Firm Size and Female Employment*

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June 2024

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Abstract

Using firm and household-level data from India, we establish a positive association between relative female employment and firm size. We find that the proportion of female workers is higher in firms with a larger number of total employees and output, even after controlling for firm, industry and occupation level unobservables. We further show that higher benefits and amenities offered by larger firms, like maternity benefits and paid leave, which are likely to be valued more by female workers, with no accompanying increase in the gender wage gap is a plausible mechanism behind our findings. We then exploit a natural experiment in the amendment of labor laws across the Indian states, which increased the firm size thresholds for the applicability of regulatory compliances. Using a difference-in-difference estimation, we find an increase in the proportion of female workers by approximately 10% in treated vs. control states. One of the channels behind this increase is the accompanying increase in firm size by around 5% and welfare expenses per employee by 13%. Our results show that policies that increase firm growth, which in turn increase provision of amenities valued by women (without employer backlash), are likely to increase female employment.

JEL Codes: J16, J18, L25

Keywords: Employment, gender, firm size, labor laws

*Funding from Ashoka University and CEDA-BMGF grant is acknowledged. We thank Nandhini S, Ushmita Seth, Tanish Bafna, and Rabi Mondal for excellent research assistance. We also thank seminar participants at John Hopkins University and IFPRI, Washington DC and conference participants at Southern Economic Association, USA and BITS Pilani, Hyderabad for their useful comments. All errors remain our responsibility.

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1 Introduction

There is substantial variation in workforce participation of women across countries. While 52% women aged 15 or older work in the labor market across the OECD countries, this proportion stands at 22% for South Asia. The literature largely discusses the role played by the U-shaped association of female employment with income and education and variation in social norms across countries as primary explanations behind the observed patterns. Differential demand for women due to variation in firm attributes, which can also constrain the availability of suitable labor market opportunities for women, has received far less attention in explaining the observed disparities.

India has experienced rapid economic growth since the 1990s. Simultaneously, there has been a dramatic increase in female education and a substantial fall in fertility. Despite these changes, the female labor force participation (FLFP) rate has remained stable within a low 30-32% range during 1990-2005 and has declined since then in rural areas.[1] Another stylized fact about the Indian economy is the firm-size distribution, which shows a dense concentration of micro-sized firms in the country. Almost 98% of the firms are micro in nature, i.e., have a size of fewer than ten employees in the country (Economic Census). Even in the registered manufacturing sector, this proportion was 30% during 2010-19 (Annual Survey of Industries).[2] If the job attributes between small versus large firms differ in a way that these jobs may be differently attractive for women in comparison to men, then the firm-size distribution may be a limiting factor for female employment in the country. Against this background, this paper investigates the relationship between firm size and female employment in India and the factors that explain this relationship.

We use firm-level data to examine how relative female employment changes with firm size. Here, we use the Annual Survey of Industries from 1998-2019, a nationally representative panel data on registered manufacturing establishments in India. Controlling for unobserved heterogeneity at the establishment level, we find a significant positive elasticity of 0.47 between firm size measured as the total number of hired workers and the proportion of hired female workers. This positive relationship is statistically significant and robust to using alternative definitions of relative female employment (proportion of female worker mandays and presence of female workers) and alternative definitions of

[1] International Labour Organization. "ILO Modelled Estimates and Projections database (ILOEST)" ILOSTAT. Accessed December 6, 2022.

[2] Between 1998-2003, the average number of employees per organized manufacturing firm in India was approximately 56 (with a median size of 15), which increased to about 80 (with a median size of 19) by 2014-2019.

firm size (total employees and total output). We also verify the relationship at the firm level using data from the Economic Census of India (1998, 2005, 2013) that captures both the unorganized and the organized sector firms across all industrial sectors - agriculture, construction, manufacturing, and services. While we cannot account for firm-level unobserved heterogeneity since firms cannot be linked over time in this data, cross-section estimates show a significant positive association (elasticity of almost 0.75) between firm size (number of hired workers) and the proportion of female hired workers. This positive relationship holds across all major industrial sectors. We also flexibly model firm size to check for non-linearity in this relationship. While the relationship is concave, we find that even up to a firm size of 1200 workers (99.9 percentile), it remains positive.

We then corroborate the above findings using the nationally representative National Sample Surveys (1999-2012) and Periodic Labor Force Surveys (2017-2019). These surveys collect data on repeated cross-sections of households and individuals, on their employment status and establishment size, based on the total number of employees in the following brackets: ≤ 5, 6-9, 10-20, >20. The firm size details are collected for individuals employed in the non-farm sector. Controlling for differential gender composition of workers at the district-year as well as at the industry-occupation-year level and including extensive individual-level controls, we find that female workers are 5% more likely to be employed in firms having 20 or more workers vs. firms having less than 6 workers when compared to male workers.

After establishing the reduced form evidence that shows a positive relationship between firm size and relative female employment, we then use exogenous variation in labor law amendments in two states of India - Rajasthan in 2014 and Jharkhand in 2017 - to verify whether policies that can potentially increase firm size also matter for female employment. These amendments increased the firm size threshold for the applicability of the Factories Act from 10 to 20 workers (when power was used) and from 20 to 40 workers (when no source of power was used). The amendment to the Industrial Disputes Act increased the threshold for a firm to lay off or retrench workers and close an establishment without prior permission from 100 to 300 permanent workers. These amendments provided a direct incentive for firms under the size of 100 to increase their size beyond the thresholds of 20, 40, and 100. It also provided establishments that employed between 100 and 300 permanent workers flexibility in hiring and firing workers. These Acts have previously been shown to constrain firm size in India (Amirapu & Gechter, 2020). Additionally, by reducing compliance costs, these

amendments can directly lend to increased output and profits and consequently affect the amenities that an enterprise can spend on.

We use a differences-in-differences estimation strategy (both two-way fixed effects and in a staggered design) to estimate the causal impact of the amendments on the proportion of female workers. Using an event study design, we also confirm the absence of pre-trends in these outcomes before the amendments across treated and control states. We find that the proportion of female workers increases by 16% in the treated states vs. the control states after the amendments (using two-way fixed effects strategy). We also use the recent, more appropriate methods provided in Callaway & Sant'Anna (2021) for staggered treatment designs for estimating the Average Treatment Effect on the Treated (ATT). We again find an increase in the proportion of female workers by 13% after the amendments using the alternative method and find no pre-trends. We also find an increase in the number of female workers and the probability of an enterprise hiring a female after the amendments.

Lastly, we examine the mechanisms through which larger firms can affect female employment. At the firm level, we find empirical evidence in support of higher employee welfare benefits (including maternity benefits, paid leave, and creches, among others) provided by bigger firms. Using household-level data, we confirm that workers employed in larger firms (20 or more workers) are 70% more likely to get maternity benefits, 45% more likely to get paid leaves, 50% more likely to have a written contract, and 70% more likely to get pension benefits from their employers, vs. workers in firms having less than 6 workers.

Additionally, we also find that the labor law amendments led to increased expenditure on employee welfare by establishments in the treated vs. the control states. This was also accompanied by an increase in the profits and output of firms in the treated states. Again, we find no pre-trends in these outcomes. In general, there are three possible channels through which these amendments can affect relative female employment. First, it can incentivize firms to increase their size above the earlier binding thresholds. By reducing compliance costs, it can also directly spur an increase in output and profits. Both of these can result in higher welfare expenses by firms as they can afford to provide amenities valued by women. Lastly, it can increase overall demand by spurring firms' entry (through aggregate employment and growth). All channels can increase female employment. To check the first channel, we estimate the impact of the amendments on total workers hired and

employees of the firm. We find that firm size increases by 5% after the amendments in treated vs. the control states using the staggered design. However, these results are only marginally significant. We find a high direct impact of the amendments on output and profits per employee as these increase by 15% and 35%, respectively, after the amendments. These results show that policies that enable firms to grow in size or directly increase their profitability can also have a positive impact on female employment. This is largely due to increased spending on amenities by firms.

Taken together, the above findings indicate that bigger firms can hire more women due to better non-wage amenities offered by these firms, which are valued more by female employees. A natural next question is why bigger firms provide these amenities. There may be legal requirements behind the provision of these benefits. For instance, in India, firms with more than 50 employees are supposed to provide creches to their employees; maternity leave provision also kicks in for firms that have at least 10 employees. If legal reasons are the only factors behind bigger firms providing these non-wage amenities, then employers can compensate for these by paying lower wages to female workers. However, we find no consistent association between the gender wage gap and firm size. While there is no discernible relation between the two at the firm level, individual-level data shows that the gender gap in wages, if anything, is smaller in larger firms. This holds after controlling for detailed worker demographics and job characteristics.

Second, larger firms are likely to be more profitable and have higher total factor and labor productivity. Hence, they may find it feasible to spend more on employee benefits, which are relatively more valued by women. However, can other underlying factors also explain why bigger firms optimally choose to provide such amenities? In this paper, we propose a task-based explanation for the higher provision of benefits by bigger firms that are valued by women. To illustrate firm incentives, we use a task-based theoretical framework (similar to Acemoglu & Autor (2011)), where, as the number of tasks in firms goes up (Adenbaum, 2022), they would be incentivized to provide higher compensation or better benefits to women if their relative productivity in these new tasks were higher, which in turn also leads to more men being hired, and increases overall firm size. This possibility is indicated in recent empirical work by Chaturvedi *et al.* (2023), which uses job advertisement data from India. Using machine learning methods to extract skills from the textual descriptions, it shows that bigger firms are more likely to demand a larger number of skills; they are also more likely to jointly demand both male and female-associated skills. This shows that male and

female labor is more complementary in bigger firms. If women are more valued in the new tasks that a firm undertakes as its size increases, then demand for female workers by the firm can go up. For instance, a smaller firm may only need manufacturing workers, but a bigger firm would also need human resource personnel to manage the administration of employees. Another example in the manufacturing industry can be small food processing units, which generally only grind flour and pulses; bigger units in food processing that grind flour are also likely to make final consumer items such as bread or wafers from the flour.

Lastly, there could be other factors like lower discrimination by bigger firms or better-streamlined hiring processes in these firms, which reduce discrimination against women. Baert *et al.* (2018) provide experimental evidence from Belgium suggesting that there is no association between firm size and hiring discrimination for women and other minority groups. We are currently implementing an audit experiment explicitly testing for this mechanism in the Indian context, with results awaited. Additionally, Rebien *et al.* (2020) show that smaller firms are more likely to hire through referrals while bigger firms use more formal search processes to hire workers. The latter can lead to a more diversified pool of applicants. On the other hand, hiring through referrals can result in male workers tapping into their male-dominated networks to refer workers. While this channel can also be at play, and we cannot rule this out, it cannot be the only explanation behind our findings. This is because it cannot explain the larger benefits or amenities valued by women being offered by bigger firms with no effect on the gender wage differentials. If anything, a larger supply of women may increase the gender wage gap between women and men.[3]

Our work contributes to several strands of literature. First, we contribute directly to the literature on firm-level determinants of female labor demand. Surprisingly, there has been little research in this area. Ozler (2000) finds that export-oriented firms are more likely to employ women. Juhn *et al.* (2014) causally show that new export opportunities in Mexican manufacturing reduced gender inequality in blue-collar jobs in the sector due to technology upgrading by exporting firms while Gaddis & Pieters (2017) find no gendered impacts for Brazil. Reilly & Wirjanto (1999)

[3]It could also be that bigger firms have diversity targets and specifically look to hire women. However, this would lead to lower profits for bigger firms since profit maximization would no longer be the only objective. We, however, do not find a fall in the profit per employee as firm size increases. Also, these initiatives have only gained momentum in the last decade in India. The relationship between firm size and female employment holds with similar strength both in 1998-2009 and 2010-2019. This shows that DEI initiatives by bigger firms are unlikely to be the main driver behind the obtained association.

find no monotonic relationship between firm size and proportion of female employees in Canadian firms while Mitra (2003) finds that women and blacks are more likely to be employed in larger establishments in the United States. Female presence on boards is also related positively to firm size (Carter *et al.*, 2003). Other firm characteristics that have been shown to be related to female employment include owner's gender and industry of work. In general, the literature on demand-side factors shaping female employment is limited. We contribute to this literature by showing the positive association of firm size with the proportion of female workers in the Indian context and examining the mechanisms that explain this relationship[4].

Second, the relationship between firm size and non-pecuniary benefits like job flexibility, job autonomy, job security, work-life balance is ambiguous theoretically (Bryson *et al.*, 2017). Existing literature for the developed countries shows that employer-provided welfare like child-care assistance (financial assistance for child-care, on-site child care, or information service to access childcare), maternity, parental, and sick-child leave are more likely in firms that have a larger employee size (Den Dulk *et al.*, 2012; Evans, 2002; Hall & Soskice, 2002; Hayghe, 1988). A variety of reasons may explain this pattern. Regulatory compliance based on country context (Goodstein, 1994), economies of scale which allow large firms to undertake fixed costs involved with family-friendly policies, dedicated human resource departments which are more likely to develop family-friendly workplace policies (Glass & Estes, 1997), and differential demand for women workers which can be met through provision of such non-wage amenities which women employees value. On the other hand, larger firms can also have more inflexible schedules and longer working hours for employees (Shao *et al.*, 2021), reducing the share of female workers in bigger firms. While there is evidence that compared to men, women have a preference for both workplace flexibility and non-pecuniary benefits (Goldin, 2014; Morchio & Moser, 2020; Erosa *et al.*, n.d.; Mas & Pallais, 2017; Wiswall & Zafar, 2018), how these vary by firm size for the developing countries is not well-understood. We contribute to this literature by showing the positive association of firm size with non-pecuniary benefits such as maternity and paid leave policies and other non-wage amenities in the Indian context.

Third, if production technology is skill-biased (Acemoglu, 2003) and men and women differ in

[4]Card *et al.* (2016) also notes that on average, females are more likely to work in larger establishments than men in Portugal. Using Current Population Survey data from 2000 onwards, we also find women are more likely to be employed full-time in bigger firms than smaller firms, relative to men. These estimates are available on request.

skills, or if technology is gender-biased due to male-female differences in endowments of brain vs. brawn, then this can directly generate differences in the proportion of women workers across firms, based on their production technology (Galor & Weil, 1996; Weinberg, 2000). This could indicate an increased demand for female workers by larger firms if female workers are more complementary to production technology in these firms. The difference in technology across firms can arise due to the increased number of tasks that these firms require Adenbaum (2022). Taking a cue from the empirical findings in Chaturvedi *et al.* (2023), which indicate that bigger firms demand more number of skills with relatively higher growth in skills generally associated with women, we develop a theoretical framework that shows that bigger firms with more task requirements are likely to have a higher demand for women and hence spend more on amenities that women workers value. This increases the proportion of female employees in bigger firms.

Lastly, while there is a large literature that studies the effects of labor regulations on employment across countries (Botero *et al.*, 2004; Kahn, 2007) and productivity (Autor *et al.*, 2007; Dougherty *et al.*, 2011), there is no evidence on the effects of labor regulations on relative female employment. The evidence on how these impact firm size is also limited. Almeida & Carneiro (2009) examines how enforcement of labor regulations affects firm size in Brazil and finds that stricter enforcement of labor laws constrains firm size and increases unemployment. In the Indian context, studies have examined the impact of amending labor regulations on overall employment and growth since these acts impose substantial costs on firms. Besley & Burgess (2004) show that amendments to the Industrial Disputes Act in India during 1958-1992 in a pro-worker direction led to lower output, employment, investment, and productivity in these states. Many studies examine the impact of spatial (state-level) variation in labor regulations on firm adjustment to various shocks like trade reforms (Hasan *et al.*, 2007), rainfall variation (Chaurey, 2015; Adhvaryu *et al.*, 2013), dismantling the License Raj (Aghion *et al.*, 2008), among others. See Chaurey (2015) for a review. However, none of these studies examine the effects on female employment. We fill this gap in the literature and show that one of the mechanisms through which relaxing labor regulations, which inhibit firm growth, increase female employment is by increasing firm size.

The rest of the paper is organized as follows. The next section discusses the contextual background in India. We discuss the data sources in Section 4 and the empirical strategy in Section 5. The reduced form findings are presented in Section 6 and the effect of amendments in Section

7. The mechanisms are discussed in Section 8.1, and Section **??** proposes a simple model that can rationalize our findings. We conclude in Section 9

2 Background

Rapid economic growth, declining fertility, and increasing women's education in India over the past three decades have not resulted in increasing women's attachment to the labor market in India. In fact, the female workforce participation in the country continues to remain low at 27% (Periodic Labor Force Survey, 2018) and has shown a precipitous and persistent decline since 1987 in rural India from 54 percent in 1987 to 30 percent in 2018. While increasing incomes and rising male education are some of the supply-side factors that have been shown to contribute to the decline, the low rates are also attributed to social norms around women's work whereby households prefer to have women undertake home production rather than work outside (Afridi *et al.*, 2018). However, the role played by demand-side factors remains under-explored.[5]

Stringent labor regulations in India have often been blamed for the lagging manufacturing sector in the country, which could have absorbed women who leave agriculture. For instance, the Factories Act in India and the regulations therein were historically only applicable to firms with 10 or more workers when the firm uses electric fuel power or to firms that employ 20 or more workers without power. Amirapu & Gechter (2020) estimate the increase in unit labor costs by 35% associated with these regulations when the firm size increases beyond 10 workers, thus creating a distortionary effect. Establishments that qualify to be registered under the Factories Act are supposed to adhere to workplace safety and provide worker benefits mandated under the law.

Another regulation called the Industrial Disputes Act (IDA) stipulates that any industrial establishment with more than a certain threshold of workers must obtain prior permission from the state government before laying off workers or closing the establishment.[6] Some studies have

[5] For instance, Afridi *et al.* (2023) show that increasing mechanization in agriculture can partly explain the fall in female employment in agriculture. Also, see Deshpande & Singh (2021), which shows that women drop in and out of the labor force in India based on demand.

[6] At this level of threshold (usually 100 for most states till 2013), Amirapu & Gechter (2020) find a smaller increase in unit labor costs when compared to the threshold of 10 workers. Sections V-A and V-B of the IDA cover layoffs and retrenchments. Section V-A lays down regulations for establishments with 50 or more workers. A retrenched worker is entitled to compensation equaling 15 days' average pay for each year of service, and for layoffs, every worker is paid fifty percent of basic wages and a dearness allowance for each day that they are laid off (maximum of 45 days). It also requires that firms give sixty days (Section V-A) and ninety days (Section V-B) of prior notification with the government.

suggested that the Factories Act, which increases the regulatory compliance costs, and the IDA, especially the provision of limiting the firing of workers to 100, contribute significantly to the small size of firms in India (Hsieh & Olken, 2014).[7] The provisions under the IDA make firing workers more costly and can restrict firms from attaining their true size if they end up losing the flexibility to retrench workers when the demand falls.

2.1 Amendments to Labor Laws

States have the power to amend these acts and change the firm size thresholds for their applicability. We exploit the amendment to the Factories Act and the IDA in two states of India - Rajasthan, which amended these Acts in 2014, and Jharkhand, which amended them in 2017.[8] These amendments involved increasing the firm size for the applicability of the Factories Act from 10 to 20 workers when power was used and from 20 to 40 workers when no source of power was used. The amendment to the IDA increased the threshold for a firm to layoff or retrench workers and close an establishment without prior permission from 100 to 300 permanent workers. These amendments provided direct incentives for firms under the size of 100 to increase their size beyond the thresholds of 20, 40, and 100. It also provided the establishments that employed between 100 and 300 permanent workers flexibility in hiring and firing workers.[9]

Along with these amendments, Rajasthan also made unionization more difficult by mandating that union membership must reach at least 30 percent of the establishment's total workforce, as opposed to the 15 percent required earlier. It also mandated that workers who wish to raise an

[7] Alse see http://www.economist.com/node/9955756. A few existing studies find some bunching at the 100-workers threshold but not much, thus arguing that the threshold of 100 for the regulation may not be a binding constraint for firm size (Hsieh & Olken, 2014; Amirapu & Gechter, 2020). However, **?** argues that bunching at the threshold is not the only indicator for policies to restrict firm size and argues that establishment transitions around the threshold when such policies change are also important to examine.

[8] The state government of Madhya Pradesh also amended the IDA in 2015. However, simultaneously, it also amended the Factory Act to allow women to work night shifts in the manufacturing units. Hence, we drop Madhya Pradesh from our analyses since the amendment of the night shift provision can also lend directly to increasing the hiring of female workers in manufacturing establishments. Other states like Uttar Pradesh and Maharashtra amended the Factories Act firm size thresholds and also amended the night shift rules. These are hence dropped from the analyses, too. We also drop the small north-eastern states from the analyses including Assam. Lastly, we drop Haryana and Andhra Pradesh from our analyses because while we are able to find notifications for amendments, there is no circular available online for the exact date of implementation. Given the uncertainty in their status, these are also dropped from the analyses. We finally have 21 states and union territories in our analyses.

[9] While there should have been a direct effect on the growth of firms sized more than 300, it is plausible that firms just around the cutoff of 300 may have been incentivized to reduce their size to allow themselves the flexibility, but firms beyond the immediate vicinity of the 300 permanent employees cutoff could also gain through the general equilibrium impacts of increased output and employment in the states that implemented the reform.

objection with the government regarding their discharge or retrenchment must do so within 3 years of being discharged. There was no time limit earlier. The Contract Labor (Regulation and Abolition) Act was also amended. It would now apply to establishments with 50 or more contract workers. It used to apply to establishments with 20 or more contract workers earlier. Jharkhand also amended the Factories Act in 2015, but this was implemented only by December 2016. It amended the IDA in 2016 to increase firm size thresholds for applicability, but this was implemented in 2017. Hence, for Jharkhand, we take the treatment year as 2017 since the on-ground implementation of both amendments occurred in 2017. Another major amendment made violations under the Factories Act non punishable by police arrest upon payment of a fine. Also, complaints against the employer about violation of this Act would not receive cognizance by a court without prior written permission from the State government.[10] Though, as noted in (Bhattacharjea, 2021), not all amendments were pro-employer. For instance, the severance pay was increased by twice the amount, which was a pro-worker amendment. Thus, while these amendments were largely pro-employer, ex-ante it is not clear whether these would necessarily spur firm growth.[11]

3 Model

Consider a static economy with heterogeneous workers. We assume that frictions that workers face in the labor market allow firms to enjoy some market power. A firm's productivity z follows a distribution $F([\underline{z}, \bar{z}])$, and it produces output, the price of which is normalized to 1, using only labor as its sole input. Each firm hires both male (N_m) and female (N_f) workers and provides amenities, $a \in \{1, \bar{a}\}$. We assume that women value amenities, such that better amenities improve their average productivity, z_f, where $z_f(\bar{a}) > z_f(1)$[12]. For simplicity, we assume that amenities are standardized at $a = 1$ for male workers, and their average productivity is normalized to 1. We assume that the cost of providing amenities, $a = 1$, is fixed and equals $\bar{C}$. Once firms decide to

[10] In Rajasthan, the Apprentices Act, 1961 was also modified with the stipend for apprentices fixed at the minimum wage and the government to bear part of the costs of apprentice training.

[11] An initial investigation at macro level conducted by the Economic Survey 2018-19 (Ministry of Finance, India) shows higher aggregate growth rates in the number of manufacturing enterprises, output per enterprise, and workers per enterprise in Rajasthan vs. the rest of India two years before and after the reform. Whether this had an effect on relative female employment remains unknown. However, as noted above, many other states also amended these laws after 2014, and using the entire country as control would then not be appropriate (Bhattacharjea, 2021).

[12] This can be interpreted in two ways: that the firm is able to attract higher productivity women, or alternatively, the female workers are able to increase their productivity when better amenities are available

produce any positive output, this fixed cost does not affect their marginal decisions; hence, can be normalized to equal 0. We restrict our attention to the interactions between an individual firm and the individual workers they hire. We refrain from incorporating interactions between firms or between members of the household.

A z-productivity firm produces output by hiring N_m male and N_f female workers and providing amenities a using a CES production function, which is described below:

$$Y(N_m, N_f, a) = z\left\{N_m^{\frac{\sigma-1}{\sigma}} + \tau(z)\left\{z_f(a)N_f\right\}^{\frac{\sigma-1}{\sigma}}\right\}^{\frac{\sigma}{\sigma-1}} \tag{1}$$

Here, τ is the weight attached to the female output. Thus, $\tau < 1$ measures the degree of discrimination against women[13] and is allowed to vary with firm productivity z.

The firm faces labor supply curves for men and women:

$$N_g = k_g a^{\rho} w^{\epsilon} \qquad\qquad \rho, \epsilon, k_g > 0, g \in \{m, f\} \tag{2}$$

We assume that labor supplied increases with their wages and the level of amenities. Here, ϵ and ρ capture the elasticity of labor supply with respect to wages and amenities, respectively. To capture the frictions that women face on the supply side, such as additional household responsibilities, care duties, or social norms, we can assume that $k_f < k_m$.

Since $a = 1$ for men, $N_m = k_m {w_m}^{\epsilon}$. Using the labor supply functions, we can rewrite wages in terms of employment:

$$w_m = \left(\frac{N_m}{k_m}\right)^{\frac{1}{\epsilon}}; \qquad w_f = \left(\frac{N_f}{k_f a^{\rho}}\right)^{\frac{1}{\epsilon}} \tag{3}$$

As employment increases, wages offered by these firms need to go up to attract new workers. Further, wages and amenities are inversely related. This represents compensating differentials, i.e., firms can choose to provide lower wages and higher amenities to female workers, keeping their employment unchanged. Given this, the firm makes decisions regarding the number of male and female workers to hire and the level of amenities that they would provide.

[13] τ can also be interpreted as the importance of tasks where women have a comparative advantage, which is allowed to change with the productivity of firms (which in turn affects their size)

We divide the problem into two steps. First, for a given level of amenities, we solve for the firm's decision regarding the number of workers they would hire. Given these decisions, firms choose the level of amenity that allows them to maximize profit.

Let us consider the profit maximization problem of a $z-type$ firm providing amenities $a \in \{1, \bar{a}\}$.

$$\pi(z,a) = \max_{N_m, N_f} Y(N_m, N_f, a) - w_m(N_m)N_m - w_f(N_f, a)N_f \tag{4}$$

FOC:

$$N_m: \quad \frac{\partial Y}{\partial N_m} = w_m(N_m) + \frac{\partial w_m}{\partial N_m} N_m \tag{5}$$

$$N_f: \quad \frac{\partial Y}{\partial N_f} = w_f(N_f, a) + \frac{\partial w_f}{\partial N_f} N_f \tag{6}$$

The LHS of equations 5 and 6 represent the marginal revenue product, and the RHS represents the marginal cost of hiring an additional male and female labor, respectively. The marginal revenue product decreases with employment due to diminishing marginal productivity. The marginal cost curve has two components: the wage that must be paid to the new worker hired and the increase in wages that must be paid to all existing workers; thus, it increases in employment. The equilibrium is reached at the level of employment where the marginal revenue product equals the marginal cost, which is higher than the wage paid to all workers. As a firm's productivity goes up for a given level of amenities, the marginal revenue product increases at all levels of employment, thereby increasing the equilibrium number of male and female workers hired. Thus, higher productivity of firms is also associated with a larger workforce. For a given level of amenities, each worker would also receive higher wages, attracting more workers to the market.

Substituting for the functional forms, we rewrite the profit function as:

$$\pi(z,a) = \max_{N_m, N_f} z \left\{ N_m^{\frac{\sigma-1}{\sigma}} + \tau(z) \left\{ z_f(a) N_f \right\}^{\frac{\sigma-1}{\sigma}} \right\}^{\frac{\sigma}{\sigma-1}} - \left\{ \frac{1}{k_m} \right\}^{\frac{1}{\epsilon}} (N_m)^{\frac{1}{\epsilon}+1} - \left\{ \frac{1}{k_f a^\rho} \right\}^{\frac{1}{\epsilon}} (N_f)^{\frac{1}{\epsilon}+1} \tag{7}$$

and the corresponding FOCs are

$$N_m: \qquad z^{\frac{\sigma-1}{\sigma}} Y^{\frac{1}{\sigma}} (N_m)^{\frac{-1}{\sigma}} = \left(\frac{1}{\epsilon}+1\right)\left\{\frac{1}{k_m}\right\}^{\frac{1}{\epsilon}} (N_m)^{\frac{1}{\epsilon}} \tag{8}$$

$$N_f: \qquad z^{\frac{\sigma-1}{\sigma}} Y^{\frac{1}{\sigma}} (N_f)^{\frac{-1}{\sigma}} \tau(z)\left\{z_f(a)\right\}^{\frac{\sigma-1}{\sigma}} = \left(\frac{1}{\epsilon}+1\right)\left\{\frac{1}{k_f a^{\rho}}\right\}^{\frac{1}{\epsilon}} (N_f)^{\frac{1}{\epsilon}} \tag{9}$$

Combining equations 8 and 9 yields the equilibrium female-to-male labor ratio, which is given by:

$$\frac{N_f}{N_m} = \left\{\tau(z)\left\{z_f(a)\right\}^{\frac{\sigma-1}{\sigma}} a^{\frac{\rho}{\epsilon}} \left\{\frac{k_f}{k_m}\right\}^{\frac{1}{\epsilon}}\right\}^{\frac{1}{\frac{1}{\sigma}+\frac{1}{\epsilon}}} \tag{10}$$

This shows that the equilibrium ratio of female to male employees in a firm is higher for firms with lower discrimination towards women (higher τ) and when the frictions associated with female labor supply relative to males are lower (higher $\frac{k_f}{k_m}$). If male and female workers are considered to be substitutes (perfect or imperfect), such that the elasticity of substitution, $\sigma > 1$, higher amenities improve the average productivity of women and attract female workers willing to accept lower wages; thus, incentivizing firms to hire more women relative to men. However, if male and female workers are considered to be complements in production, such that $\sigma < 1$, the effect of amenities on the equilibrium female-to-male employment ratio is ambiguous. While higher amenities attract more female workers, who will be willing to accept lower wages, their improved productivity increases their effective labor, which incentivizes firms to hire more men due to the complementarity.

The equilibrium wage ratio is given by:

$$\begin{aligned}\frac{w_f}{w_m} &= \left\{\frac{k_m}{k_f a^{\rho}}\frac{N_f}{N_m}\right\}^{\frac{1}{\epsilon}} \\ &= \left\{\frac{k_m}{k_f a^{\rho}}\right\}^{\frac{1}{\sigma+\epsilon}} \left\{\tau(z)\left\{z_f(a)\right\}^{\frac{\sigma-1}{\sigma}}\right\}^{\frac{\frac{1}{\epsilon}}{\frac{1}{\sigma}+\frac{1}{\epsilon}}}\end{aligned} \tag{11}$$

Thus, the gender wage ratio (defined as the ratio of female to male wages) is higher when the degree of discrimination in the firm is lower. When women face greater frictions associated with their labor supply ($\frac{k_f}{k_m}$ is lower), their reservation wage is higher. Thus, the gender wage gap is lower. The effect of amenities on the wage ratio depends on the elasticity of substitution between male and female workers. If the workers are substitutes, the effect of amenities on the wage ratio is

ambiguous. This is because, while the productivity of female workers rises with amenities, thus incentivizing firms to substitute for more women, firms can choose to compensate women less by providing more amenities. Thus, the wage ratio could increase or decrease depending on whether the demand effect dominates or the compensating differential effect dominates. When male and female workers are complementary in production, the compensating differential effect, in conjunction with an increase in the effective labor provided by women, which increases the demand for male workers, unambiguously leads to a fall in the gender wage ratio.

The firm's decision to provide higher amenities for women depends on which choice yields the maximum profit, as described below:

$$\Pi(z) = \max_{a \in \{\underline{a}, \bar{a}\}} \{\pi(z, \bar{a}) - C, \pi(z, 1)\} \tag{12}$$

where C is the relative cost of providing the higher-valued amenities.

By the envelope theorem,

$$\begin{aligned} \frac{\partial \pi^*(z,a)}{\partial z} = & \left\{ N_m^{\frac{\sigma-1}{\sigma}} + \tau(z) \left\{ z_f(a) N_f \right\}^{\frac{\sigma-1}{\sigma}} \right\}^{\frac{\sigma}{\sigma-1}} \\ & + z \frac{\sigma}{\sigma-1} \left\{ N_m^{\frac{\sigma-1}{\sigma}} + \tau(z) \left\{ z_f(a) N_f \right\}^{\frac{\sigma-1}{\sigma}} \right\}^{\frac{1}{\sigma-1}} \tau'(z) \left\{ z_f(a) N_f \right\}^{\frac{\sigma-1}{\sigma}} \end{aligned} \tag{13}$$

If discrimination towards women is non-increasing with firm size and male and female workers are substitutes in production, $\frac{\partial \pi^*(a)}{\partial z} > 0$. Further, as $z_f(a) > z_f(1)$, $\frac{\partial \pi^*(z,\bar{a})}{\partial z} > \frac{\partial \pi^*(z,1)}{\partial z}$. Thus, the difference in profits when firms provide higher versus lower amenities increases with their productivity and, therefore, with firm size.

If the cost of providing better amenities is too small such that even the smallest firms can afford to pay for it, $C < \pi(\underline{z}, \bar{a}) - \pi(\underline{z}, 1)$, or alternatively, too large that none of the firms can afford to pay for it, $C > \pi(\bar{z}, \bar{a}) - \pi(\bar{z}, 1)$, then the relationship between firm size and the equilibrium gender employment gap and gender wage ratio solely depends on how the level of discrimination changes with firm size. In this case, there is no heterogeneity between firms in terms of the level of amenities that they provide. However, if $\pi(\underline{z}, \bar{a}) - \pi(\underline{z}, 1) < C < \pi(\bar{z}, \bar{a}) - \pi(\bar{z}, 1)$, there exists a z^T, such that for all $z > z^T$, that is the larger firms find it profitable to provide better amenities, whereas the smaller firms choose not to. Similarly, as discussed above, if male and female workers are considered

substitutes, the gender employment ratio increases for larger firms, and the effect on the wage ratio is ambiguous. If discrimination is lower for the larger firms, this effect is amplified, whereas if it is higher, the effect is dampened. Alternatively, if male and female workers are considered complements, the gender wage ratio decreases for larger firms. However, their effect on the employment ratio is ambiguous. Finally, If discrimination is higher for the larger firms, this effect is amplified, whereas if it is lower, the effect is dampened.

4 Data

4.1 Firm Data

We use multiple datasets to estimate the effect of firm size on the proportion of female employees. The main establishment censuses or surveys in India with variation across firm sizes include the Economic Census (EC) and the Annual Survey of Industries (ASI).[14] Our main data is the Annual Survey of Industries (ASI), which is a nationally representative panel survey conducted annually by the National Sample Survey Organisation, covering registered manufacturing enterprises in India. The unit of observation is the manufacturing establishment of a firm. The ASI has two components: a census component whereby establishments employing over 100 workers or those located in the 6 least industrially developed states are surveyed every year, and a survey component, whereby the ASI uses, for each year, a stratified random sample for establishments hiring less than 100 workers. Such establishments are typically surveyed once every 3 years.[15] The plant-level ASI data is available from 1998-2019. The ASI provides district identifiers between 1998 and 2009 and establishment identifiers for the period between 1998 and 2019. This enables us to undertake both analyses within a firm over time as well as to examine cross-sectional patterns between the variables

[14] Another enterprise data, namely, NSSO's 'Unincorporated Non-Agricultural Enterprises Survey' (excluding construction) conducted every 5-year interval collates data on firm-level variables. However, this data is restricted to those enterprises that are unincorporated, i.e., not registered under the Companies Act in India. Also, it excludes firms registered under the Factories Act in India. NSSO's Unincorporated Enterprise Surveys, thus, have less significance for this study as they cover only unregistered firms, which typically have less than 20 workers. These data were collected in 1997 (January - December 1997), 2005 (July 2005 - June 2006), 2006 (July 2006 - June 2007), 2010 (July 2010 - June 2011), 2015 (July 2015 - June 2016), and are available at unit level for 2010 and 2015. See ILO Report.

[15] In the sample component, firms in each state are arranged into different groups based on their 4-digit industry classification, and $1/5^{th}$ units are drawn from each state and 4-digit industry combination based on stratified circular systematic sampling.

of our interest.[16]

The ASI provides rich data on firm employment, gender-disaggregated employment of permanent manufacturing workers and mandays hired, wages paid, enterprise fixed capital, plant and machinery, output, inputs including expenditures on employee welfare and contributions towards pension etc.[17] This allows us to examine the relationship between firm size and proportion of female workers along with gender wage gap, welfare expenses, output and profits per employee. Additionally, we also check for labor productivity and total factor productivity (TFP).

Table 1 shows the summary statistics of the main labor market variables used in the analyses. The proportion of female workers is defined as the total number of female workers in permanent employment out of the total number of workers in permanent employment. The proportion of female mandays is defined as the total female worker mandays in permanent employment out of the total worker mandays in permanent employment. On average, women constitute 12% of total workers in manufacturing enterprises using either definition. Firm size can be defined in terms of workers, all paid employees, or output of an establishment.[18] On average, a firm has 41 workers, whereas the total paid employees, including contract workers, are 76. We test the robustness of our findings to alternative definitions of total firm size using all employees. Alternatively, we also define firm size by the output produced by a firm. This is defined as the total value of output (price $\times$ quantity) produced by a firm deflated by two-digit industry-specific Wholesale Price Index (WPI) with 2004 as the base year.

We also use other firm-level outcomes in our analyses. These are described in panel (c). The gender wage gap in a firm is defined as the ratio of the female daily wage rate to the male daily wage rate paid out by it. The female (male) wage rate is computed as wages paid to female (male) workers by female (male) worker mandays. On average, women receive 86% of the wage rate as men across manufacturing firms. Welfare expenses refer to group benefits like direct expenditure

[16] While panel identifiers from 1998-2009 are available in the public domain, we obtained these from the Ministry of Statistics and Program Implementation for 2010-2019.

[17] Apart from permanent workers, ASI also provides data on contract workers, supervisors, unpaid and other employees. However, it does not provide gender disaggregated information for these categories of employees. Of these, contract workers are not on the payroll of the firm but are hired on a contract basis from third-party firms, depending on the need. Total workers capture 72% of all permanent full-time employees and 54% of all paid employees. Thus, gender-disaggregated data for workers captures a large proportion of the share of permanent employees in a firm.

[18] For the purpose of this paper, we use the terms *firm* and *establishment* interchangeably. This is because multi-plant establishments constitute only 5% among the manufacturing plants having at least USD 30 million sales in India (Chakrabati & Tomar, 2022). This number is likely to be even smaller in the overall manufacturing sector since multi-plant firms are generally big in size.

on maternity, creches, canteen facilities, educational, cultural, and recreational facilities, paid per employee annually. Provident Fund (PF) is the annual social security contribution of the employer paid per employee.[19] Both expenditures are deflated using the CPI with the base year as 2004. Profits are deflated by two digit industry specific Wholesale Price Index (WPI) with 2004 as the base year and divided by total employees. Total factor Productivity (TFP) is measured using the method described in Levinsohn & Petrin (2003). This is implemented using the procedure provided in Petrin *et al.* (2004). We use the average capital stock (average of closing and starting capital stock in a year) measure for capital. Labor productivity is defined as the total value of real output per employee.

Figure 1 shows the firm size distribution for firms upto the 95^{th} percentile of the firm size distribution over the years in our data. Panel (a) shows it for total workers, while panel (b) shows it for total employees. There is no major change in the distribution over time, but we do observe some increase in firm size, with the curve moving slightly on the right over the years. Figure 2 shows the scatter plot (binned) of the proportion of female workers across firm size. We keep firms with total workers upto 300 since, as we have seen earlier, 95% of the firms are below this threshold. Clearly, we see an increase in the proportion of female workers as firm size increases upto almost 120, and then it stays almost constant thereafter. This shows that the relationship between firm size and relative female workers is non-linear.

4.2 Household Data

We use data from the nationally representative Employment and Unemployment rounds of India's National Sample Surveys (NSS) in 1999-00, 2004-05, 2009-10, 2011-12 (referred to as 1999, 2004, 2009, and 2011 in this paper) and Periodic Labor Force Surveys (PLFS) conducted in 2017-18 and 2018-19 (referred to as 2017 and 2018 in the paper).[20] The PLFS has replaced the NSS since 2017; however, both surveys largely remain comparable in terms of methodology, design, and the variables on which data are collected. Each survey starts from July of the first year to June of the second

[19] This includes old age benefits like provident fund, pension, gratuity, etc., and employer's contribution towards other social security charges such as employees state insurance, compensation for work injuries and occupational diseases, provident fund-linked insurance, retrenchment, and layoff benefits.

[20] We do not use the NSS survey conducted in 2007 since it does not collect data on firm size.

year, thus covering an entire year.[21] These surveys follow a two-stage sampling design and include repeated cross-sections of households that are selected through stratified random sampling.[22] An equal number of households are randomly surveyed in each quarter within each PSU (over an entire year from July to June) to ensure equal spacing of observations across the year.

The surveys provide information on individual characteristics like age, gender, education, marital status, participation, and earnings in the labor market. Our main employment variable measures labor market participation over the reference period of 365 days preceding the date of the survey. We measure employment using the 'Usual Principal and Subsidiary Status (UPSS)' in the NSS, which classifies a respondent as employed if she worked in paid or unpaid activity for at least 30 days in the preceding year.[23] The survey provides details about employment - nature of employment (self-employed, salaried, casual), occupation and industry of employment, and whether the work is full-time or part-time. Further, for individuals employed in non-cultivation sectors, information on the number of workers in their enterprise and availability of social security benefits is also provided. There is little variation in firm size, with the respondents having to choose among the following options for the number of employees: less than 6, 6-9, 10-19, and more than 20. For our analyses, we consider employed individuals aged 15-65 years at the time of the survey who work as paid employees (salaried or casual laborers). We also use information on the following benefits provided to the worker by the employer: (i) whether the employer provides health care and maternity benefits, (ii) retirement (Provident Fund/Pension) plus gratuity benefits, and (iii) paid leave to the worker.[24]

Lastly, we use information on daily earnings and days worked in the last reference week before the survey was conducted to construct the daily wage rate for workers employed in paid employment. Over time, state and district boundaries have changed in India. Thus, we combine the new states

[21] There is a small difference in stratification in the PLFS - households in villages and urban blocks are additionally stratified on the basis of the general education level of their members. However, this has no bearing on population estimates since all estimates are weighted by sampling weights provided in each round.

[22] In rural areas, the first stratum is a district, and villages are the primary sampling units (PSU) chosen randomly in a district. In urban areas, towns and cities are stratified on the basis of population, and then within each stratum, urban blocks, which form the PSU, are selected using probability proportional to size with replacement.

[23] The National Sample Survey uses three reference periods for the employment survey: (i) Last year, (ii) Last week, and (iii) each day of the previous week. We use the Usual Principal and Subsidiary Status (UPSS) definition based on the preceding reference year since the information on firm size is collected only for employment in the last year. In the UPSS definition, the activity status on which a person spent a relatively longer time (major time criterion) during the 365 days preceding the date of the survey is considered the Usual Principal Activity Status of the person. After determining the principal status, the economic activity on which a person spent 30 days or more during the reference period of 365 days preceding the date of the survey is recorded as the Subsidiary Economic Activity.

[24] The information on these benefits is only available for paid employees in our data.

and districts with the parent states and districts from which they were created in order to maintain a consistent set of state and district codes across years using the administrative boundaries in 1999. Appendix Table A.1 summarizes the main variables in the household data.

5 Empirical Strategy

We first describe our empirical strategy that exploits the panel structure of the firm-level data to show the relationship between relative female employment and firm size. We also present the estimates using household data. Lastly, we discuss the strategy used to estimate the impact of changes in Indian labor laws and their impact on relative female employment.

5.1 Firm level

We estimate the effect of firm size on the proportion of female workers using two specifications. We first exploit the panel nature of the ASI data and estimate the relationship between the two variables within a firm over time using the below specification:

$$ln(Y)_{ijst} = \gamma_0 + \gamma_1 ln(Firm\ Size)_i + \delta_i + \delta_{jt} + \delta_{st} + \delta_t + \epsilon_{ijst} \tag{14}$$

where $Y \in$ {proportion of female workers, proportion of female mandays} in firm i, in industry j in state s in year t.[25] The main independent variable of interest is $ln(Firm\ Size) \in$ {log of total workers, log of total employees, log of total output} in a firm. δ_i are firm fixed effects, δ_{jt} are the industry (4 digit) times year fixed effects, δ_{st} are the state times year fixed effects and δ_t are the year fixed effects. The main coefficient of interest is γ_1, which shows the effect of a one percent increase in firm size on the percentage increase in the proportion of female workers. We also use alternative functional forms where proportion of female workers is the dependent variable. In that case, γ_1

[25]The small value added when taking a log depends on the scale of the variable. For instance, when using the proportion of female workers as a dependent variable, we add 0.001 to all values since values for the original variable lie between 0 and 1. To do this, we take a cue from Bellemare & Wichman (2020), which shows that Inverse Hyperbolic Sine (IHS) Transformation of the variables can affect elasticity magnitude. It recommends that values for x and y should be preferably above 10 for reliable elasticity estimates when using the IHS transformation. Using similar arguments, the log transformation of a variable after adding a small value is also likely to be sensitive to the value that is added. We then use the same rule of thumb here. Before using IHS, we rescale the proportion of female workers by 1000 to get values mostly above 10, and hence when calculating the log we add 0.001 to the untransformed values (i.e., use ln(0.001+y)). For employment variables, we use ln(0.1+y) and rescale by 10 before IHS transformation. For other variables like welfare, output, and productivity, we use ln(1+y) and do not rescale these variables before IHS transformation. For profits, we always use the IHS transformation since it has negative values too.

is interpreted as the absolute effect on the proportion of female workers when firm size increases by one percent. Additionally, we also estimate a cross-sectional specification without firm fixed effects. In the cross-section specification, all variables remain the same as in equation 14 except that firm fixed effects are dropped. We additionally control for organization type, rural location, and initial year of production (X_{ijst}). All regressions are weighted by the provided probability weights. The standard errors are clustered at the firm level for the panel estimates and state-NIC level for cross-sectional estimates.[26]

5.2 Household level

We estimate the below specification using individual-level employment data.

$$Y_{ijndt} = \alpha_0 + \sum_{s=1}^{3} \alpha^s Firm\ Size(s)_i + \alpha_4 X_{ijndt} + \delta_{dt} + \delta_{jt} + \delta_{nt} + \epsilon_{ijst} \tag{15}$$

where Y_{ijndt} takes a value of one if individual i in occupation j in industry n in district d in year t is female and zero otherwise. $Firm\ Size(s)$ is a set of dummy variables, such that $Firm\ Size(1)$ takes a value of one if firm size is 6-9 employees, $Firm\ Size(2)$ takes a value of one if firm size is between 10-19 employees and $Firm\ Size(3)$ takes value of one if firm size is more than 20 employees. X_{ijndt} are control variables for age, age square, education, religion, caste, marital status, and rural-urban location of the household. δ_{dt}, δ_{jt}, and δ_{nt} refer to district by year, occupation by year, and industry by year fixed effects, respectively. All regressions are weighted by the probability weights provided in the survey, and the standard errors are clustered at the district level. The main coefficients of interest here are $\{\alpha_3, \alpha_2, \alpha_1\}$. For instance, α^1 indicates the difference in probability of female vs. male employment across firms employing 6-9 workers vs. firms having 1-5 workers. An increase in firm size would be associated with a larger probability of female employment when $\alpha_3 > \alpha_2 > \alpha_1$ and all of them are positive in sign.

[26] Since the proportion of female workers is a fractional variable, one can also consider estimating the above specifications using non-linear models for fractional logit. However, given the extensive number of fixed effects in our estimation strategy, these methods are computationally very intensive and do not converge in our case. Additionally, Papke & Wooldridge (2008) show that when the estimate of interest is the marginal effect, then there are no significant differences between fractional logit and a linear estimator such as a fixed effects model with a continuous outcome variable.

5.3 Impact of Labor Law Amendments

We first compare the change in outcomes in states that amended the labor laws with states that did not amend them before and after the amendment events, after controlling for firm-specific unobservables. We estimate a difference-in-differences model using the below specification:

$$ln(Y)_{ijst} = \delta_i + \delta_t + \delta_{jt} + \beta_1 Amendment^{\tau}_{st} + \epsilon_{ijst} \tag{16}$$

where Y_{ijst} includes the proportion of female workers as the primary outcome for firm i in industry j in state s in year t. Here, τ denotes the relative year, e.g., $\tau = -1$ for the year before the treatment, and t is the actual calendar year. Again, we log-linearize the outcome variables adding a small value to counter the problem of zero values, as discussed earlier. The main variable of interest, $Amendment_{st}$, is an indicator variable that takes a value of one for states that amend the labor laws following the years after the reform (i.e., $\tau \geq 0$) and zero otherwise. In the empirical analysis, we use data from 2009-2019 and analyze the impact on firm outcomes since reporting of industry and product codes is more consistent after 2008. We control for establishment (δ_i) and year fixed effects (δ_t) effects to control for unobservables at the establishment and year levels. This also ensures that we compare treated and control establishments, based on the state in which they are located, before and after the treatment. Given that the variation in treatment occurs at the state level, we cluster standard errors at the level of the state (Bertrand *et al.*, 2004). β_1 measures the average treatment effect of labor amendments on firm outcomes. Apart from the proportion of female workers as the outcome variable, we also evaluate the impact of the amendments on various firm size measures, welfare expense per employee, profits per employee and productivity.

While the above estimation gives the average effect of the amendments, we also estimate the dynamic treatment effects before and after the amendments. This estimation allows one to check for pre-trends and also to estimate the treatment effects of the amendments exploiting the staggered implementation across the two states. We estimate the following event-study specification:

$$ln(Y)_{ijst} = \delta_i + \delta_t + + \delta_{jt} + \sum_{\tau=-4, \tau \neq -1}^{\tau=2} \beta_\tau Amendment^{\tau}_{s(i)} + \epsilon_{ijst} \tag{17}$$

The main variable of interest, $Amendment^{\tau}_{s(i)}$ is an indicator variable that takes a value of one for

states that amend the labor reforms, τ periods from the amendment, and zero otherwise. We create bins for the endpoints of the event window based on standard event-study applications (Schmidheiny & Siegloch, 2019). We do this at event dates of -4 and 2 and normalize coefficients to event time -1.[27] The year of the amendment is denoted as event time 0.[28]

β_τ measures the average treatment effect in percentage on the outcome variables τ periods from the treatment. The event study design allows us to test for common pre-trends directly and to test whether the effects in the post-amendment years differ from these. Specifically, we test whether $\beta_\tau > 0$ for years $\tau \geq 0$ differ from zero. If the amendments increase the proportion of female workers, then β_τ should be positive for periods after the amendment.

A growing literature in the difference-in-differences design highlights the possible bias that can afflict the Average Treatment Effects (ATE) using the two-way fixed effects estimator when there is variation in the timing of treatment (Goodman-Bacon, 2021; Callaway & Sant'Anna, 2021; Sun & Abraham, 2021).[29] This is due to two reasons. First, when the treatment effects are dynamic, i.e., when treatment effects can change over time. In such a case, previously treated units form a bad control group for units that are treated later. Second, the weights attached to the treatment effects depend on the number of periods that a unit is observed as treated. Hence, given that the two states that amended the labor laws during this time period undertook it 3 years apart, it becomes imperative to correct this concern. To account for these issues, we use the estimator proposed by Callaway & Sant'Anna (2021) since it allows one to directly construct wild-clustered bootstrapped intervals.[30]

6 Results

We first discuss the reduced form estimates obtained using firm-level data (equation 14). Table 2 shows the effect of firm size on the proportion of female workers in column (1) and on the proportion of female mandays in column (2). The dependent variable is the logged proportion of female workers

[27] The leads and lags are determined by the treatment years. Given the first treatment occurred in 2014, the maximum number of periods after treatment is five. The second treatment was in 2017, and this makes the maximum number of pre-periods equal to eight. The binning of endpoints at four and two ensures that both the treated states are included in the pre and post-period event window, respectively.

[28] The common number of pre-periods is four, and post-periods is two, directing our choice of endpoints.

[29] See Roth *et al.* (2022) for a review.

[30] We also used alternate estimators such as those by Sun & Abraham (2021) and find similar results.

in columns (3) and (5) and logged proportion of female mandays in columns (4) and (6). Panel A reports the results controlling for firm fixed effects. We find that an increase in firm size, defined as the total number of workers, by 1% leads to a 0.027 percentage points and 0.026 percentage points increase in the proportion of female workers and mandays in a firm, respectively (columns 1-2). These results hold when we take a log transformation of the dependent variable in columns (3)-(4), with elasticity estimates of 0.47 and 0.46 for the proportion of female workers and mandays, respectively.

Finally, in columns (5)-(6), we use a specification that allows for a quadratic in the log of firm size and find that the relationship between the proportion of female workers and firm size is largely positive, with only a slight decline for very large firms. Figure 3 plots the predicted proportion of female employees across the firm size distribution upto 1200 employees. we find that the relationship continues to be positive even for firms having 1200 workers, which largely constitutes 99.9 percentile of firm size distribution in the ASI data. Table 2, panel (b), shows the estimates using a cross-sectional estimation strategy, where we do not control for firm fixed effects but include other controls at firm level. We find that our results remain largely comparable using this alternative estimation method as well.

Table 3 reports the estimation results for equation 15. Columns (1)-(2) report the results for all workers. While column (1) controls for industry by year and occupation by year fixed effects, column (2) controls for industry by occupation by year fixed effects. Thus, column (2) uses a stricter specification, as the probability of female vs. male employment within an industry-occupation in a given year is controlled for. We find that the probability of a female worker among all workers increases with firm size in both the specifications. Women are more likely to be employed in firms with 10-20 workers and 20 and above workers by 1.9 percentage points (or 10%) and 4.1 percentage points (or 22%) vs. firms with 1-5 workers, respectively (column 2). Columns (3)-(4) report the results for only full-time workers so that these workers are comparable to the full-time workers reported in the ASI data at the firm level. Information on the full-time vs. part-time status of workers is provided only for the National Sample Survey (1999-2011) rounds; thus, the observations for these specifications are smaller. We continue to find that the probability of a female vs. male worker increases with firm size, even among full-time workers. Women are more likely to be employed full-time in firms with 10-20 workers and 20 and above workers by 2.3 pp (or 12.5%) and 5.1 pp

(or 28%) vs. firms with 1-5 workers, respectively (column 4). Thus, the magnitude of the positive relationship between firm size and relative female employment is slightly larger for full-time workers. The above results show that women are more likely to be employed in firms of bigger size. This finding holds using both firm and individual employment data.

6.1 Robustness: Reduced Form Estimates

We check the robustness of our findings using a variety of alternative specifications. First, we check whether the firm-level results showing a positive association between firm size and the proportion of female workers continue to hold for alternative definitions of firm size. Table 4, columns (1)-(2) define firm size using total employees rather than workers, thus including contractual workers and supervisory staff. Columns (3)-(4) define firm size by total output of the firm. We find that the positive relationship between firm size and proportion of female workers continues to hold across these specifications. Estimates using firm fixed effects show that an increase in firm size by 1%, measured in terms of employment, is associated with an increase in the proportion of female workers by 0.38%. The marginal effect of firm size, when measured in terms of output, is lower with a 1% increase in firm output, resulting in a 0.093% increase in the proportion of female workers. We also find an increase in the proportion of female mandays using these alternative definitions of firm size (columns 2 and 4). Additionally, we examine the robustness of our results to the dependent variable defined as whether or not a female worker is employed in a firm and again find a significantly positive effect of firm size defined (using any of the firm size definitions - workers, employees, and output) on the probability of a firm employing a female worker.[31] We also examine the association in the case of rural and urban enterprises separately. Appendix Table A.2 shows that the positive relationship between firm size and proportion of female workers holds across both areas with slightly higher elasticity estimates for rural areas.

Given that the ASI data pertains to only the manufacturing sector in India, we next examine the robustness of our findings on the relationship between firm size and the proportion of females hired using the Economic Census in India. The Economic Census is a census of firms across all industries and sizes. However, this data is collected every few years (1998, 2005, 2013) and does not allow one

[31] The estimates show that an increase in workers (output) by one percent increases the probability of females among the workers by 0.09 percentage points (0.017 percentage points). These results are omitted for brevity but available on request.

to track the same firm over time. It collects data on all hired employees of an enterprise by gender, the owner's gender, the organization type, detailed industry classification, and source of finance for the enterprise. In addition, it also contains information on the district of an enterprise's location. It does not contain information about any other firm attribute. We, therefore, cannot examine the effect of firm size on other firm-level outcomes using these data. Thus, we use this data as a robustness check for our main finding for manufacturing sector enterprises in India. Table 5 reports the results for the relationship between firm size and the logged proportion of females hired by each enterprise across all sectors of the Indian economy. Columns (1)-(4) report the results for the proportion of female employees among all employees, with additional controls included successively till column (3). We find that the proportion of female employees increases by 1.58% when firm size increases by 1% (column 3 with all controls). Column (4) reports results from a quadratic specification in the log of firm size, and we find that the relationship between firm size and the proportion of female employees is positive initially and then turns negative for reasonably huge firm sizes.

Table 5, columns (5)-(6), report the estimates for only hired workers. This sample of workers, hence, is comparable with both the ASI and the NSS worker sample. We find that a 1% increase in firm size (calculated in terms of hired workers) increases the proportion of hired female workers by 0.74% (column 5). The non-linear specification in column (6) shows that the relationship is positive across firm sizes that form a large mass in our data. We undertake several other checks. We examine whether the observed positive relationship between firm size and the proportion of female workers holds across rural and urban sectors. Appendix Table A.3 reports the results for hired employees using the Economic Census data across rural and urban areas for each of the four economic sectors - agriculture, manufacturing, construction, and services. We find that an increase in firm size is associated with an increase in the proportion of female workers for each sector in both rural and urban areas. The effect size is larger for rural areas, in consonance with the findings from the ASI data. We also examine the relationship between firm size and the proportion of female hired employees by the gender of the firm's owner. On average, female-owned enterprises hire more women workers as a proportion of all hired workers (Appendix Table A.4). Thus, the positive relationship between firm size and the proportion of female employees can be muted for them. Appendix Table A.4 shows the relationship between firm size and the proportion of female-hired

workers for male-owned firms (panel A) and female-owned firms (panel B). As expected, the positive relationship is much stronger for male-owned enterprises, with the elasticity ranging between 0.74 and 1. On the other hand, for female-owned enterprises, while it is positive for agriculture and services sectors, it is insignificant for manufacturing and construction.[32] Overall, the positive relationship dominates since 92% of the enterprises in India during 1998-2013 were owned by men.

7 Impact of Amendments

We next estimate the impact of the labor law amendments in Rajasthan and Jharkhand, which were largely pro-employer since the worker size thresholds for the applicability of IDA and the Factories Act were increased, on firm outcomes using equation 16. Table 6 shows the impact of the amendments on the proportion of female workers in columns (1)-(2). We find an increase in the proportion of female workers in a firm by almost 16% when controlling for firm and year-fixed effects along with variation across industries over time in the outcome variable. To test the presence of pre-trends and evaluate the dynamic effects over time in the outcome variables due to the policy change, we then estimate the event study in equation 17. Figure 4, panel (a), plots the coefficients obtained using a two-way fixed effects estimator. We find no differential trends in the proportion of female workers in the treated states versus the control states before the amendments were passed, but there is a significant positive impact on the proportion of female workers from the year in which the amendments became effective.

As discussed earlier, the positive impact of relaxing labor laws on the proportion of female workers could be driven by both an increase in firm size, as firms may find it easier to expand when costly restrictions that become applicable at certain thresholds are relaxed, or increased surplus or an aggregate increase in demand as costly compliances with regards to IDA and Factories Act regulations are eased. To check whether the expansion of firm size plays any role in explaining the observed increase in relative female employment, we also estimate the impact of the amendments on various firm size indicators. Table 6, columns (3)-(4) show that total workers increased by

[32] This is possible if women-led enterprises operate in the manufacturing of certain goods where predominantly women workers are hired. For instance, data from the Economic Census show that out of all women-owned enterprises, around 50% are involved in manufacturing tobacco products, 10% in textiles, and 10% in the production of match sticks. On the other hand, 4%, 14%, and less than 1% of male-owned enterprises are in these sectors, with no other sector exceeding 10%. Thus, male-owned enterprises operate across a range of manufacturing products rather than specializing in a select few. Over the years, female-owned enterprises have increased from 5% in 1998 to 11% in 2013.

2.6%, employees by 3.6%, and output by 22%, with the estimates for workers and employees being insignificant. Figure 4, panel (b), plots the event study estimates. These show a significantly positive impact on total workers after the amendments; however, we also find positive pre-trends before the amendments. Panels (c) and (d) show the effects on total employees and output. We do not find pre-trends in these outcomes but clearly see that the impact is increasing with time. For the output, it is only significant three years after the amendments come into force, showing that there maybe a lagged effect on firm outcomes of easing labor laws.

Given the staggered implementation of the amendments and the possibility that the TWFE estimators will not be consistent in the presence of dynamic effects in this scenario, we next use the alternate DID strategy proposed by Callaway & Sant'Anna (2021) to estimate the impact of the amendments on the outcome variables. These estimates use the doubly robust inverse probability weighting using never-treated observations as the relevant control group and also allow for wild-clustered bootstrapping of the errors. We plot the coefficients in Figure 5. We find no differential trends across treated and control states before the amendments but find a positive impact on the proportion of female workers (panel a) and total workers (panel b) after the amendments. The confidence intervals become slightly wider in this specification, but the Average Treatment effect on the Treated (ATT) estimated using the method shows a 13% increase in the proportion of female workers, statistically significant at the 1% level. The total number of workers increased by 5% (significant at 10% level) after the amendments. Other firm size variables like total employees (panel c) and output (panel d) also increase after amendments. The overall ATT on output of 15% is significant at the 10% level. Importantly, we do not find pre-trends in any of the outcome variables. Thus, the results taking into account the staggered implementation, in fact, are statistically stronger though slightly attenuated in magnitude than the two-way fixed effects estimator for the overall ATT. Taken together, these results show a significantly positive impact of the amendments on the relative employment of female workers. One of the channels behind this effect is plausibly increased firm size in the states that amended the labor laws, with a stronger effect on output than employment. These results show that policy reforms that increase firm growth can also increase female employment.

7.1 Robustness

We check the robustness of the impact of labor law amendments using other functional forms for the proportion of female workers. First, we use the proportion of female workers instead of its log transformation. The plots for TWFE and staggered event study estimates are shown in Figure 6, panels (a) and (b), respectively. We continue to find an increase in the proportion of female workers in the treated states versus the control states after the amendments. We then use the log of the proportion of female mandays as the dependent variable and find an increase in relative female employment using this measure and both estimation strategies in panels c and d.

Figure 7 shows the impact on female employment. We use two measures. Firstly, we use an extensive margin measure of female employment by examining whether or not a female is employed by an establishment as the dependent variable. The results are plotted in panels (a) and (b) for the TWFE and the staggered event study, respectively. We find a positive increase in the probability of female employment across firms after the amendments. We then use the log of the number of female workers as the dependent variable in panels (c) and (d). Again, we find a significant increase in the number of female workers in the treated states vs. the control states after the amendments. Appendix Table A.5 additionally reports the overall difference-in-differences estimates using the TWFE strategy for these alternative definitions of female employment. We also find that the positive effects of the amendments on the proportion of female workers exist in both rural and urban areas (column 4).

We also use the inverse hyperbolic sine transformation as an alternative way to account for zero values in our outcome variables. We do this by using appropriate rescaling of untransformed values of the dependent variables as suggested in Bellemare & Wichman (2020). We continue to find a significantly positive impact of the amendments on the proportion of female workers hired and firm size. Appendix Figure A.2 also plots the staggered event study estimates for the IHS transformation for the main variables of interest. We continue to find no significant pre-trends but an increase in the proportion of female workers and the three measures of firm size after the amendments. Finally, we keep only the neighboring states of the treated states in the control group. This reduces the states to eight in our analyses from 21. Appendix Figure A.3 shows the event study plots using the staggered design for the proportion of female workers (panel a) and various measures of firm size

(panels b, c and d). We find that the direction of the impacts remains similar, but the estimates are imprecise. The estimated ATT is 8% for the logged proportion of female workers (significant at 5% level), but the effect on workers and output, though positive at 3.2% and 6.2% respectively, is insignificant at conventional levels.

8 Mechanisms

In this section, we investigate the possible mechanisms behind the observed positive relationship between the firm size and the proportion of female workers in the firm. In Section 8.1, we discuss empirical evidence showing the provision of greater amenities by bigger firms, which are valued more by women, which can explain this positive relationship. In Section **??**, we then propose a theoretical model that can rationalize our findings of higher amenities but generates ambiguous effects on the gender wage gap.

8.1 Amenities and Firm Size

There are several factors that can affect the relative employment of women across firms depending on their size. First, we check for the possibility that bigger firms can offer higher benefits to employees, such as welfare expenses that include health and maternity (welfare) or pensions (PF). Benefits can be valued differently across employees based on their gender. For instance, if women value maternity benefits provision, then they are more likely to prefer bigger firms if these firms are more likely to offer them. Table 7, column (1), panel A, reports the results for the association between the log of per-employee welfare benefits like health and maternity with firm size measured as total employees, exploiting variation in size within a firm over time.[33] We find that an increase in total employees by 1% increases the welfare benefits per employee by 0.42% and per employee pension benefits by 0.38% (column 2, panel A). These positive associations hold in cross-sectional estimates in panel B as well.

Second, the gender wage gap can vary with firm size. Exante, this can go in any direction - if bigger firms pay higher benefits that women value more, they can reduce the wages offered to

[33]We use total employees as the firm size since welfare and provident fund expenditures are captured for all employees and not just for workers. Also, profits and output values apply to all employees. The results are similar when total workers are used to measure firm size instead.

female employees. Alternatively, if they are less likely to discriminate or the provision of benefits is accompanied by higher female labor marginal productivity, then the gender wage gap might reduce with an increase in firm size. Table 7, column (3), reports the results for the association between the log of relative female to male daily wage rate with firm size. In panel A, when using firm fixed effects, we find that the female-to-male wage ratio increases by 0.001% when firm size increases by 1%. When examining the relationship using the cross-sectional estimation, we again find an increase in the female-to-male wage ratio by 0.002% when firm size increases by 1%. None of the estimates are significant, though. Importantly, we do not find any evidence of a decline in relative female wages in bigger firms. This shows that compensating wage differentials arising due to increased provision of benefits is not the only channel driving the positive association of relative female employment with firm size.

We then examine the association between other firm outcomes that are also likely to change with firm size. Table 7, columns (4), (5), (6) estimate the relationship between firm size and profits per employee, labor productivity, and TFP, respectively. We find that there exists a positive relationship between firm size measured through total employees and profit per employee and labor productivity for both panel and cross-sectional estimates. The estimates show that profits increase by 1% and labor productivity by 0.58%, respectively, when the firm size increases by 1%. The TFP measure increases by 0.05% when using variation within a firm over time and by 0.25% when using cross-section variation across firms as firm size increases by 1%. We check the robustness of the above findings by defining firm size using total output (Table 8). We also use the IHS transformation to account for zeroes. We find that all the previous results continue to hold for these other firm-level outcomes as well. These results are available on request.

Additionally, we verify the above findings for similar variables that can be constructed using the NSS and the PLFS data. We first examine the relationship between firm size and wages across gender in Table 9. Here, the dependent variable is the log of the daily wage rate.[34] Columns (1)-(2) show the association between wage rates and firm size, while columns (3)-(4) additionally show the relationship between gender wage gap and firm size. The results show that bigger firms offer higher average wages (columns 1-2) and that these firms also display a lower gender wage gap

[34]We construct this by dividing the weekly earnings by the number of days worked by an individual in the last week.

(columns 3-4). On average, the daily wage rate earned by women is 42% lower than men. However, women who work in firms of size 6-20 earn 36% lower wages, while those in firms with 20 and above employees receive 30% lower daily wages than men. Thus, the gender wage gap tends to be smaller in bigger firms. While we control for demographic characteristics of women in our individual data (age, education, caste, religion, sector, and marital status), these are unlikely to control for the full extent of the selection bias, and hence, these magnitudes on the gender wage gap should only be taken suggestively. Importantly, we again do not find any increase in the gender wage gap (or lower female-to-male wage ratio) with firm size.

Next, Table 10 shows the association between firm size and attributes of the job contracts and benefits offered by a firm, which may be differently valued by gender. For instance, extant literature shows that women prefer part-time work over full-time work. If bigger firms are more likely to offer part-time work, then that may explain some part of the positive relationship between firm size and female employment. Column (1) shows that the availability of part-time work does not change significantly with firm size in India. Hence, this cannot explain the positive relationship.Column (2) shows that a worker is more likely to have a written contract of employment when working in bigger firms. Firms of size 20 or above are 14 percentage points ($\approx$ 50%) more likely to offer a written contract. Column (3) shows that firms of size 6-10, 10-20, and more than 20 are 1.6, 4.7, and 15 percentage points (70%) more likely to offer healthcare and maternity benefits. Bigger firms are also more likely to offer pension benefits (column 4) and paid leave to employees (column 5) by 70% and 45%, respectively. Thus, we find that most benefits, except part-time work, seem to increase with firm size.

We also provide additional evidence from data on reported benefits by employees on an aggregator platform in India called Ambitionbox which uses crowd-sourced data from employees to gather their reviews about various amenities when these are offered by firms. Appendix Table A.6 shows whether a particular benefit reported as being offered in a given firm is related to the number of employees the firm has in India. Again, we find that bigger firms are more likely to provide child care, free transport, and work from home, apart from other amenities. A firm having 500-1000 employees is almost 40 percentage points more likely to offer these benefits vs. firms having at most 10 employees. This corresponds to almost a 100% increase for benefits such as child care and 60% for free transport. Some of these benefits have been shown to be valued more by women Mas &

Pallais (2017); Wiswall & Zafar (2018). We also test which of these benefits matter for greater female representation across firms using the household data.

Appendix Table A.7 shows the association between the availability of a particular nature of contract or benefit and the probability of a female worker being employed in a firm that offers it. The dependent variable is whether or not a worker is a female. Columns (1) and (2) control successively for various fixed effects at the industry and occupation level and include other individual controls, along with the five benefits that we have examined earlier. The results show that women are 17 percentage points more likely to work in a part-time job, 2.7 percentage points more likely to work in a firm where a written contract is offered, and 2 percentage points more likely to work in firms where healthcare and maternity benefits are offered compared to men. On the other hand, the availability of old-age support, such as pensions, reduces the relative presence of female workers in a firm.[35]

We next examine the effect of the labor law amendments that shift the applicability of labor laws to firms of bigger size on other firm outcomes. If the proportion of female workers hired increases after the amendments due to firms offering higher amenities valued by female employees as their size increases, then other non-wage benefits that are predicted to increase with firm size and are valued by female employees should also increase. Table 11 shows that welfare and PF per employee increase after the amendments are enacted in the treated states by 19% (column 1) and 1.9% (column 2), respectively. However, for PF, the effect is insignificant. There is a decline in the female-to-male wage ratio (column 3), but as we will see later, it does not hold when taking into account the staggered estimation strategy. Hence, again, the impact of the amendments on the gender wage gap is not robust. Profits per employee and TFP also increase by 35% (column 4) and 3% (column 6), respectively. We find no significant increase in output per employee (column 5) after the amendments, but the effect is positive and shows 11% percent increase in labor productivity due to amendments. Figure 8 shows the event study estimates for these outcomes using the staggered design. Clearly, there is an increase in welfare expenses per capita (ATT of 13% and significant at 5% level), which include maternity and childcare benefits, along with other employee welfare expenses after the amendments. There is also a clear increase in profits per employee (ATT of 38%

[35]The number of observations is smaller than the original table since information on part-time vs. full-time work is only available for the NSS Survey rounds. Columns (3)-(4) use complete data after dropping the part-time work variable. We find similar results.

significant at 1% level), but TFP and labor productivity show a positive effect 1-2 periods after the amendments are enacted with an ATT of 2.5% and 9% respectively, which is significant at 5% level. Taken together, these results show that after the amendments, due to an increase in both size and profits of the firms, they are able to offer more non-wage benefits that are valued by female workers without reducing the relative female wages and, hence, are able to attract them. The output and profit growth could be directly due to reduced compliance costs or as firms increase their size in response to the amendments.

9 Conclusion

In this paper, we study the relationship between firm size and relative female employment in India. Using data on manufacturing establishments from the Annual Survey of Industries (ASI) from 1998-2019, we find that after controlling for unobserved heterogeneity at the establishment level, the proportion of female employees increases with an increase in firm size. We find a similar association when we use cross-sectional data from the National Sample Surveys (1999-2018) and the Economic Census of India, which captures firms across all sectors of the economy. We next use exogenous variation in labor law amendments in two states of India, which increased worker size thresholds for their applicability: Rajasthan in 2014 and Jharkhand in 2017. Using a staggered differences-in-differences estimation strategy, we find that the amendments increase the firm size by approximately 5% and the proportion of hired female workers by 13%.

Further investigation shows that larger firms spend more on employee welfare (such as healthcare, child care, and maternity benefits), which are valued more by women. This is further supported by an increase in welfare expenses per employee after the labor law amendments. These results indicate that policies that enable firms to grow in size can also have a positive impact on female employment. However, the main channel through which this happens is by making workplace conditions more attractive for female workers as bigger firms are able to invest in these amenities without an accompanying fall in female wages relative to men to compensate for their provision. Theoretically, this can be explained by a task-based approach to production where bigger firms demand more tasks, with female workers relatively more productive in new tasks, leading to greater demand and investment in amenities valued by them.

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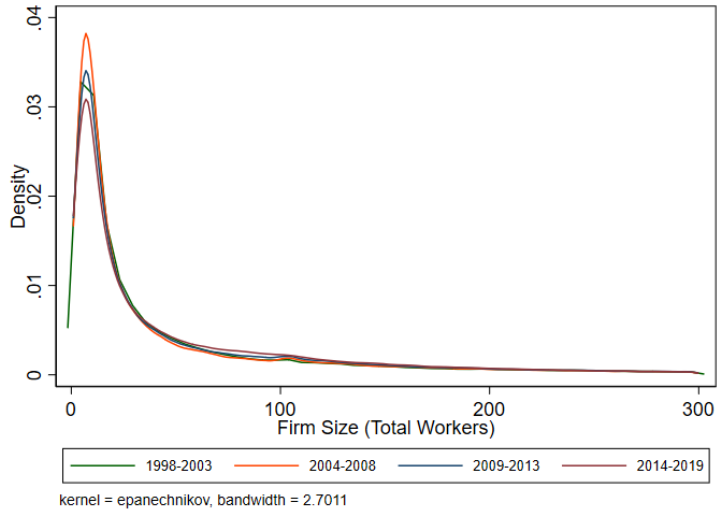
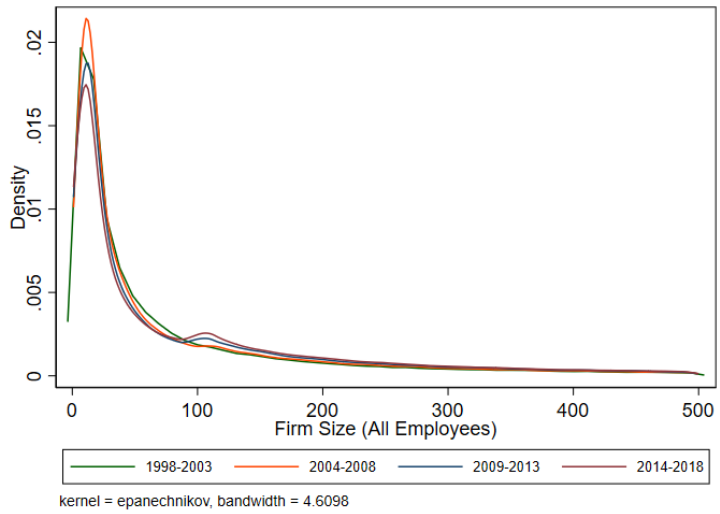
Figure 1: Firm size distribution over years (ASI data)

(a) Total Workers



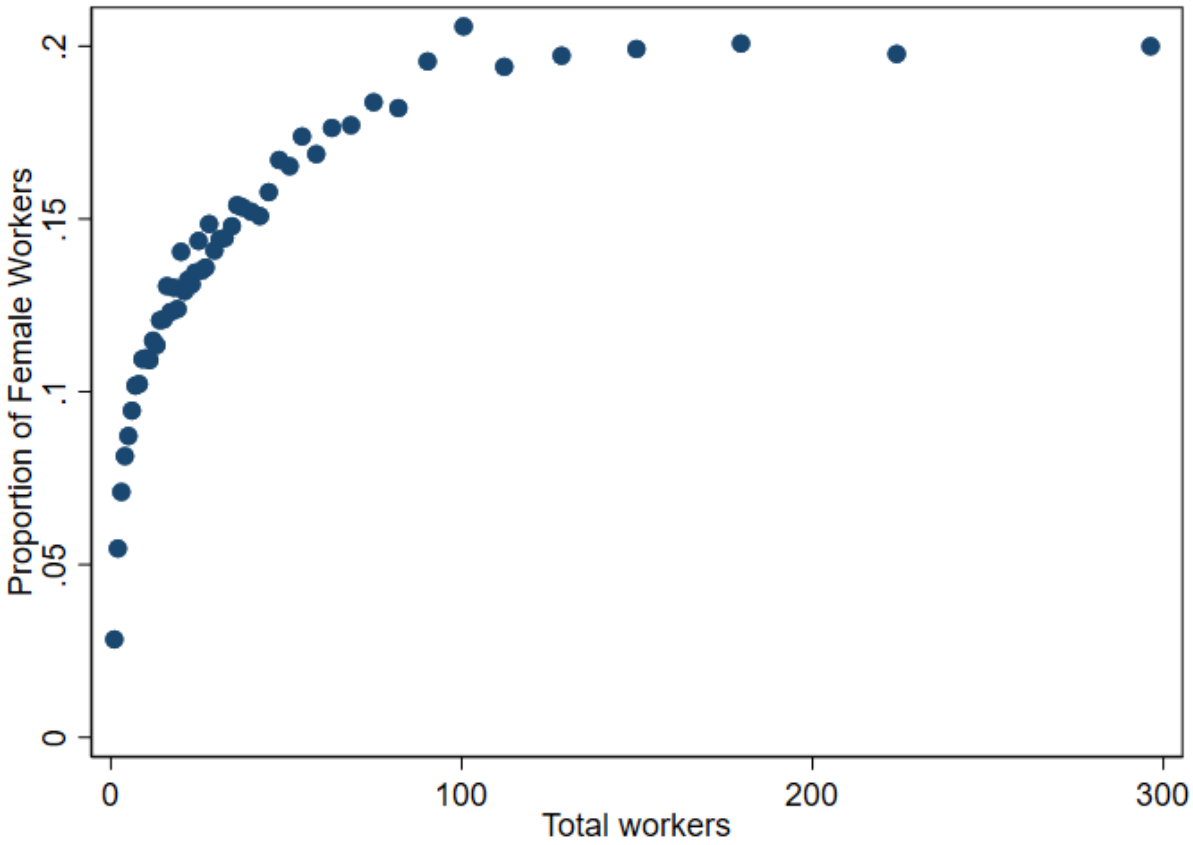
(b) Total Employees



Notes: Panel (a) plots the density of firm size distribution for total workers. Panel (b) plots the density of the distribution for proportion of female employees.

Source: ASI 1998-2019.

Figure 2: Proportion of Female workers across Firm Size (ASI data)

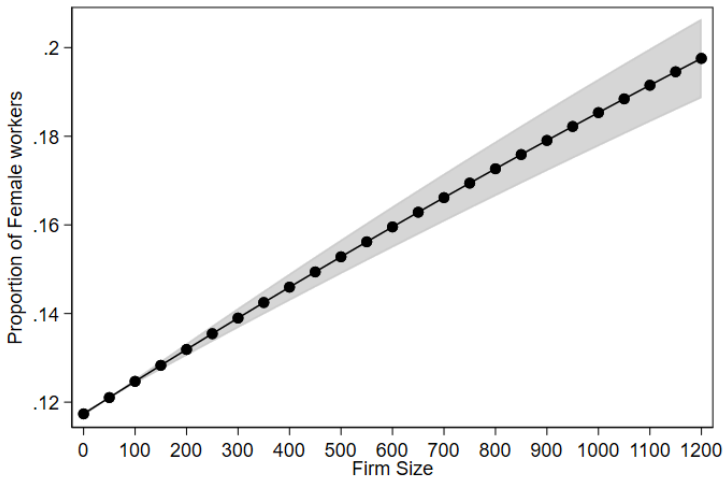


Notes: We plot the binscatter between total workers in a firm and proportion of female workers

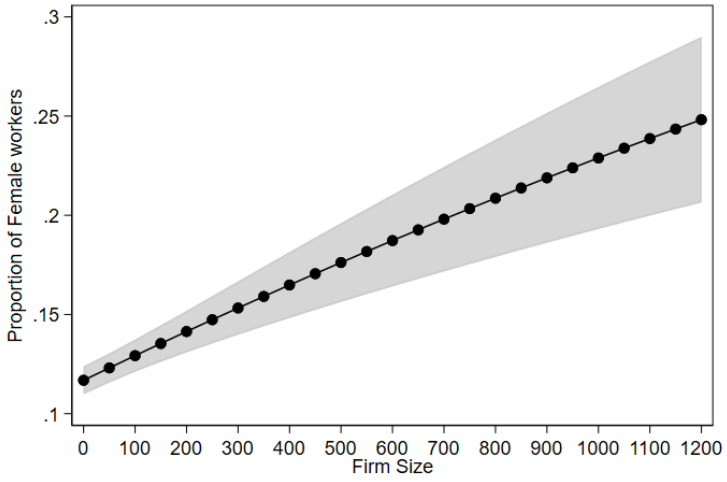
Source: ASI 1998-2019.

Figure 3: Firm size and proportion of female workers

(a) Panel Estimates



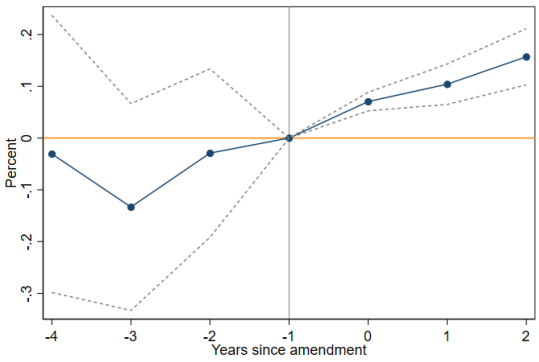
(b) Cross-section estimates



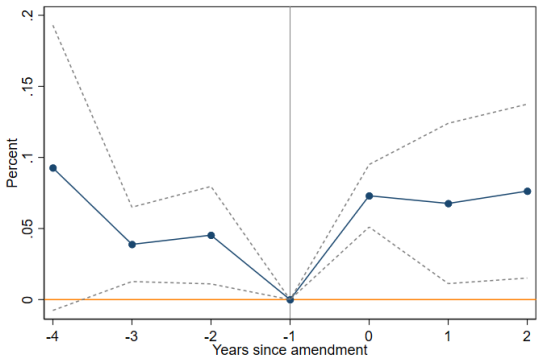
Notes: Panel (a) and (b) plot the predicted proportion of female employees at each level of firm size using a quartic specification in firm size (measured by total workers) using panel and cross-section estimation strategy, respectively.
Source: ASI 1998-2019.

Figure 4: Impact of Amendments: Female Employment and Firm Size (TWFE Event Study)

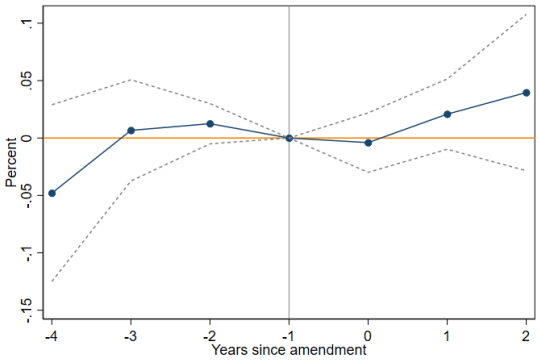
(a) Proportion of Female Workers



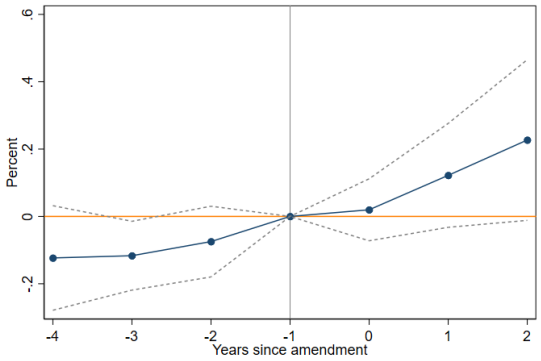
(b) Total Workers



(c) Total Employees



(d) Total Output

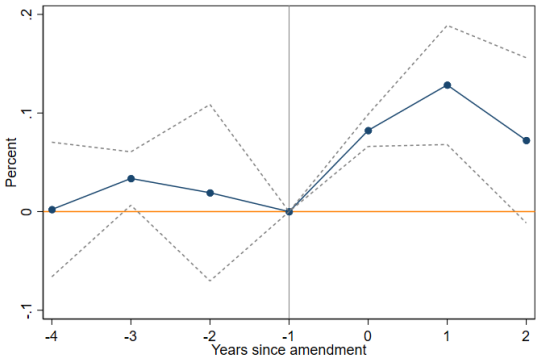


Notes: The above figures show event-study plots estimating the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act using the two-way fixed effects estimator. The outcome of interest is the (logged) proportion of female workers (Panel a), (logged) number of total workers (Panel b), (logged) number of total workers (Panel c) and (logged) total value of output (Panel d). The unit of observation is the manufacturing establishment in a year. We keep establishments that report using some labor in a given year. The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment fixed effects, year fixed effects and industry-year fixed effects. Standard errors are clustered by state.

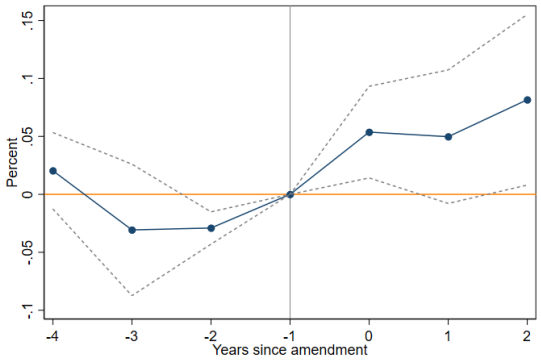
Source: ASI 2009-2019.

Figure 5: Impact of Amendments: Firm size and Female Employment (Staggered Event Study)

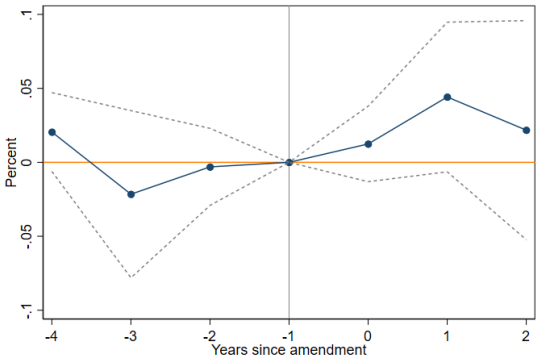
(a) Proportion of Female Workers



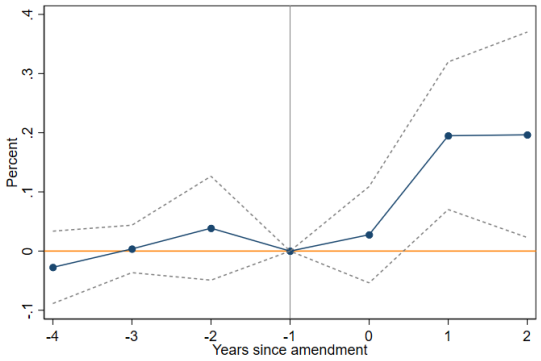
(b) Total Workers



(c) Total Employees



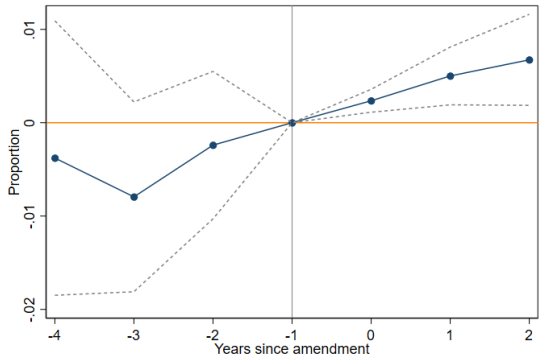
(d) Total Output



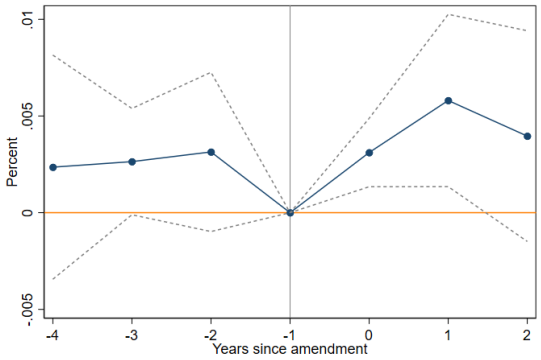
Notes: The above figures show event-study plots estimating the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act using the (Callaway & Sant'Anna, 2021) estimator. The outcome of interest is the (logged) proportion of female workers (Panel a), (logged) number of total workers (Panel b), (logged) number of total workers (Panel c) and (logged) total value of output (Panel d). The unit of observation is the manufacturing establishment in a year. We keep establishments that report using some labor in a given year. Treated states are Rajasthan and Jharkhand in 2014 and 2017, respectively. The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment and year fixed effects. Standard errors are clustered by state.
Source: ASI 2009-2019.

Figure 6: Impact of Amendments: Alternative measures of Relative Female Employment (Robustness)

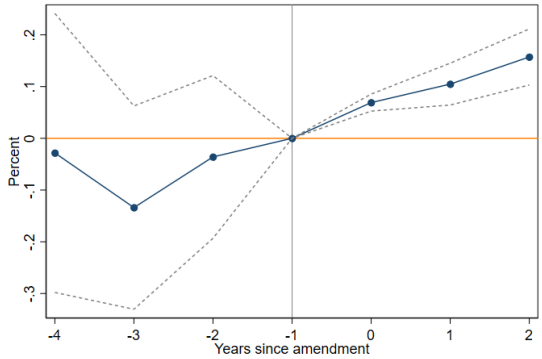
(a) Female proportion (TWFE)



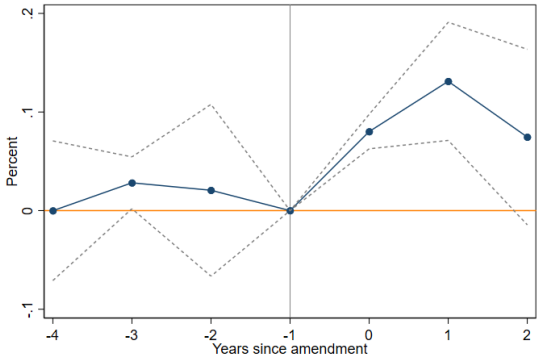
(b) Female proportion (CS)



(c) ln(Female proportion mandays) (TWFE)



(d) ln(Female proportion mandays) (CS)

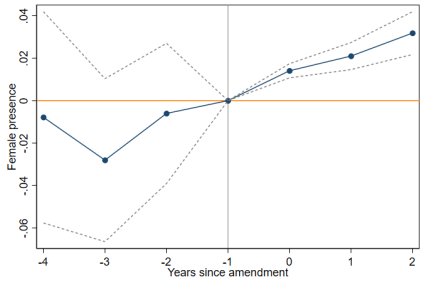


Notes: We plot the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act. The outcome of interest is the proportion of female workers (Panels a and b), whether logged proportion of female mandays (Panels c and d). Event-study plots using the TWFE estimator in Panels a and c and using the (Callaway & Sant'Anna, 2021) estimator in Panels b and d. The unit of observation is the manufacturing establishment in a year. We keep establishments that report using some labor in a given year. The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment and year fixed effects. Standard errors are clustered by state.

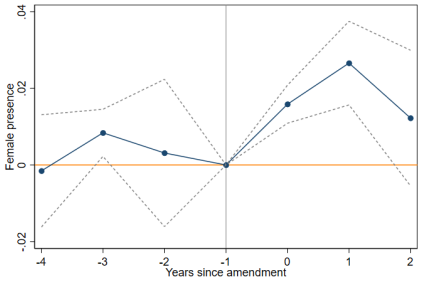
Source: ASI 2009-2019.

Figure 7: Impact of Amendments: Female Employment

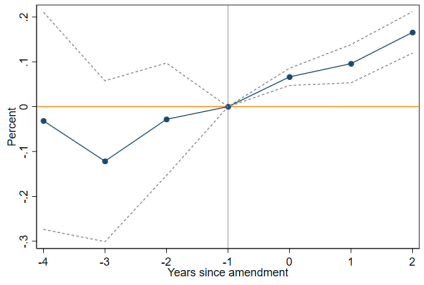
(a) Female presence (TWFE)



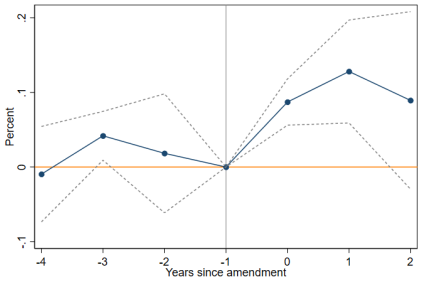
(b) Female presence (CS)



(c) ln(Female workers) (TWFE)



(d) ln(Female workers) (CS)

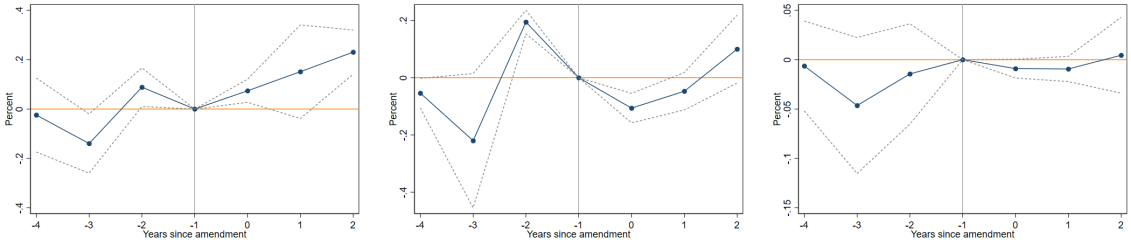


Notes: We plot the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act. The outcome of interest is whether a female worker is present (Panels a and b) and logged number of female workers in an establishment (Panels c and d). Event-study plots using the TWFE estimator in Panels a and c and using the (Callaway & Sant'Anna, 2021) estimator in Panels b and d. The unit of observation is the manufacturing establishment in a year. We keep establishments that report using some labor in a given year. The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment and year fixed effects. Standard errors are clustered by state.

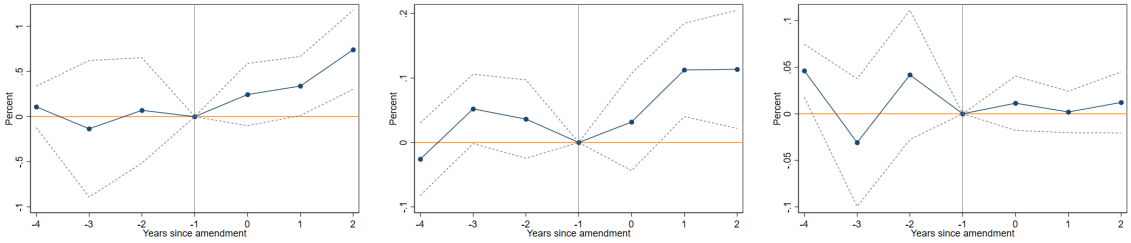
Source: ASI 2009-2019.

Figure 8: Impact of Amendments on Other firm outcomes (Staggered Event Study)

(a) Welfare per capita (b) PF per capita (c) Gender Wage Gap



(d) Profit per capita (e) Labor Productivity (f) TFP



Notes: The above figures show event-study plots estimating the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act using the (Callaway & Sant'Anna, 2021) estimator. The outcome of interest is the (logged) welfare per employee (Panel a), the (logged) provident fund provision per employee (Panel b), the log of the female to male wage ratio (Panel c), the IHS transformation of profit per employee (Panel d), total output per employee (panel e) and the TFP measure (panel f). The unit of observation is the manufacturing establishment in a year. We keep establishments that report using some labor in a given year. The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment and year fixed effects. Standard errors are clustered by state.

Source: ASI 2009-2019.

Table 1: Descriptive statistics

	(1)	(2)	(3)
	Mean	**SD**	**N**
Panel A: Female Employment			
Proportion of Female Workers	0.122	0.241	870153
Proportion of Female Mandays	0.120	0.239	761843
Panel B: Firm Size			
Firm Size (Workers)	40.511	236.194	964485
Firm Size (All Employees)	75.915	414.969	964485
Firm Size (Output, INR)	2.734e+08	5.523e+09	964485
Panel C: Other Firm Variables			
Welfare (INR, per employee)	2301.135	4646.865	954120
PF (INR, per employee)	3501.183	5406.843	954118
Gender Gap (female wage/male wage)	0.860	0.236	230141
Profit (INR, per employee)	90595.229	163399.333	901006
Labor Productivity	1705573.934	3093527.424	954121
TFP	32670.788	1518429.368	891863

Notes: Proportion of female workers are defined as total female workers in permanent employment out of total workers in permanent employment. Proportion of female mandays refer are defined as total female worker mandays in permanent employment out of total worker mandays in permanent employment. Firm size is defined as total permanent workers in a firm. Firm Size (All Employees) refers to all employees including permanent workers, contract workers, supervisors and unpaid employees. Firm size (Output) is defined as total value of output (price $\times$ quantity) produced by a firm deflated by two digit industry specific Wholesale Price Index (WPI) with 2004 as the base year. Gender wage gap is defined as the ratio of female wage rate by male wage rate. Labor productivity is defined as total value of real output per employee. Total factor Productivity (TFP) is measured using the method described in Levinsohn & Petrin (2003) and implemented using the procedure provided in Petrin *et al.* (2004) with average capital in a year to measure the capital stock in the current year. Provident Fund (PF) is annual social security contribution of the employer paid per employee. Welfare expenses refer to group benefits like direct expenditure on maternity, creches, canteen facilities, educational, cultural and recreational facilities, paid per employee annually. Both the expenditures are deflated using the CPI with base year as 2004. Profits are deflated by two digit industry specific Wholesale Price Index (WPI) with 2004 as the base year and divided by total employees.
Source: Annual Survey of Industries 1998-2019.

Table 2: Firm Size and Relative Female Employment (ASI data)

	(1)	(2)	(3)	(4)	(5)	(6)
	Female Proportion		ln(Female Proportion)			
	Worker	Mandays	Worker	Mandays	Worker	Mandays
Panel A: Panel Estimates						
ln(Firm Size)	0.027***	0.026***	0.470***	0.462***	0.749***	0.721***
	(0.001)	(0.001)	(0.006)	(0.007)	(0.016)	(0.017)
ln(Firm Size)^2					-0.049***	-0.045***
					(0.002)	(0.002)
R-Squared	.855	.861	.812	.816	.812	.817
Observations	784521	681817	784521	681817	784521	681817
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Cross-Sectional Estimates						
ln(Firm Size)	0.028***	0.027***	0.430***	0.425***	0.730***	0.700***
	(0.003)	(0.002)	(0.020)	(0.019)	(0.067)	(0.061)
ln(Firm Size)^2					-0.048***	-0.044***
					(0.009)	(0.008)
R-Squared	.385	.387	.376	.376	.378	.377
Observations	836214	731860	836214	731860	836214	731860
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is proportion of female workers in column 1 and proportion of mandays of female workers in column 2. In columns 3 and 5, the dependent variables is logged proportion of female workers and in columns 4 and 6 its is logged proportion of female worker mandays. Firm size is defined as log of number of male and female workers in the enterprise. Controls in Panel B are organisation type, sector (rural/urban) and year of initial production. Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by establishment level survey weights. Standard errors in parentheses are clustered at firm level for Panel A and at state-NIC (4-digit) level for Panel B. ***, **, * show significance at 1%, 5% and 10%, respectively.

Source: Annual Survey of Industries 1998-2019.

Table 3: Firm Size and Relative Female Employment (Household data)

	All workers		Full time	
	(1)	(2)	(3)	(4)
6- 9	-0.004	-0.002	0.001	0.002
	(0.003)	(0.004)	(0.004)	(0.004)
10-20	0.014**	0.019***	0.017**	0.023***
	(0.004)	(0.004)	(0.005)	(0.005)
20 and above	0.032***	0.041***	0.042***	0.051***
	(0.005)	(0.005)	(0.006)	(0.006)
Constant	0.182***	0.180***	0.165***	0.163***
	(0.002)	(0.002)	(0.002)	(0.002)
Mean of DV	0.196	0.198	0.182	0.184
R-Squared	0.382	0.431	0.367	0.415
Observations	322795	316179	201485	197036
District x Yr FE	Yes	Yes	Yes	Yes
Ind x Yr FE	Yes		Yes	
Occ x Yr FE	Yes		Yes	
Ind x Occ x Yr FE		Yes		Yes
Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable takes a value of one when a worker is female and zero otherwise. Controls include age, age square, education level, religion, social group, income decile and marital status. Mean of DV denotes the mean of the dependent variable. Data includes all individuals working in the non-cultivation sector who work as paid employees (salaried or casual work). Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by individual survey weights. Standard errors in parentheses are clustered at district level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: NSS rounds 55, 61, 66 and 68, PLFS 2017-18 and PLFS 2018-19. Columns 3-4 only contain data from NSS rounds 55, 61, 66 and 68 whereas columns 1 and 2 additionally contain data from PLFS 2017-18 and PLFS 2018-19. This is because PLFS does not contain details on part/full time work.

Table 4: Firm Size (alternative definitions) on Relative Female Employment (ASI data)

	(1)	(2)	(3)	(4)
	ln(female proportion)			
	Worker	Mandays	Worker	Mandays
ln(Firm Size (All Employees))	0.383***	0.375***		
	(0.007)	(0.008)		
ln(Firm Size (Output))			0.093***	0.094***
			(0.004)	(0.004)
R-Squared	.809	.813	.806	.811
Observations	784521	681939	784521	682036
Firm FE	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is log proportion of female workers in columns 1 and 3, and log proportion of mandays of female workers in columns 2 and 4. Firm size is defined as log of number of total employees in the enterprise in columns 1-2. In columns 3-4, firm size (Output) is defined as log of total real value of output. Mean of DV denotes the mean of the dependent variable without log transformation. Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by establishment level survey weights. Standard errors in parentheses are clustered at firm level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Annual Survey of Industries 1998-2019.

Table 5: Firm Size and Relative Female Employment (Census Data)

Dependent variable:	Total				Hired	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Firm Size (All))	1.358***	1.276***	1.585***	2.602***		
	(0.025)	(0.025)	(0.034)	(0.061)		
$(\ln(\text{Firm Size (All)}))^2$				-0.533***		
				(0.019)		
ln(Firm Size (Hired))					0.744***	0.879***
					(0.016)	(0.029)
$(\ln(\text{Firm Size (Hired)}))^2$						-0.054***
						(0.007)
Mean Female Proportion	.187	.187	.182	.182	.153	.153
R-Squared	.193	.334	.547	.564	.312	.312
Observations	1.31e+08	1.31e+08	1.17e+08	1.17e+08	3.02e+07	3.02e+07
District by Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry by Yr FE	No	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of proportion of females amongst total workers (columns 1-4) and hired workers (columns 5-6). Controls used are enterprises' operation, sector, ownership by gender, source of finance and type of ownership. District by year and Industry by year fixed effects are included in all specifications in columns 3-6. Standard errors in parentheses are clustered at district level within each year. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Economic Census 1998, 2005, 2013.

Table 6: Effect of Amendments on Relative Female Employment and Firm Size (DID Estimates)

	(1)	(2)	(3)	(4)	(5)
	ln(female proportion)		ln(firm size)		
	Workers	Workers	Workers	Employees	Output
Amendment	0.157	0.163*	0.026	0.036	0.229*
	(0.093)	(0.083)	(0.040)	(0.028)	(0.112)
R-Squared	.82	.822	.824	.885	.577
Observations	296871	296871	296871	296871	296871
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Indus. × Yr FE	No	Yes	Yes	Yes	Yes

Notes: The table reports difference-in-differences estimation results for the outcome variables of female employment and firm size. The dependent variable is log proportion of female workers in columns 1-2, log total workers in column 3, log total employees in column 4 and log total value of output in column 5. Treated states are Rajasthan and Jharkhand in 2014 and 2017, respectively. Each column reports the effective number of observations after incorporating the included fixed effects. Standard errors in brackets are heteroscedasticity robust and clustered at the state level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Annual Survey of Industries 2009-2019.

Table 7: Firm Size (total employees) and Other Firm Outcomes (ASI data)

	(1)	(2)	(3)	(4)	(5)	(6)
	Welfare per capita	PF per capita	Gender Wage Gap	Profit per capita	Labor Productivity	TFP
Panel A: Panel Estimates						
ln(Firm Size)	0.425***	0.381***	0.001	1.033***	0.589***	0.052***
	(0.008)	(0.009)	(0.002)	(0.028)	(0.012)	(0.003)
R-Squared	.765	.823	.543	.504	.714	.774
Observations	864987	864985	192570	812512	864988	804664
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Cross-Sectional Estimates						
ln(Firm Size)	0.693***	0.784***	0.002	0.822***	0.448***	0.248***
	(0.020)	(0.020)	(0.002)	(0.041)	(0.029)	(0.006)
R-Squared	.388	.385	.0927	.0697	.257	.411
Observations	915211	915209	221948	866096	915212	858003
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variables are log transformation of the variables mentioned above each column except profits per employee for which IHS transformation is taken. The variables are defined in Table 1. Firm size is defined as log of total employees in the enterprise. Controls used in Panel A are organisation type, and in Panel B are organisation type, sector (rural/urban) and year of initial production. Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by establishment level survey weights. Standard errors in parentheses are clustered at firm level for Panel A and at state-NIC (4-digit) level for Panel B. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Annual Survey of Industries 1998-2019.

Table 8: Firm Size (output) and Other Firm Outcomes (ASI data)

	(1)	(2)	(3)	(4)	(5)	(6)
	Welfare per capita	PF per capita	Gender Wage Gap	Profit per capita	Labor Productivity	TFP
Panel A: Panel Estimates						
ln(Firm Size)	0.249***	0.233***	-0.000	1.394***	0.854***	0.533***
	(0.003)	(0.004)	(0.002)	(0.009)	(0.001)	(0.004)
R-Squared	.769	.826	.543	.534	.953	.801
Observations	864987	864985	192592	812512	864988	804664
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Cross-Sectional Estimates						
ln(Firm Size)	0.324***	0.377***	0.008**	1.344***	0.860***	0.479***
	(0.014)	(0.013)	(0.003)	(0.026)	(0.005)	(0.012)
R-Squared	.373	.37	.0931	.149	.828	.475
Observations	915211	915209	221971	866096	915212	858003
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variables are log transformation of the variables mentioned above each column except profits per employee for which IHS transformation is taken. The variables are defined in Table 1. Firm size is defined as total real output produced by a firm. Controls used in Panel B are organisation type, sector (rural/urban) and year of initial production. Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by establishment level survey weights. Standard errors in parentheses are clustered at firm level for Panel A and at state-NIC (4-digit) level for Panel B. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Annual Survey of Industries 1998-2019.

Table 9: Firm Size and Gender Wage Gap (Household data)

	(1)	(2)	(3)	(4)
	ln(wage)			
6- 10	0.090***	0.083***	0.076***	0.072***
	(0.006)	(0.006)	(0.006)	(0.006)
10-20	0.145***	0.133***	0.136***	0.130***
	(0.007)	(0.007)	(0.007)	(0.006)
20 and above	0.282***	0.259***	0.266***	0.248***
	(0.009)	(0.008)	(0.007)	(0.007)
Female			-0.451***	-0.428***
			(0.012)	(0.012)
Female × 6-10			0.081***	0.064***
			(0.016)	(0.017)
Female × 10-20			0.076***	0.054**
			(0.018)	(0.019)
Female × 20 and above			0.131***	0.116***
			(0.022)	(0.020)
Constant	5.615***	5.618***	5.694***	5.692***
	(0.003)	(0.003)	(0.003)	(0.003)
Mean of DV	480.987	477.682	480.987	477.682
R-Squared	0.621	0.657	0.642	0.675
Observations	300266	293761	300266	293761
District x Yr FE	Yes	Yes	Yes	Yes
Ind x Yr FE	Yes		Yes	
Occ x Yr FE	Yes		Yes	
Ind x Occ x Yr FE		Yes		Yes
Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of real daily wage(at 2017 prices) for all columns. Controls include age, age square, education level, religion, social group, sector (rural/urban) and marital status. Mean of DV denotes the mean of the dependent variable without log transformation. Data includes all individuals working in the non-cultivation sector who work as paid employees (salaried or casual work). Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by individual survey weights. Standard errors in parentheses are clustered at district level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: NSS rounds 55, 61, 66 and 68, PLFS 2017-18 and PLFS 2018-19.

Table 10: Firm Size and the Nature of Labor Contracts and Benefits (Household data)

Dependent Variable:	Part -time	Written Contract	Healthcare /Maternity	Pension	Paid Leave
	(1)	(2)	(3)	(4)	(5)
6- 9	-0.003	0.021***	0.016***	0.028***	0.030***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
10-20	0.001	0.049***	0.047***	0.078***	0.069***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)
20 and above	-0.001	0.140***	0.151***	0.221***	0.161***
	(0.004)	(0.007)	(0.008)	(0.008)	(0.007)
Constant	0.038***	0.153***	0.120***	0.178***	0.228***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Mean of DV	0.036	0.266	0.222	0.326	0.359
R-Squared	0.154	0.509	0.493	0.632	0.593
Observations	204414	266603	258175	299870	266526
District x Yr FE	Yes	Yes	Yes	Yes	Yes
Ind x Occ x Yr FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes: In column 1 the dependent variable takes a value of one when a worker is working part time and zero otherwise. In column 2 the dependent variable takes a value of one when a worker has a written contract and zero otherwise. In column 3-5 the dependent variable takes a value of one if a the mentioned benefit is eligible for the benefit at work and zero otherwise. Controls include age, age square, education level, religion, social group, income decile, sector(rural/urban) and marital status. Mean of DV denotes the mean of the dependent variable. Data includes all individuals working in the non-cultivation sector who work as paid employees (salaried or casual work). Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by individual survey weights. Standard errors in parentheses are clustered at district level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: NSS rounds 55, 61, 66 and 68, PLFS 2017-18 and PLFS 2018-19. Column 1 contain data from NSS rounds 55, 61, 66 and 68. Columns 2, 3 and 5 contain data from NSS rounds 61, 66 and 68. Columns 2-5 additionally contain data from PLFS 2017-18 and PLFS 2018-19. This is because NSS round 55 does not contain details on paid leave, written contract, healthcare/ maternity or pension; It only has data on whether the respondent was covered under any type of provident fund. PLFS does not contain details on part/full time work.

Table 11: Effect of Amendments on Other Firm Outcomes (DID Estimates)

	(1) Welfare per capita	(2) PF per capita	(3) Gender Gap	(4) Profit per capita	(5) Labor Productivity	(6) TFP
Amendment	0.196***	0.019	-0.022**	0.357***	0.113	0.028*
	(0.038)	(0.063)	(0.011)	(0.116)	(0.083)	(0.015)
R-Squared	.744	.809	.457	.479	.687	.754
Observations	292501	292497	89058	272401	292501	273465
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes	Yes

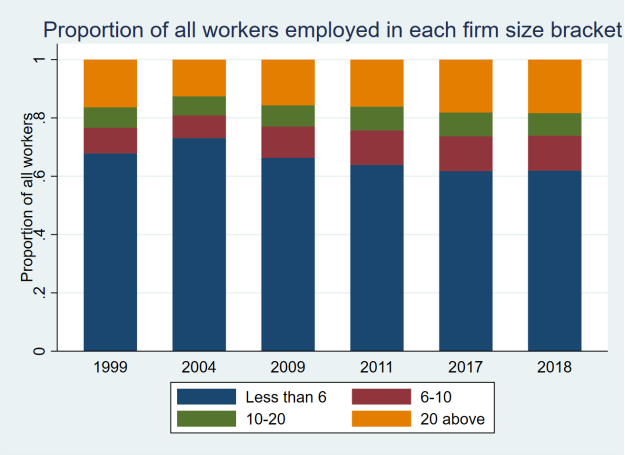
Notes: The table reports difference-in-differences estimation results for the outcome variables of welfare, provident fund, gender wage gap, profits labor productivity and TFP. The dependent variable is log welfare per employee, log PF per employee, log female to male wage rate, IHS transformation of profits per employee, log labor productivity, and log TFP in columns 1, 2, 3, 4 , 5 and 6 respectively. A small value 1 is added for for welfare, pf and output to account for zero values. Treated states are Rajasthan and Jharkhand in 2014 and 2017, respectively. Each column reports the effective number of observations after incorporating the included fixed effects. Standard errors in brackets are heteroscedasticity robust and clustered at the state level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Annual Survey of Industries 2009-2019.

ONLINE APPENDIX

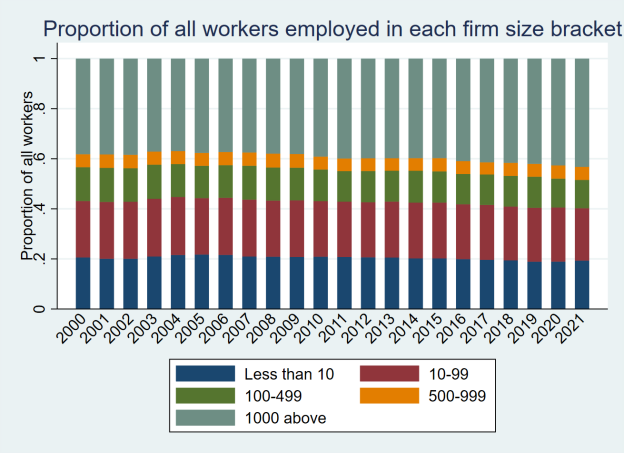
A Appendix: Figures and Tables

Figure A.1: Firm size distribution: India vs US

(a) India: NSS



(b) USA: CPS

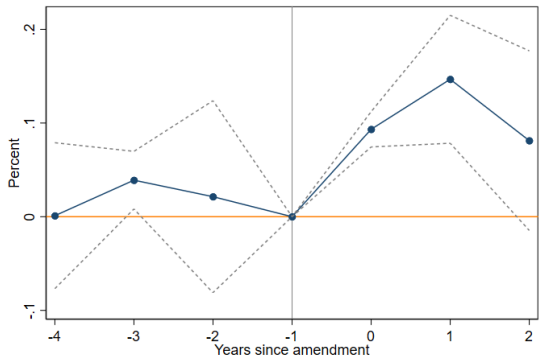


Notes: Panel (a) plots the density of firm size distribution for total workers. Panel (b) plots the density of the distribution for total employees=total workers+ unpaid employees+ contractual employees + supervisory staff.

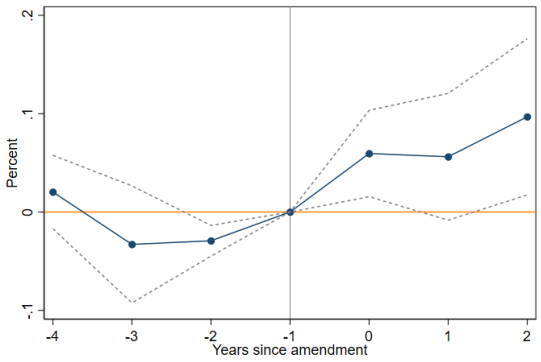
Source: NSS and CPS (various rounds)

Figure A.2: Impact of Amendments: Relative Female Employment and Firm Size (Staggered Event Study, Robustness, IHS)

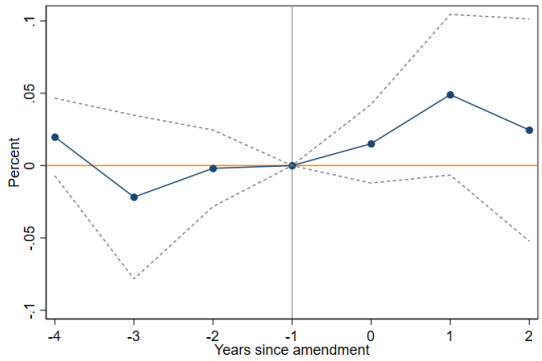
(a) Proportion of Female Workers



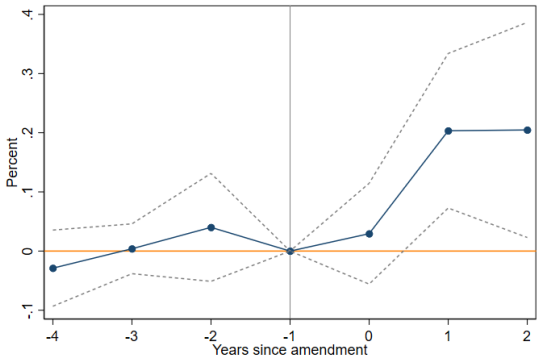
(b) Total Workers



(c) Total Employees



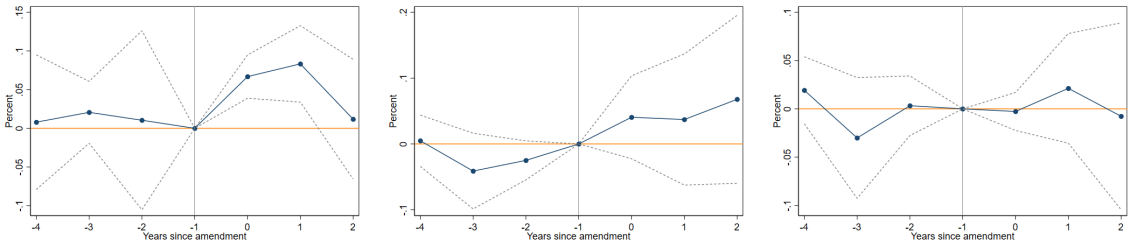
(d) Total Output



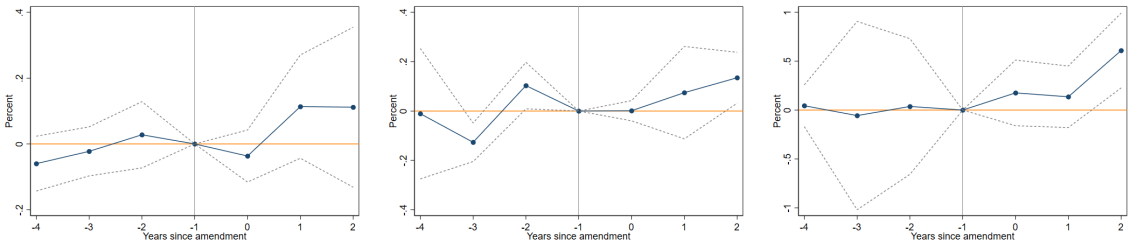
Notes: The above figures show event-study plots estimating the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act using the (Callaway & Sant'Anna, 2021) estimator. The unit of observation is the manufacturing establishment. The outcome of interest is the (ihs) number of total workers rescaled by 10 (Panel a) and the (ihs) proportion of female workers rescaled by 1000 (Panel b). For rescaling in IHS transformations see Bellemare & Wichman (2020). The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment and year fixed effects. Standard errors are clustered by state.
Source: ASI 2009-2019.

Figure A.3: Impact of Amendments: Firm size and Female Employment (Staggered Event Study, neighboring states as control)

(a) Proportion of Female Workers (b) Total Workers (c) Total Employees



(d) Total Output (e) Welfare per employee (f) Profit per employee



Notes: The above figures show event-study plots estimating the impact of state level amendments increasing the thresholds for firm sizes for applicability of the Factories Act and the Industrial Disputes Act using the (Callaway & Sant'Anna, 2021) estimator. The outcome of interest is the (logged) proportion of female workers (Panel a), (logged) number of total workers (Panel b), (logged) number of total workers (Panel c) and (logged) total value of output (Panel d), (logged) welfare expenses per employee and IHS transformation of profit per employee. The unit of observation is the manufacturing establishment in a year. We keep establishments that report using some labor in a given year. Treated states are Rajasthan and Jharkhand in 2014 and 2017, respectively and the control states are Punjab, Bihar, west Bengal, Orissa, Chhattisgarh and Gujarat. The solid line represents the average annual treatment effects, and the dashed lines denote the 95% confidence intervals. The treatment effects are with respect to the year before the amendment came into force (dashed vertical line). Specifications include establishment and year fixed effects. Standard errors are clustered by state.

Source: ASI 2009-2019.

Table A.1: Descriptive Statistics - NSS Household data

	(1)	(2)	(3)
	N	**Mean**	**SD**
Panel A: Outcome Variables			
Proportion of Female Workers	322911	0.192	0.394
Wage Rate (INR, Daily)	300386	440.741	531.213
Proportion of Part Time Workers	209000	0.037	0.189
Proportion of Workers with Written Contract Holders	271725	0.204	0.403
Proportion of Workers with Healthcare/ Maternity Benefits	263240	0.174	0.379
Proportion of Workers with Pension benefits	306504	0.258	0.438
Proportion of Workers with Paid Leave	271644	0.290	0.454
Panel B: Firm Size Variable (with 4 brackets)			
Less than 6 Workers	322911	0.440	0.496
6-10 Workers	322911	0.165	0.371
10-20 Workers	322911	0.116	0.321
More than 20 workers	322911	0.279	0.448

Notes: The observations are limited to wage earners (salaried and casual) belonging to prime age group (15-65 years).
Source: NSS rounds 55, 61, 66 and 68, PLFS 2017-18 and PLFS 2018-19.

Table A.2: Firm Size and Relative Female Employment across Sectors (ASI data)

	(1)	(2)	(3)	(4)
Sectors:	Rural		Urban	
	Worker	Mandays	Worker	Mandays
Panel A: Panel Estimates				
ln(Firm Size)	0.505***	0.494***	0.433***	0.434***
	(0.011)	(0.012)	(0.008)	(0.009)
R-Squared	.827	.833	.816	.819
Observations	306652	269414	451886	390041
Firm FE	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Panel B: Cross-Sectional Estimates				
ln(Firm Size)	0.459***	0.450***	0.406***	0.403***
	(0.029)	(0.028)	(0.018)	(0.017)
R-Squared	.406	.406	.367	.366
Observations	338237	298823	497846	432924
Indus. × Yr FE	Yes	Yes	Yes	Yes
State × Yr FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable is log proportion of female workers in column 1 and column 3, and log proportion of mandays of female workers in column 2 and column 4. Columns 1-2 report the effects for rural regions and columns 3-4 report the effects for urban regions. Firm size is defined as log of number of male and female workers in the enterprise. Controls used in Panel A are organisation type, and in Panel B are organisation type, sector (rural/urban) and year of initial production. Each column reports the effective number of observations after incorporating the included fixed effects. Regressions are weighted by establishment level survey weights. Standard errors in parentheses are clustered at firm level for Panel A and at state-NIC (4-digit) level for Panel B. ***, **, * show significance at 1%, 5% and 10%, respectively.

Source: Annual Survey of Industries 1998-2019.

Table A.3: Firm Size and Relative Female Employment across Economic Sectors (Census Data)

	(1)	(2)	(3)	(4)
	Agriculture	Manufacturing	Construction	Services
Panel A: All Sectors				
ln(Firm Size (Hired))	1.104***	0.695***	0.960***	0.757***
	(0.064)	(0.021)	(0.027)	(0.016)
Mean Female Proportion	.304	.199	.11	.125
R-Squared	.241	.388	.241	.268
Observations	1186150	8607731	458694	1.99e+07
Panel B: Rural Sector				
ln(Firm Size (Hired))	1.157***	0.860***	1.010***	0.796***
	(0.072)	(0.025)	(0.035)	(0.021)
Mean Female Proportion	.321	.273	.115	.159
R-Squared	.242	.412	.284	.281
Observations	1039675	4109976	215321	6334445
Panel C: Urban Sector				
ln(Firm Size (Hired))	0.791***	0.575***	0.927***	0.733***
	(0.070)	(0.021)	(0.032)	(0.017)
Mean Female Proportion	.184	.132	.106	.109
R-Squared	.234	.328	.229	.267
Observations	146417	4497714	243267	1.36e+07
District by Yr FE	Yes	Yes	Yes	Yes
Industry by Yr FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of proportion of females amongst hired workers. Controls used are enterprises' operation, sector, ownership by gender, source of finance and type of ownership. District by year and Industry by year fixed effects are included in all specifications. Standard errors in parentheses are clustered at district level within each year. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Economic Census 1998, 2005, 2013.

Table A.4: Firm Size and Relative Female Employment across Economic Sectors (Census Data): By Ownership Gender

	(1)	(2)	(3)	(4)
	Agriculture	Manufacturing	Construction	Services
Panel A: Male Owned Firms				
ln(Firm Size (Hired))	1.134***	0.746***	1.001***	0.807***
	(0.065)	(0.022)	(0.028)	(0.017)
Mean Female Proportion	.272	.132	.0968	.0961
R-Squared	.253	.284	.236	.206
Observations	1020338	7619021	441478	1.87e+07
Panel B: Female Owned Firms				
ln(Firm Size (Hired))	0.800***	-0.037	-0.039	0.065*
	(0.134)	(0.041)	(0.093)	(0.037)
Mean Female Proportion	.5	.719	.446	.562
R-Squared	.164	.365	.416	.295
Observations	165676	988576	16990	1239346
District by Yr FE	Yes	Yes	Yes	Yes
Industry by Yr FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of proportion of females amongst hired workers. Controls used are enterprises' operation, sector, source of finance and type of ownership. District by year and Industry by year fixed effects are included in all specifications. Standard errors in parentheses are clustered at district level within each year. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Economic Census 1998, 2005, 2013.

Table A.5: Effect of Amendments on Relative Female Employment and Firm Size (DID Estimates): Robustness to alternative definitions

	Female proportion	Any female	ln(Female workers)	ln(Female proportion)	
	(1)	(2)	(3)	(4)	(5)
	Workers	Workers	Workers	Mandays	Workers
Amendment	0.008**	0.034*	0.162*	0.164*	0.152
	(0.004)	(0.016)	(0.083)	(0.084)	(0.090)
Amendment × Rural					0.030
					(0.026)
Mean	.134	.333			
R-Squared	.87	.783	.854	.823	.822
Observations	296871	296871	296871	296871	296871
Firm FE	Yes	Yes	Yes	Yes	Yes
Indus. × Yr FE	Yes	Yes	Yes	Yes	Yes

Notes: The table reports difference-in-differences estimation results for the outcome variables of firm size and female employment. The dependent variable is proportion of female workers in column 1, an indicator variable that takes a value of one if a female worker is hired and zero otherwise in column 2, log number of female workers in column 3, log proportion of female worker mandays in column 4 and log proportion of female workers in column 5. Treated states are Rajasthan and Jharkhand in 2014 and 2017, respectively. Each column reports the effective number of observations after incorporating the included fixed effects. Standard errors in brackets are heteroscedasticity robust and clustered at the state level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Annual Survey of Industries 2009-2019.

Table A.6: Firm Size and Available Amenities

	Child Care	Free Transport	Health Insurance	Job Training	SoftSkill Training	Cafeteria	Educ Assistance	Work_From Home
11-50	-0.032*	0.003	0.118***	0.101***	0.081***	0.060***	0.052***	0.136***
	(0.017)	(0.016)	(0.014)	(0.013)	(0.014)	(0.016)	(0.017)	(0.016)
51-200	0.067***	0.169***	0.346***	0.248***	0.247***	0.278***	0.214***	0.269***
	(0.017)	(0.015)	(0.014)	(0.012)	(0.014)	(0.016)	(0.017)	(0.015)
201-500	0.268***	0.334***	0.462***	0.332***	0.355***	0.445***	0.383***	0.380***
	(0.017)	(0.016)	(0.015)	(0.013)	(0.014)	(0.017)	(0.017)	(0.016)
501-1000	0.413***	0.402***	0.493***	0.346***	0.385***	0.489***	0.455***	0.422***
	(0.018)	(0.017)	(0.015)	(0.014)	(0.015)	(0.018)	(0.018)	(0.017)
1001-5000	0.527***	0.449***	0.508***	0.361***	0.405***	0.542***	0.505***	0.458***
	(0.018)	(0.017)	(0.015)	(0.014)	(0.015)	(0.017)	(0.018)	(0.017)
5001-10000	0.570***	0.447***	0.501***	0.347***	0.401***	0.532***	0.498***	0.466***
	(0.026)	(0.024)	(0.022)	(0.019)	(0.021)	(0.025)	(0.026)	(0.024)
10001 - 50000	0.562***	0.454***	0.508***	0.356***	0.402***	0.525***	0.515***	0.471***
	(0.025)	(0.024)	(0.022)	(0.019)	(0.021)	(0.024)	(0.025)	(0.023)
50001 - 100000	0.471***	0.402***	0.471***	0.317***	0.387***	0.511***	0.363***	0.436***
	(0.048)	(0.045)	(0.041)	(0.036)	(0.040)	(0.047)	(0.048)	(0.044)
100001+	0.400***	0.389***	0.446***	0.329***	0.350***	0.399***	0.400***	0.433***
	(0.039)	(0.037)	(0.033)	(0.029)	(0.033)	(0.038)	(0.039)	(0.036)
Constant	0.273***	0.442***	0.438***	0.610***	0.557***	0.383***	0.398***	0.480***
	(0.016)	(0.015)	(0.014)	(0.012)	(0.013)	(0.015)	(0.016)	(0.015)
Mean of DV	.47	.678	.797	.869	.827	.71	.68	.786
R-Squared	.311	.312	.233	.154	.169	.222	.208	.136
Observations	24170	24170	24170	24170	24170	24170	24170	24170
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the association between total employees and various benefits (across columns) offered by a firm. In the above table, industry type, age, age squared and headquater country are taken as controls. Standard errors in brackets are heteroscedasticity robust. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: Ambition Box (January 2023).

Table A.7: Nature of Labour Contract-Benefits and Relative Female Employment (Household data)

	(1)	(2)	(3)	(4)
Part Time	0.187***	0.171***		
	(0.013)	(0.013)		
Written	0.022***	0.027***	0.017***	0.020***
	(0.007)	(0.007)	(0.005)	(0.005)
Healthcare/	0.019***	0.020***	0.018***	0.019***
Maternity	(0.006)	(0.006)	(0.005)	(0.005)
Pension/PF/Gratuity	-0.052***	-0.059***	-0.050***	-0.053***
	(0.008)	(0.008)	(0.007)	(0.008)
Paid Leave	-0.009*	-0.004	-0.011**	-0.006
	(0.005)	(0.005)	(0.004)	(0.004)
Constant	0.195***	0.195***	0.205***	0.204***
	(0.002)	(0.002)	(0.002)	(0.002)
Mean of DV	0.197	0.198	0.199	0.201
R-Squared	0.388	0.436	0.386	0.436
Observations	157238	154291	263028	257999
District x Yr FE	Yes	Yes	Yes	Yes
Ind x Yr FE	Yes		Yes	
Occ x Yr FE	Yes		Yes	
Ind x Occ x Yr FE		Yes		Yes
Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable takes a value of one when a worker is female and zero otherwise. Controls include age, age square, education level, religion, social group, income decile, sector(rural/urban) and marital status. Mean of DV denotes the mean of the dependent variable. Data includes all individuals working in the non-cultivation sector who work as paid employees (salaried or casual work). Regressions are weighted by individual survey weights. Standard errors in parentheses are clustered at district level. ***, **, * show significance at 1%, 5% and 10%, respectively.
Source: NSS rounds 55, 61, 66 and 68. PLFS 2017-18 and PLFS 2018-19 are excluded from the analyses in columns 1 and 2 because the PLFS does not contain details on part/full time work.