.356]	[0.238]
Romano-Wolf p-value	[0.317]	[0.337]	[0.654]	[0.654]	[0.654]	[0.337]	[0.654]	[0.317]
N	28,302	9,658	8,254	10,390	17,461	10,841	22,759	5,543
	Panel B: Using firms with 10 to 30 female workers							
$W \geq 20$	-0.072	-0.109	0.117	-0.194**	-0.029	-0.167*	-0.051	-0.083*
	(0.053)	(0.098)	(0.094)	(0.086)	(0.065)	(0.093)	(0.054)	(0.050)
sharpened q-value	[0.362]	[0.362]	[0.362]	[0.237]	[0.519]	[0.303]	[0.362]	[0.303]
Romano-Wolf p-value	[0.455]	[0.555]	[0.555]	[0.158]	[0.723]	[0.386]	[0.555]	[0.406]
N	13,223	4,675	3,766	4,782	8,477	4,746	9,599	3,624

Robust standard errors in parentheses. The regression includes a 2nd order polynomial above and below the threshold, as well as year and sector fixed effects (ISIC four-digit). The dependent variable is the log number of male/female workers. *: significant at 10 %; **: at 5%; ***: at 1%.

Table 7. Discontinuity in the log of capital per female workers

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
	Panel A: Value of capital stock							
W $\geq$ 20	-0.200**	-0.253	0.034	-0.425***	-0.099	-0.428***	-0.081	-0.389***
	(0.098)	(0.167)	(0.198)	(0.157)	(0.123)	(0.161)	(0.108)	(0.139)
sharpened q-value	[0.054]	[0.115]	[0.478]	[0.022]	[0.260]	[0.022]	[0.260]	[0.022]
Romano-Wolf p-value	[0.138]	[0.376]	[0.901]	[0.040]	[0.713]	[0.050]	[0.733]	[0.020]
N	12,992	4,591	3,699	4,702	8,360	4,632	9,519	3,473
	Panel B: Value of capital stock (machinery and equipment)							
W $\geq$ 20	-0.126	-0.217	0.056	-0.275*	0.019	-0.408**	0.037	-0.400***
	(0.102)	(0.174)	(0.209)	(0.164)	(0.109)	(0.152)	(0.125)	(0.177)
sharpened q-value	[0.335]	[0.335]	[0.535]	[0.232]	[0.535]	[0.080]	[0.535]	[0.074]
Romano-Wolf p-value	[0.505]	[0.505]	[0.970]	[0.337]	[0.970]	[0.119]	[0.960]	[0.069]
N	12,938	4,574	3,683	4,681	8,316	4,622	9,468	3,470
	Panel C: Value of capital stock (other)							
W $\geq$ 20	-0.275**	-0.131	-0.052	-0.620***	-0.226	-0.395**	-0.217	-0.329**
	(0.112)	(0.184)	(0.215)	(0.198)	(0.141)	(0.184)	(0.132)	(0.167)
sharpened q-value	[0.053]	[0.170]	[0.253]	[0.015]	[0.100]	[0.068]	[0.100]	[0.080]
Romano-Wolf p-value	[0.099]	[0.832]	[0.861]	[0.030]	[0.277]	[0.158]	[0.277]	[0.188]
N	11,585	4,063	3,297	4,225	7,205	4,380	8,220	3,365
	Panel D: Expenses in electricity							
W $\geq$ 20	-0.089	-0.146	0.121	-0.242*	0.065	-0.377**	0.029	-0.301**
	(0.083)	(0.137)	(0.156)	(0.144)	(0.098)	(0.148)	(0.082)	(0.137)
sharpened q-value	[0.402]	[0.402]	[0.574]	[0.228]	[0.574]	[0.097]	[0.819]	[0.110]
Romano-Wolf p-value	[0.693]	[0.693]	[0.753]	[0.376]	[0.753]	[0.089]	[0.812]	[0.198]
N	13,302	4,696	3,789	4,817	8,558	4,744	9,683	3,619
	Panel E: Expenses in fuel							
W $\geq$ 20	0.115	0.026	0.113	0.174	0.132	0.092	0.276**	-0.220
	(0.100)	(0.174)	(0.184)	(0.169)	(0.130)	(0.156)	(0.107)	(0.157)
sharpened q-value	[0.763]	[0.979]	[0.979]	[0.763]	[0.763]	[0.979]	[0.090]	[0.763]
Romano-Wolf p-value	[0.723]	[0.871]	[0.871]	[0.772]	[0.772]	[0.871]	[0.059]	[0.644]
N	10,800	3,491	3,040	4,269	6,656	4,144	7,450	3,350

Robust standard errors in parentheses. The regression includes a 2nd order polynomial above and below the threshold, as well as year and sector fixed effects (ISIC four-digit). Dependent variables are the log of the proxy for capital per female worker. *: significant at 10 %; **: at 5%; ***: at 1%.

Table 8. Discontinuity in the log of capital per male workers

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
	Panel A: Value of capital stock							
$W \geq 20$	-0.125	-0.137	-0.082	-0.236*	-0.075	-0.241**	-0.038	-0.291**
	(0.077)	(0.124)	(0.164)	(0.123)	(0.102)	(0.117)	(0.097)	(0.122)
sharpened q-value	[0.267]	[0.594]	[0.792]	[0.178]	[0.723]	[0.158]	[0.792]	[0.119]
Romano-Wolf p-value	[0.317]	[0.594]	[0.881]	[0.278]	[0.881]	[0.129]	[0.782]	[0.257]
N	12,873	4,548	3,656	4,669	8,246	4,627	9,400	3,473
	Panel B: Value of capital stock (machinery and equipment)							
$W \geq 20$	-0.044	-0.084	-0.053	-0.087	0.040	-0.200	0.085	-0.301**
	(0.081)	(0.131)	(0.174)	(0.128)	(0.104)	(0.130)	(0.098)	(0.136)
sharpened q-value	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[0.784]	[1.000]	[0.267]
Romano-Wolf p-value	[0.931]	[0.911]	[0.931]	[0.911]	[0.931]	[0.515]	[0.871]	[0.129]
N	12,820	4,531	3,641	4,648	8,203	4,617	9,350	3,470
	Panel C: Value of capital stock (other)							
$W \geq 20$	-0.226**	-0.065	-0.203	-0.432**	-0.224*	-0.241	-0.204	-0.226
	(0.098)	(0.151)	(0.193)	(0.176)	(0.128)	(0.151)	(0.127)	(0.151)
sharpened q-value	[0.092]	[0.222]	[0.212]	[0.092]	[0.151]	[0.151]	[0.151]	[0.158]
Romano-Wolf p-value	[0.149]	[0.693]	[0.525]	[0.089]	[0.317]	[0.426]	[0.426]	[0.426]
N	11,510	4,041	3,267	4,202	7,132	4,378	8,145	3,365
	Panel D: Expenses in electricity							
$W \geq 20$	-0.002	-0.017	0.025	-0.044	0.122	-0.214**	0.102	-0.214*
	(0.063)	(0.101)	(0.127)	(0.108)	(0.079)	(0.105)	(0.073)	(0.118)
sharpened q-value	[0.942]	[0.942]	[0.942]	[0.942]	[0.392]	[0.392]	[0.392]	[0.392]
Romano-Wolf p-value	[0.990]	[0.990]	[0.990]	[0.990]	[0.426]	[0.297]	[0.535]	[0.317]
N	13,180	4,651	3,747	4,782	8,441	4,739	9,561	3,619
	Panel E: Expenses in fuel							
$W \geq 20$	0.196**	0.103	0.085	0.371***	0.163	0.264**	0.320***	-0.096
	(0.080)	(0.138)	(0.145)	(0.136)	(0.104)	(0.126)	(0.096)	(0.143)
sharpened q-value	[0.031]	[0.266]	[0.266]	[0.024]	[0.103]	[0.048]	[0.008]	[0.266]
Romano-Wolf p-value	[0.069]	[0.812]	[0.822]	[0.059]	[0.386]	[0.178]	[0.010]	[0.822]
N	10,735	3,471	3,018	4,246	6,593	4,142	7,385	3,350

Robust standard errors in parentheses. The regression includes a 2nd order polynomial above and below the threshold, as well as year and sector fixed effects (ISIC four-digit). Dependent variables are the log of the proxy for capital per male worker. *: significant at 10 %; **: at 5%; ***: at 1%.

Table 9. Discontinuity in the log of high per low skill workers

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
				Panel A: All workers				
$W \geq 20$	0.141*	0.122	0.390**	0.020	0.283**	-0.091	0.217**	0.032
	(0.085)	(0.124)	(0.174)	(0.149)	(0.113)	(0.123)	(0.108)	(0.132)
sharpened q-value	[0.138]	[0.352]	[0.113]	[0.810]	[0.113]	[0.443]	[0.113]	[0.810]
Romano-Wolf p-value	[0.337]	[0.753]	[0.139]	[0.970]	[0.079]	[0.792]	[0.198]	[0.970]
N	12,634	4,469	3,609	4,556	8,006	4,628	9,043	3,591
				Panel B: Male				
$W \geq 20$	0.100	-0.017	0.206	0.214	0.178	-0.079	0.170*	0.004
	(0.079)	(0.119)	(0.162)	(0.136)	(0.110)	(0.130)	(0.095)	(0.140)
sharpened q-value	[0.404]	[0.577]	[0.404]	[0.404]	[0.404]	[0.489]	[0.404]	[0.577]
Romano-Wolf p-value	[0.574]	[0.990]	[0.574]	[0.485]	[0.238]	[0.891]	[0.337]	[0.990]
N	11,645	4,099	3,308	4,238	6,087	4,530	8,060	3,585
				Panel C: Female				
$W \geq 20$	0.141	0.106	0.467**	-0.000	0.203	0.089	0.203	0.057
	(0.099)	(0.155)	(0.200)	(0.168)	(0.159)	(0.116)	(0.139)	(0.126)
sharpened q-value	[0.377]	[0.559]	[0.185]	[0.996]	[0.377]	[0.559]	[0.377]	[0.593]
Romano-Wolf p-value	[0.564]	[0.911]	[0.129]	[0.990]	[0.535]	[0.911]	[0.564]	[0.911]
N	9,704	3,146	2,777	3,781	5,103	4,601	6,776	2,928

Robust standard errors in parentheses. The regression includes a 2nd order polynomial above and below the threshold, as well as year and sector fixed effects (ISIC four-digit). Dependent variables are the log of the ratio for high and low skills workers by gender. *: significant at 10 %; **: at 5%; ***: at 1%.

Table 10. Discontinuity in other variables

	All Years (1)	Years 95-07 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
				Panel A: Log average wages				
W ≥ 20	-0.002	-0.033	0.021	0.003	0.055	-0.112**	0.041	-0.098**
	(0.030)	(0.046)	(0.055)	(0.055)	(0.037)	(0.049)	(0.035)	(0.046)
sharpened q-value	[0.927]	[0.869]	[0.886]	[0.927]	[0.361]	[0.160]	[0.536]	[0.160]
Romano-Wolf p-value	[1.000]	[0.852]	[0.960]	[1.000]	[0.446]	[0.099]	[0.614]	[0.129]
N	13,350	4,723	3,810	4,817	8,599	4,751	9,726	3,624
				Panel B: Value added per worker				
W ≥ 20	-1248.428	4218.215	-9678.074	1576.650	-606.392	-3926.881	-1087.691	-4262.886
	(3852.190)	(2701.441)	(7727.923)	(7977.821)	(4171.022)	(8313.849)	(2186.427)	(12611.766)
sharpened q-value	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]
Romano-Wolf p-value	[0.980]	[0.505]	[0.673]	[0.980]	[0.980]	[0.951]	[0.951]	[0.980]
N	13,345	4,718	3,810	4,817	8,595	4,750	9,722	3,623
				Panel C: Revenues per Worker (log)				
W ≥ 20	-0.049	-0.052	0.000	-0.078	-0.007	-0.148*	-0.039	-0.067
	(0.046)	(0.073)	(0.090)	(0.081)	(0.057)	(0.078)	(0.053)	(0.077)
sharpened q-value	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[0.890]	[1.000]	[1.000]
Romano-Wolf p-value	[0.802]	[0.852]	[1.000]	[0.832]	[1.000]	[0.317]	[0.852]	[0.832]
N	13,350	4,723	3,810	4,817	8,599	4,751	9,726	3,624
				Panel D: Costs Materials and External Services per Worker (log)				
W ≥ 20	-0.040	-0.099	0.057	-0.058	-0.010	-0.128	-0.029	-0.062
	(0.058)	(0.088)	(0.109)	(0.106)	(0.074)	(0.092)	(0.069)	(0.086)
sharpened q-value	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]
Romano-Wolf p-value	[0.931]	[0.782]	[0.980]	[0.980]	[0.980]	[0.594]	[0.980]	[0.911]
N	13,349	4,723	3,809	4,817	8,598	4,751	9,725	3,624

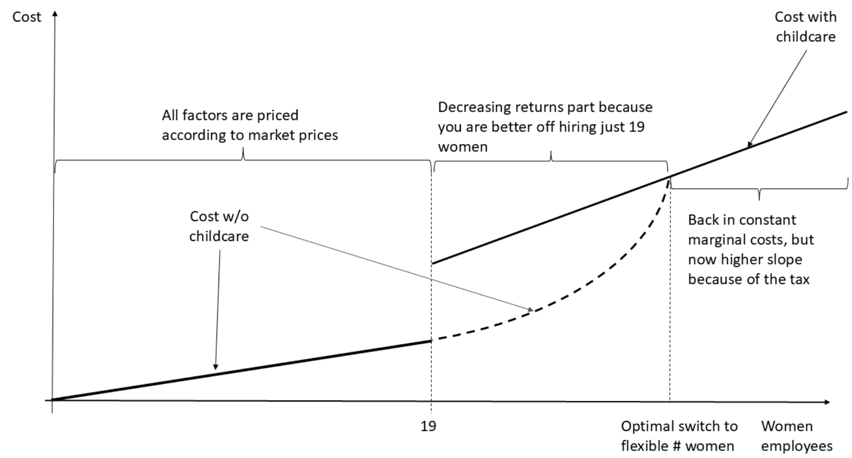
Robust standard errors in parentheses. The regression includes a 2nd order polynomial above and below the threshold, as well as year and sector fixed effects (ISIC four-digit). Dependent variables are the log of the variable indicated in the panel, except for value added per worker that can take negative values. *: significant at 10 %; **: at 5%; ***: at 1%.

Table 11. Estimated Production Function Parameters

	All Years (1)	Years 95-98 (2)	Years 99-02 (3)	Years 03-07 (4)	High W/M Sectors (5)	Low W/M Sectors (6)	Small Firms (7)	Large Firms (8)
θ	0.01	0.03	0.01	0.01	0.01	0.11	0.01	0.16
	[0.01,0.16]	[0.01,0.16]	[0.01,0.16]	[0.01, 0.11]	[0.01,0.10]	[0.01, 0.16]	[0.01, 0.12]	[0.01,0.21]
ρ	-16.01	-10.01	-21.01	-15.01	-15.01	-10.01	-15.01	-25.01
	[-25.01,-1.01]	[-25.01, 0.01]	[-25.01, 0.01]	[-25.01,-4.01]	[-25.01,0.01]	[-25.01,-4.01]	[-25.01,0.11]	[-25.01,-5.17]
τ ('000s CLP)	76.58	147.90	136.64	456.46	91.59	478.98	34.53	631.38
	[7.51,249.78]	[5.86,745.35]	[0,1337.69]	[80.78,1498.05]	[4.35, 774.32]	[86.49,1359.16]	[1.50, 329.28]	[72.75,1300.53]

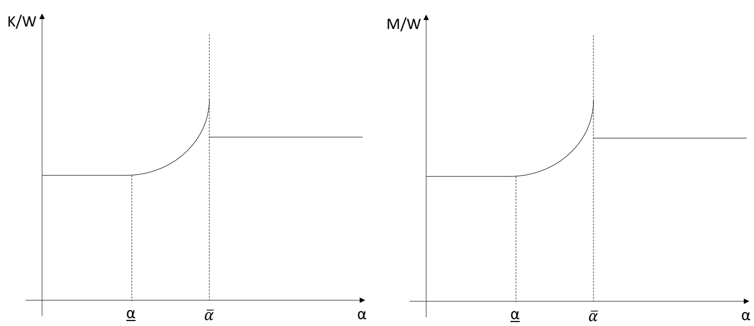
This table presents the median and 90% confidence interval of the estimation of the parameters based on 100 bootstrap samples of the estimation of the discontinuity in K/M and K/W.

Figure 1. Firms' cost functions and optimal response



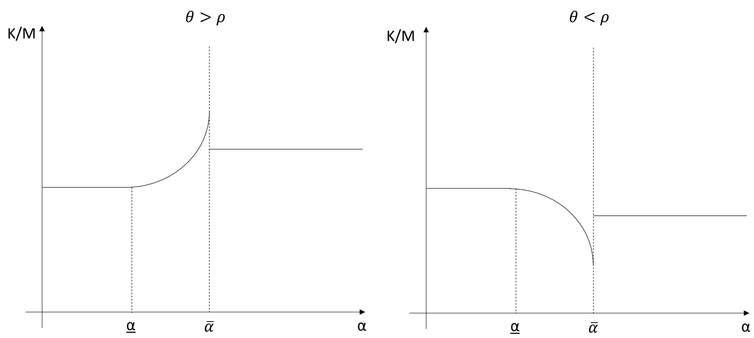
Notes: This figure presents the cost function of a firm in the model as a function of its productivity parameter α_i. The continuous thick lines correspond to the cost function if firms simply take the law as given and do not attempt to circumvent it. The thick dotted line presents the cost function for firms that willingly distort their factor ratios to avoid being subject to the law.

Figure 2. Impact of bunching on capital-women and men-women factor ratios



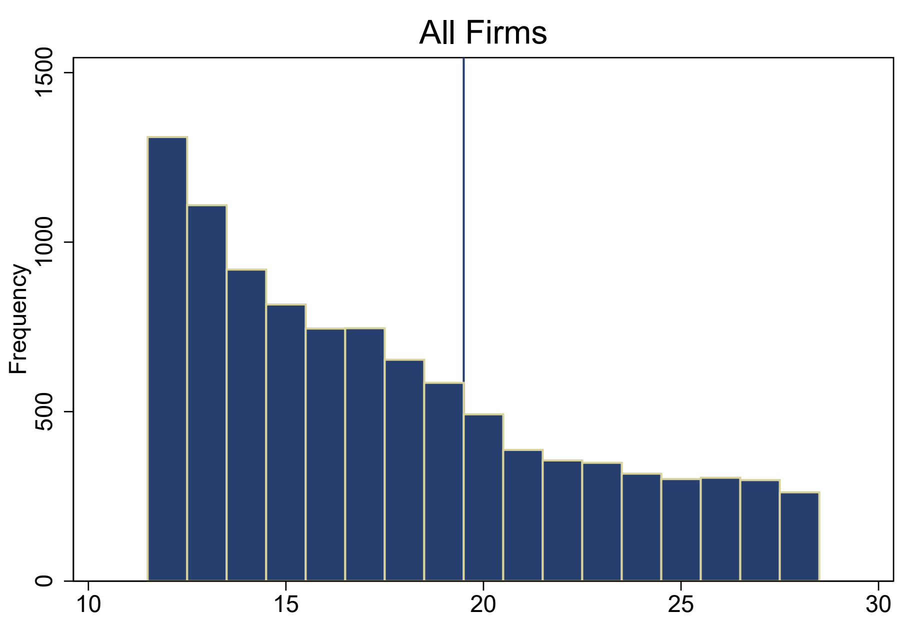
Notes: This figure presents factor ratios of firms (capital per women on the left and male per women employee on the right) in the model as a function of its productivity parameter α_i. $\underline{\alpha}$ represents the value of the productivity factor below which firms never wish to employ more than 19 women. $\bar{\alpha}$ represents the level of productivity at which firms prefer paying the childcare cost rather than avoiding employing more than 19 women.

Figure 3. Impact of bunching on capital-men factor ratio



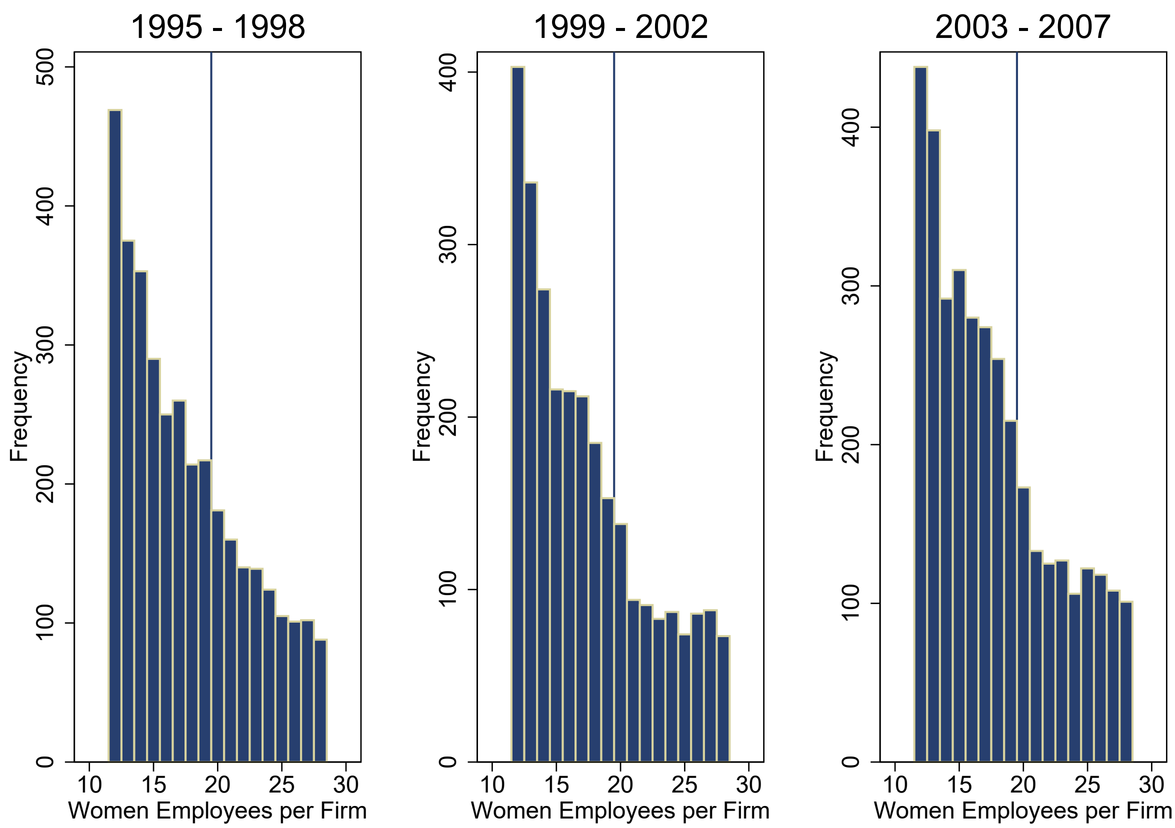
Notes: This figure presents capital to men ratio of firms in the model as a function of its productivity parameter α_i, depending on the elasticity of substitution parameters. The figure on the left shows the case where $\theta > \rho$, which corresponds to the case where capital is more complementary to men's labor than women's while the figure on the right shows the case where $\theta < \rho$ and capital is more complementary to women's labor than men's. $\underline{\alpha}$ represents the value of the productivity factor below which firms never wish to employ more than 19 women. $\bar{\alpha}$ represents the level of productivity at which firms prefer paying the childcare cost rather than avoiding employing more than 19 women.

Figure 4. Histogram of the number of female workers per firm.



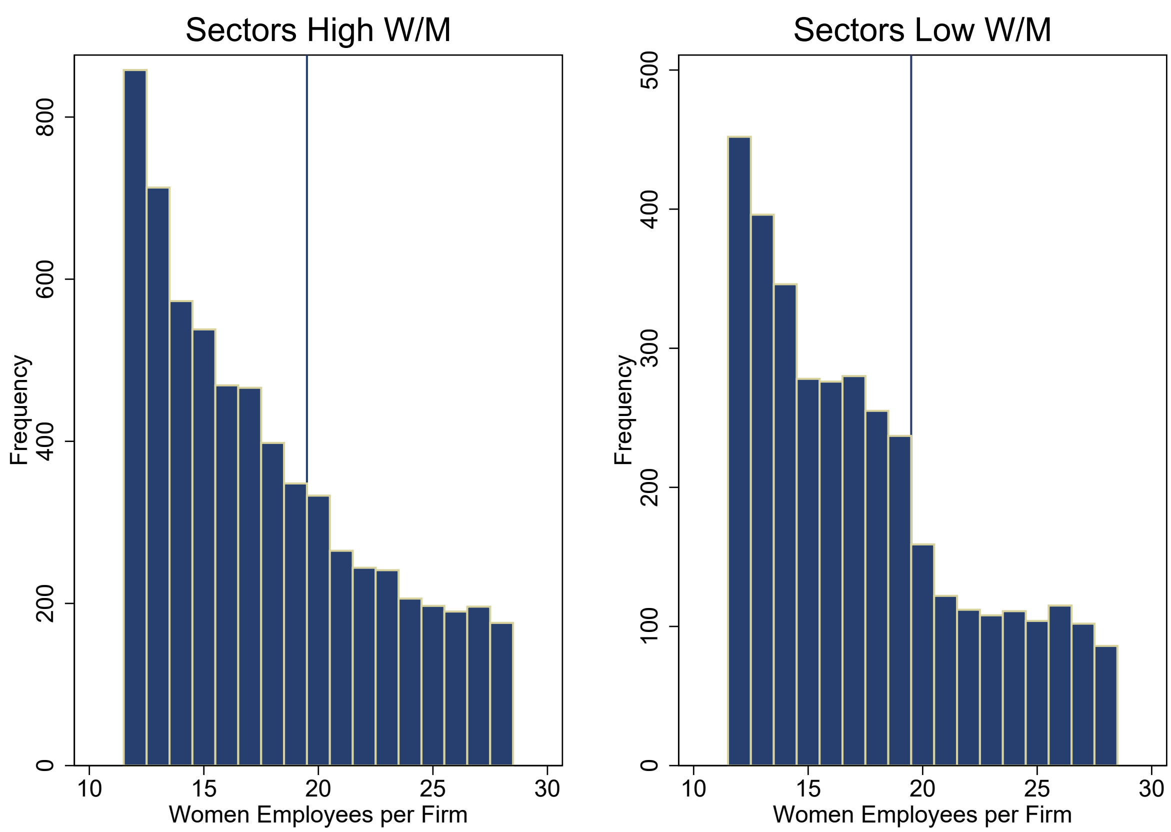
Notes: This figure presents the histogram of the frequency of firms that employ a given number of female workers. Constructed from all observations from ENIA that have between 12 and 28 female workers. N=9,950.

Figure 5. Histogram of the number of female workers per firm-by time period.



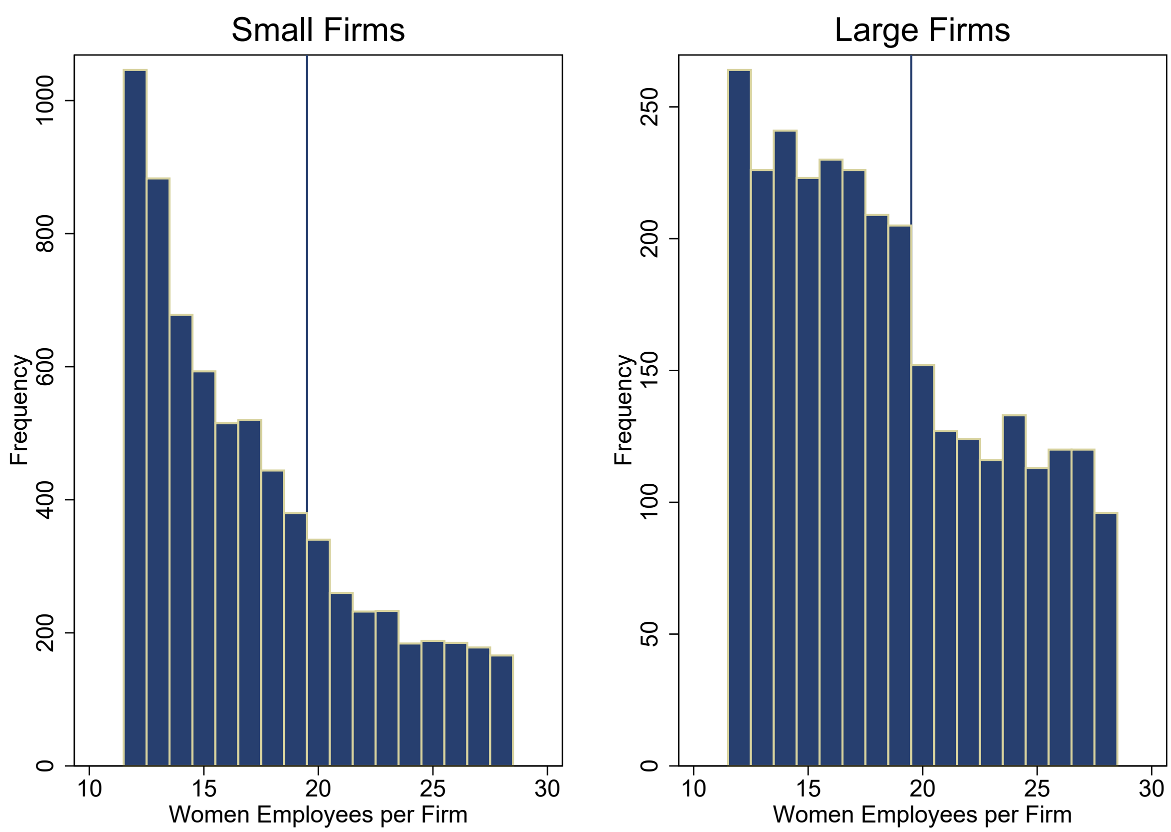
Notes: This figure presents the histogram of the frequency of firms that employ a given number of female workers in each period. Constructed from all observations from ENIA that have between 12 and 28 female workers. N=3,568 for 1995-1998, N=2,808 for 1999-2002 and N=3,574 for 2003-2007.

Figure 6. Histogram of the number of female workers per firm-by sector.



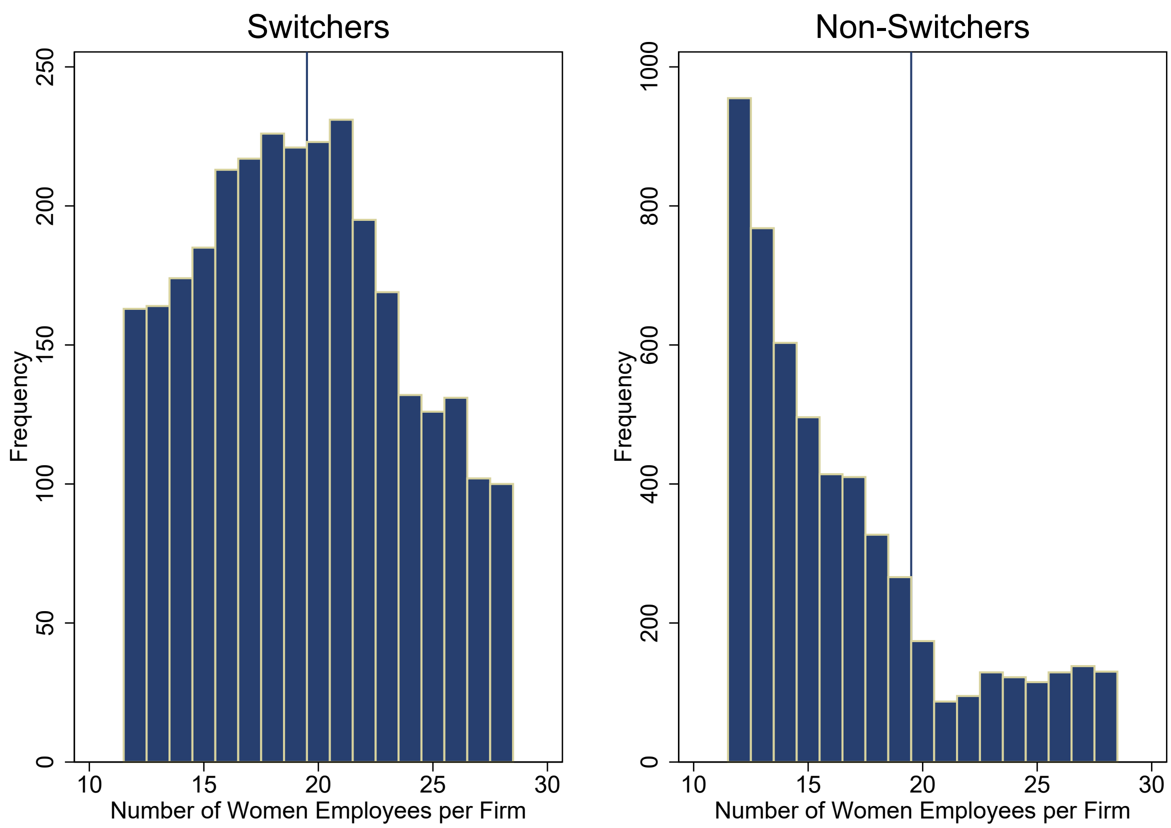
Notes: This figure presents the histogram of the frequency of firms that employ a given number of female workers in each type of sector. Constructed from all observations from ENIA that have between 12 and 28 female workers. N=6,411 for high W/M sectors and N=3,539 for low W/M sectors.

Figure 7. Histogram of the number of female workers per firm-by size.



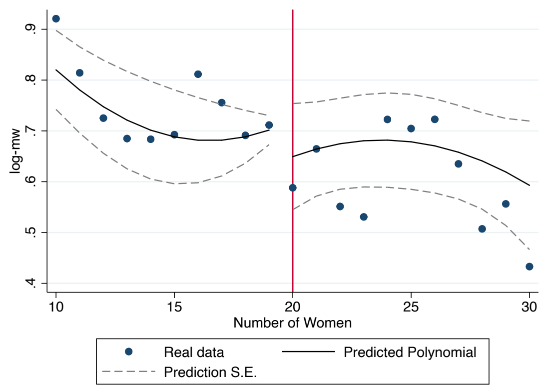
Notes: This figure presents the histogram of the frequency of firms that employ a given number of female workers by total firm size. Large firms are those employing more than 100 workers while small firms employ 100 or less workers. Constructed from all observations from ENIA that have between 12 and 28 female workers. N=7,025 for small firms and N=2,925 for large ones.

Figure 8. Histogram of the number of female workers per firm-by threshold-crossing status.

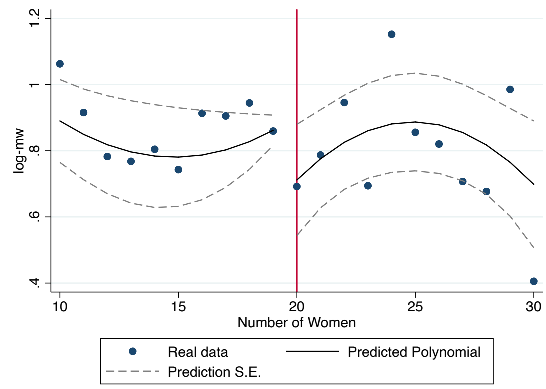


Notes: This figure presents the histogram of the frequency of firms that employ a given number of female workers by whether the firm ever became subject to the law over the time period. Constructed from all observations from ENIA that have between 12 and 28 female workers. N=2,972 for switchers and N=5,358 for non-switchers.

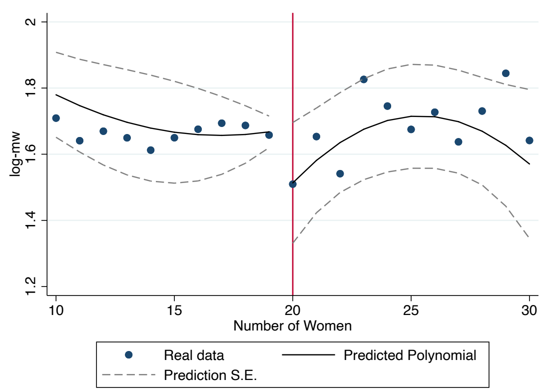
Figure 9. Discontinuity in log of men per women employees around policy threshold



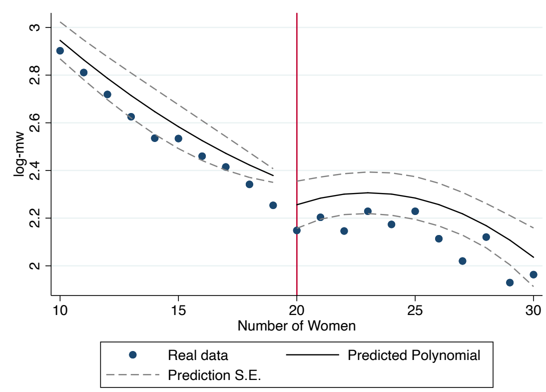
(a) Full sample



(b) Only 2003-2007



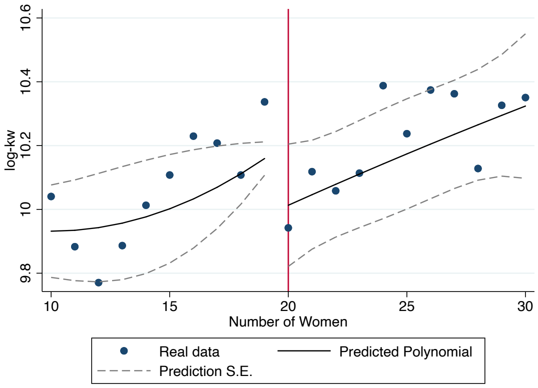
(c) Only male-intensive sector



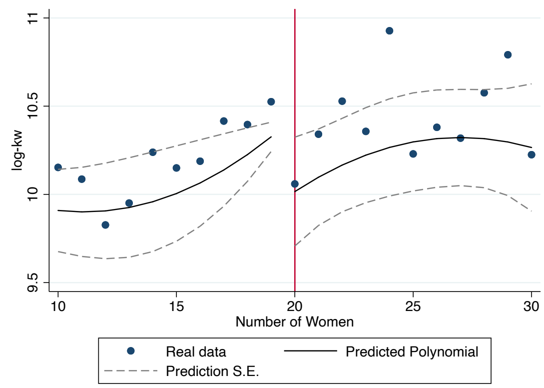
(d) Only large firms

Notes: This figure presents the estimated polynomial based on Table 6. The raw data corresponds to the average in the actual data. The fitted polynomial corresponds to the coefficients of the polynomial multiplied by the number of women employees above and below the threshold. In order to summarizes the large number of fixed effects included in the regression, we sum to this polynomial the average of the log of men to women employees for firms with 17-19 female workers. Standard errors are computed using the delta method based on the estimated coefficients of the polynomial which were robust to heteroscedasticity. Figure (a) includes all observations (N=13,223), figure (b) restricts the sample to years between 2003-2007 (N=4,782), figure (c) to only male-intensive sectors (N=4,746), and (d) only to firms with more than 50 workers (N=3,624)

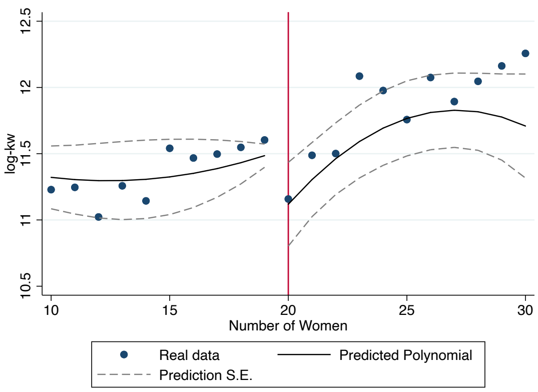
Figure 10. Discontinuity in log of capital per female employees around policy threshold



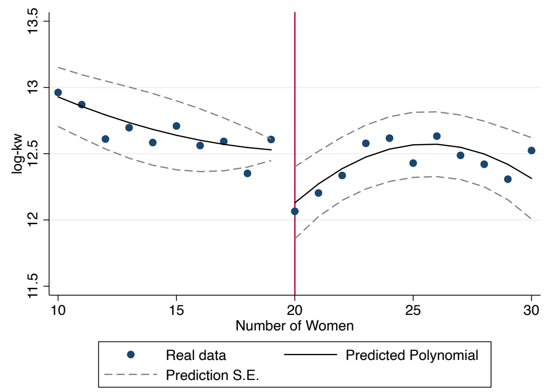
(a) Full sample



(b) Only 2003-2007



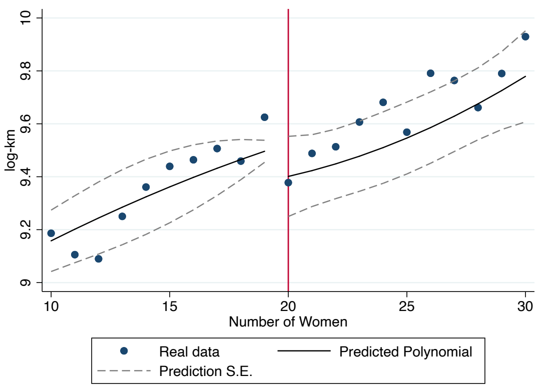
(c) Only male-intensive sector



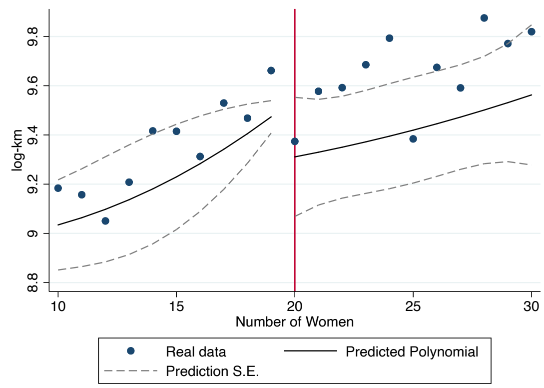
(d) Only large firms

Notes: This figure presents the estimated polynomial based on Table 7. The raw data corresponds to the average in the actual data. The fitted polynomial corresponds to the coefficients of the polynomial multiplied by the number of women employees above and below the threshold. In order to summarizes the large number of fixed effects included in the regression, we sum to this polynomial the average of the log of capital per women employees for firms with 17-19 female workers. Standard errors are computed using the delta method based on the estimated coefficients of the polynomial which were robust to heteroscedasticity. Figure (a) includes all observations (N=12,016), figure (b) restricts the sample to years between 2003-2007 (N=4,362), figure (c) to only male-intensive sectors (N=4,557), and (d) only to firms with more than 50 workers (N=3,464)

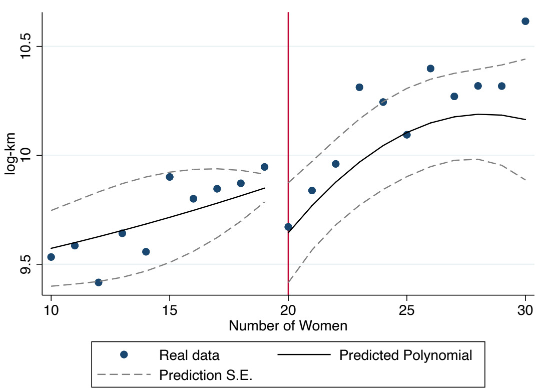
Figure 11. Discontinuity in log of capital per male employees around policy threshold



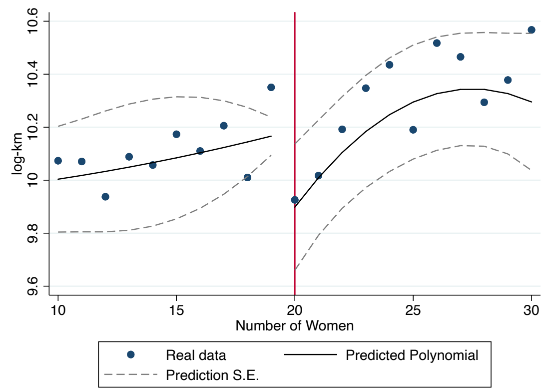
(a) Full sample



(b) Only 2003-2007



(c) Only male-intensive sector



(d) Only large firms

Notes: This figure presents the estimated polynomial based on Table 7. The raw data corresponds to the average in the actual data. The fitted polynomial corresponds to the coefficients of the polynomial multiplied by the number of women employees above and below the threshold. In order to summarizes the large number of fixed effects included in the regression, we sum to this polynomial the average of the log of capital per women employees for firms with 17-19 female workers. Standard errors are computed using the delta method based on the estimated coefficients of the polynomial which were robust to heteroscedasticity. Figure (a) includes all observations (N=12,016), figure (b) restricts the sample to years between 2003-2007 (N=4,362), figure (c) to only male-intensive sectors (N=4,557), and (d) only to firms with more than 50 workers (N=3,464)