



► Research Brief

August 2021

Impact of minimum wages on wages and employment in selected Indian States*

► Introduction

Minimum wage policy is considered a policy tool for protecting workers from unduly low pay and reducing inequality within the labour market. The ILO Global Wage Report, 2020-21, indicates that minimum wages exist in 90 per cent of ILO Member States (187 countries) and that 327 million wage earners¹ are paid at or under the statutory hourly minimum wage (ILO, 2020).

There is a wide variety of minimum wage systems. There are simple systems with only a single national minimum wage and others with different minimum wages, according to regions, sectors, occupations, or age groups. The ILO minimum wage policy guide points out that simpler systems are easier to operate and enforce but may fail to address particular circumstances related to regions or sectors in the country. In contrast, complex systems can lose effectiveness, as it is necessary to have a greater institutional capacity for monitoring non-compliance and enhancing enforcement of minimum wage provisions.

Over the last two decades, countries have turned to and strengthened minimum wage policies.² The evolution of minimum wage policies and systems are underpinned by international labour standards such as the Minimum Wage Fixing Convention, 1970 (No. 131). Similarly, the ILO minimum wage policy guide and different country experiences that make use of evidence-based social dialogue for improving institutions and procedures for

setting adequate minimum wage levels and increasing the degree of minimum wage compliance have contributed to improving minimum wage systems and their efficiency for delivering positive outcomes.

In a majority of countries, governments have the last say when setting the level of the minimum wages. However, governments usually consult employers' and workers' organisations or independent bodies when fixing or adjusting the minimum wage. The use of technical or expert committees has also emerged, supporting social partners in their endeavour to set adequate minimum wages. The use of information and official statistics has contributed to have timely and sound evidence-based studies. Technical analysis is, therefore, left to these bodies that are composed of independent experts. Similarly, technical institutions undertake studies concerning the monitoring and impact of minimum wages on the social and economic context.

However, studies must follow empirical methods that are credible to test the effects of minimum wage increment on employment and wages accurately. The results are relevant not only for monitoring minimum wage policies but also for understanding the policy implications.

The last three decades have seen a great debate on minimum wage policy. The literature discussion has mainly focused on the externalities linked to such policies,

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¹Estimates are based on microdata of 72 countries, covering an estimated 73 percent of all the wage employees in the world. The number of wage employees earning less than the minimum wage is defined in the data as all those earning less than 95 percent of the minimum wage value; wage employees earning the minimum wage are defined as those earning between 95 and 105 percent of the minimum wage value.

²Since 2000, countries such as Ireland, Russian Federation, Croatia, Montenegro, Cabo Verde, Germany, Malaysia, Myanmar, Suriname and Qatar have adopted a minimum wage.

especially on the employment effects on the teenage population. There is a lengthy discussion on this subject, and many pieces of evidence have been collected for the U.S. The early nineteen nineties introduced rich research analysis and countervailing deliberations from authors such as Card, Krueger, Neumark, and Wascher. Various factors have influenced the different results on the employment effects.

The newly empirical methods have contributed to reducing the non-systematic judgments usually buttressed by variable qualities, methods, and the type of data that researchers used (Wolfson & Belman, 2019). In summary, the evolving discussions have provided evidence that demystifies the common perception that minimum wage policy is strongly linked to job destruction, thus losing its effectiveness. Moreover, the empirical evidence suggests that the labour market may not always characterise the theoretical proposal of the perfect competitive supply and demand framework (Dube A., 2019).

However, most of the research on minimum wages has been focused on developed economies. The meta-analysis on the effects of the minimum wage on employment for the latter is rich and has improved over time (Doucouliagos & Stanley, 2009; Stanley & Doucouliagos, 2012; Belman and Wolfson, 2014; Wolfson & Belman, 2019). The literature on employment effects due to minimum wage changes in emerging economies has little cumulative analysis. However, there is growing literature, with many authors gathering relevant outcomes with empirical research. For example, Broecke et al. (2015) reviewed the literature for countries such as Brazil, China, Chile, Colombia, India, Indonesia, Mexico, Russian Federation, South Africa, and Turkey. The overall conclusion signals that minimum wages have very little or no effect on overall employment in these countries. Apparently, for developing or emerging countries, minimum wages are associated with increases (decreases) in formal (informal) employment (Broecke et al., 2015). Belman and Wolfson (2016) also have revised some of the empirical findings on developing economies, and most studies seem to converge towards Broecke et al.

It is worth mentioning that some of the findings of the minimum wage impact. In some studies, low productivity firms exited, but surviving firms increased their productivity (Mayneris et al., 2014). There may be no employment effects in the small firm sector (a proxy of the informal sector) as a consequence of non-compliance

(Gindling & Terrell, 2009). Similarly, it is found that domestic workers increased their wages, not affecting hours of employment, probably due to partial compliance (Dinkelman & Ranchod, 2012). In an Indian case study, neither wage and employment effects vary for unskilled workers in the construction and retail sectors (Soudarajan, 2014). Other studies such as the Wolfson and Belman review show adverse effects on employment: when the minimum wage is measured by the wage gap (Strobl & Walsh, 2003), there is a negative elasticity of 0.13 (Harrison & Scorse, 2010); and some find a negative impact on employment but with low levels of wage elasticity to employment (Papps K.L., 2012).

The effect of minimum wages on employment in developing countries is related to the dual labour markets (formal and informal) and enforcement levels. Maloney and Mendez (2004) for Latin American countries, Lemos (2004) for Brazil, Dinkelman and Ranchod (2012) for South Africa, and Maloney and Nuñez (2004) show less consensus on the effect of minimum wage policies. Cunningham, however, points out there is a “lighthouse” effect where informal sectors cluster the minimum wage response around this value without complete levels of compliance.

Furthermore, due to the higher levels of non-compliance to be most effective, minimum wages may require to be accompanied by other policy measures in developing countries. The creation of paid employment, increasing productivity among sustainable enterprises, and the formalisation of the informal economy are required to improve the effectiveness of minimum wages. The present study makes use of credible empirical methods found in the literature to understand the implications of the Indian minimum wage policy on wages and employment in the last years. The quarterly periodic labour force surveys from the National Sample Survey Office (NSSO) enable the use of econometric techniques and quasi-experiment modelling in the Indian context to achieve this endeavour.

This paper is arranged as follows; section 2 provides an overview of the minimum wage framework in India and the recent legal reforms. Section 3 details the data sources. Section 4 provides descriptive results and analysis on the degree of minimum wage non-compliance in particular sectors of the economy. Similarly, Section 4 presents the methodology and results, and Section 5 concludes with a discussion.

▶ Minimum wage framework in India

India was one of the first developing countries to introduce minimum wage regulations. A proposed bill to address the conditions of low-paid workers was presented at the 7th Session of the Indian Labour Conference in 1945. Three years later, the Minimum Wages Act, 1948, was enacted and remained as an emblematic piece of legislation that has shaped minimum wage policy in India over the last seventy years. The Act initially covered 13 scheduled employments (including agriculture) and covered both regular and casual workers.

Through this legal framework, minimum wage rates are set both by both Central and State governments for employees working in selected 'scheduled' employment, for different categories of workers according to skill levels, location, and occupations. The Act, however, failed to prescribe the criteria for fixing the minimum wage level but provided for tripartite advisory boards in fixing minimum wages.

In 1955, the existing minimum wage fixing machinery and its administration enabled the Indian Government to ratify the important ILO Minimum Wage Fixing Machinery Convention No. 26 (1928). Over the years, many committees, councils, plans, and institutional bodies have introduced recommendations for improving the minimum wage procedures. The determination of minimum wage on a needs-based principle was realised on the recommendation of the Indian Labour Conference (ILC) of 1957. The ILC set normative need-based criteria for setting minimum wages³. In 1992, the Supreme Court, in a historic judgment in *Workmen vs Reptakos Brett & Co.*, added another component for needs-based minimum wage criteria: "children's education, medical requirements, minimum recreation including festivals/ ceremonies, and contingencies such as old age and marriage," calculated at 25 percent of the total minimum wage.

For many years, there has been an intense debate about introducing a national minimum wage. In 1991, the National Commission on Rural Labour revisited the issue of the national minimum wage. Noting the existence of

widespread disparities in minimum wages across the country and its adverse implications for rural labour, the Commission recommended a National Floor Level Minimum Wage. In 1996, the Government introduced the National Floor Level Minimum Wage but was not given statutory backing. It is usually revised every two years, and state governments are suggested to fix their minimum wages above this benchmark.

The Minimum Wages Act, 1948 allows the Government of India to revise and fix minimum wages for employees working in scheduled employment (ILO, 2018). The Central Government may fix minimum wages for scheduled employments under its authority, including railways, mines, oilfields, major ports, and any corporation under the central Government. For everything else, the state governments fix minimum wages through both committee and notification methods.⁴ There are no defined dates for setting the minimum wages at a State level. State governments have complete autonomy to incorporate scheduled employments and fix their minimum wages at any point in time. Similarly, there are no standard methods to define employments or categories of workers (unskilled or skilled) across States. This evolving process has contributed to building a complex web of minimum wage rates in India.

The minimum wage system in India has been expanded and acquired a degree of complexity that is perhaps unique in the experience of developing countries. The complexity to an extent reflects the economic and geographical diversity of the country; it has also arisen in response to significant changes in economic policy and the structural and demographic transformation underway in the country. Another source of complexity is the regulatory framework, including ambiguities under the wage-fixing and enforcement machinery.

At present, the minimum wage system in India has nearly 429 scheduled employments, with 45 in the Central sphere and the rest in various states, and 1,915 scheduled job categories for unskilled workers (GoI, 2018). The increase in wage rates has led to significant variations

³ These norms consist of (i) three consumption units for one wage earner without incorporating the earnings of women, children and adolescents; (ii) a minimum food requirement of 2,700 calories per adult person per day; (iii) clothing requirements at 72 yards per annum for an average family of four; (iv) house rent corresponding to the minimum area provided for under the Government's Industrial Housing Scheme; and (v) 20 percent of the total minimum wage for fuel, lighting and other miscellaneous items (GoI, 2018).

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not only across states but also within states. In some states or specifically scheduled employments, minimum wages are linked to the cost of living through a variable dearness allowance adjusted usually every six months to the consumer price index.

However, in many states, the minimum wage does not include the cost of living allowance (VDA). According to the Economic Survey 2018-19, the number of scheduled employment varies from 3 in Mizoram to 102 in Assam. Similarly, the lowest minimum wage rate (per day) varies from INR 115 in Nagaland to INR 538 in Delhi, and the highest minimum wage rate varies from INR 135 in Nagaland to INR 1192 in Kerala.

The Minimum Wages Act 1948, does not cover and is not universally applicable to all wage workers. Despite the elaborate structure and proliferation of scheduled employments over time, one in every three wage workers in India has fallen outside the realm of minimum wage protection (ILO, 2018). The absence of full coverage represents a significant constraint to measure the effects of the minimum wage policy and often led to the glaring absence of coverage of some major vulnerable categories, including domestic workers.

Further, the revision and adjustment of minimum wage rates have not been a regular procedure. Adjustment of minimum wages with the cost of living index is frequently arbitrary and uneven. So, within the same state, the real minimum wage rate has increased for specific categories

of employment. In contrast, in several others, it has declined (ILO, 2018).

At present, the various minimum wage rates notified under the Act in the Central and State spheres coexist with the non-statutory National Floor Level Minimum Wage (NFLMW). Despite being non-statutory and non-binding, the NFLMW can provide a useful benchmark. Consequently, over the years, most of the notified minimum wage rates in different states have moved above the NFLMW rate. Nevertheless, there are still a few states and occupations/job categories for which the prevailing minimum wage rates are below the NFLMW as of 2018-19. In addition, the NFLMW, usually adjusted every two years but has not been revised since July 2017.

The Code on Wages 2019 has introduced many changes to minimum wage regulation that addresses some of the critical caveats mentioned earlier. The wage code has universalised the due application of minimum wages and payment of wages to all employees and simplified the minimum wage structure (Satpathy et al., 2020). Similarly, it establishes the criteria and methods related to fixation, revision, and adjustment of the “floor wage” - a binding and statutory minimum wage for the whole of India. However, the implementation of the Code on Wages is an ongoing process and the study, which will revise the effects of minimum wage policy on wages and employment for the period 2017 to 2019, still falls under the Minimum Wages Act, 1948.

⁴ In India, two methods – the appointment of committees and notification in the Official Gazette – are used to fix and revise minimum wages under section 5 of the Minimum Wages Act, 1948.

▶ Data Sources

This study makes use of the Periodic Labour Force Survey (PLFS) 2017-18 and 2018-19 datasets to estimate the primary outcome variables 'average wages' and 'average days worked'. The data on variables such as gender, socio-economic group, general education level, marital status, religion, household size, and age of a worker is also sourced from PLFS. The data on minimum wages is compiled from state-level notifications on minimum wages. The minimum wage notification for all these states reports separate minimum wages for unskilled, semi-skilled, skilled, and highly skilled labour. Usually, states report different minimum wages for other scheduled employments. We have chosen 13 States for this study: Bihar, Delhi, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Odisha, Punjab, Rajasthan, Uttarakhand and Uttar Pradesh.

However, 10 states out of 13 states in the study report the same minimum wage within their respective jurisdictions across all scheduled employment categories. Therefore, a standard minimum wage is applicable within a state for the majority of scheduled employments. For states, which report different minimum wages for the other scheduled employment, we used employment-specific wages on which study has been conducted.

Moreover, as this study focuses on low-skilled workers, we considered only those individuals from PLFS who are unskilled or semi-skilled. National Classification of Occupation (NCO) 2015 has been used to classify workers into unskilled and semi-skilled categories in the PLFS dataset. The state net domestic product data is sourced from the Reserve Bank of India handbook of statistics on Indian states.⁵

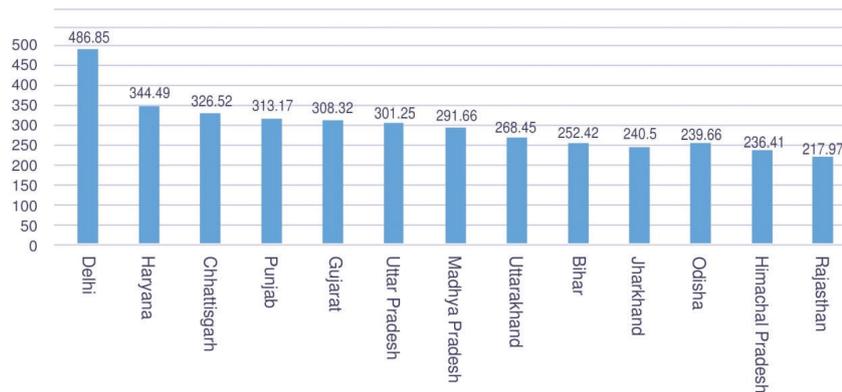
⁵Reserve Bank of India handbook of statistics on Indian states as accessed on 20th November 2020
<https://m.rbi.org.in/Scripts/PublicationsView.aspx?id=20005>

► Non-compliance with minimum wages

Non-compliance with minimum wages is one of the evident characteristics of minimum wages in developing countries like India. Figure 1 shows the state-wise average nominal minimum wages for 13 states used in the study, and figure 2 shows the state-wise proportion of workers not receiving minimum wages in five industrial groups considered for the study.⁶ States such

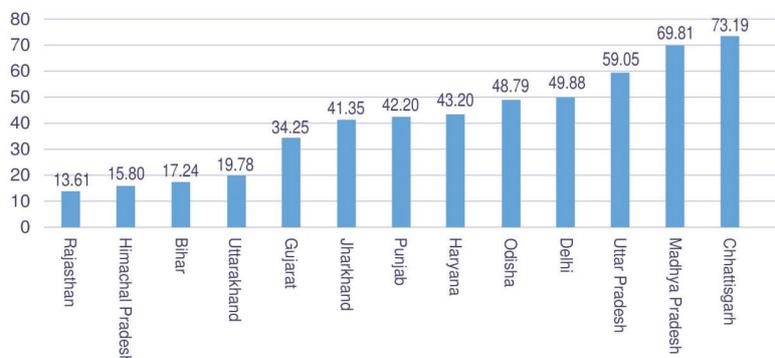
as Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and Delhi top the list in terms of non-compliance, where 73 percent, 70 percent, 59 percent, and 50 percent of the workers are not receiving minimum wages. On the other hand, in states like Rajasthan, Himachal Pradesh, Bihar, and Uttarakhand, non-compliance with minimum wages is below 20 percent.

Figure 1: State-wise average nominal minimum wages as of 31st December 2017



Source: Minimum wage notifications as published by respective states

Figure 2: State-wise proportion of workers not receiving minimum wages



Source: Author's estimation using PLFS 2017-18 and 2018-19

⁶ The five industrial groups are (a) Manufacture of food products and beverages; (b) Textiles and Apparels; (c) Water supply, sewage and waste management; (d) Construction; (e) Wholesale and retail trade, repair of motor vehicles.

Further, Table 1 provides the industrial group-wise non-compliance of minimum wages. Among the five industrial groups considered in the study, Waste management, Water supply, and sanitation, and textiles & apparel have a non-compliance rate of 34.6 percent and 37.9 percent, respectively, which is better than the rest of the sectors. Wholesale and retail, trade & repair, and maintenance of motor vehicles and construction have the worst non-compliance, of 48.5 percent and 46.9 percent respectively,

among the sectors we have considered. Can minimum wage have an impact on wages and employment given the low state of enforcement? Soundarajan (2019), in her study of low-skilled construction workers in India, has shown that the impact of minimum wages on employment is positive wherever the enforcement of minimum wages for construction workers is high in India. However, given the state of enforcement, the next section explores how wages are distributed around minimum wages.

Table 1: State-wise and industrial, the group-wise average proportion of workers not receiving minimum wages

State	Food products and Beverage	Textiles and Apparels	Waste Management, Water Supply	Construction	Wholesale and retail trade & repair and maintenance of motor vehicles
Himachal Pradesh	0.0	1.2	8.8	20.6	39.2
Punjab	42.9	29.2	12.8	53.0	46.3
Uttarakhand	7.9	37.5	33.2	15.9	25.9
Haryana	31.2	56.7	23.4	33.2	43.4
Delhi	64.7	50.8	3.8	52.3	48.7
Rajasthan	17.0	13.0	5.2	14.2	13.3
Uttar Pradesh	47.4	63.1	35.2	55.2	66.7
Bihar	15.5	14.1	9.0	15.2	23.1
Jharkhand	69.6	25.9	61.2	40.9	39.3
Odisha	36.8	74.8	49.9	57.5	31.0
Chhattisgarh	71.5	75.6	84.2	80.6	60.5
Madhya Pradesh	66.8	54.8	59.7	73.4	68.8
Gujarat	32.1	25.2	67.5	36.1	44.4
Total	43.6	37.9	34.6	46.9	48.5

Source: Author's estimation using PLFS 2017-18 and 2018-19

► Methodology and Results

5.1 Kernel Density Plots (KDPs)

Kernel Density Plots (KDPs) is one of the ways (regression analysis is the other) to analyse the impact of minimum wages on market wages (Wolfson, 2018). For minimum wages to impact employment, it would first have to impact market wages. KDPs help us in drawing a probability density function using non-parametric techniques. It is essentially a curve similar to a histogram whose edges are smooth. The maximum point on the curve gives us

an idea about where the majority of workers' levels of wages are clustered. If the curve is steep on both sides of a particular wage level, Ω , then that implies most of the workers are receiving wages that are clustered around Ω . In other words, wage level Ω is the focal point in the market for wage bargaining. If Ω turns out to be minimum wage, then that would imply minimum wages are acting as a focal point where wages of most of the workers are clustered.

Figure 3: Kernel Density Plots for Five industrial groups in 13 States of India

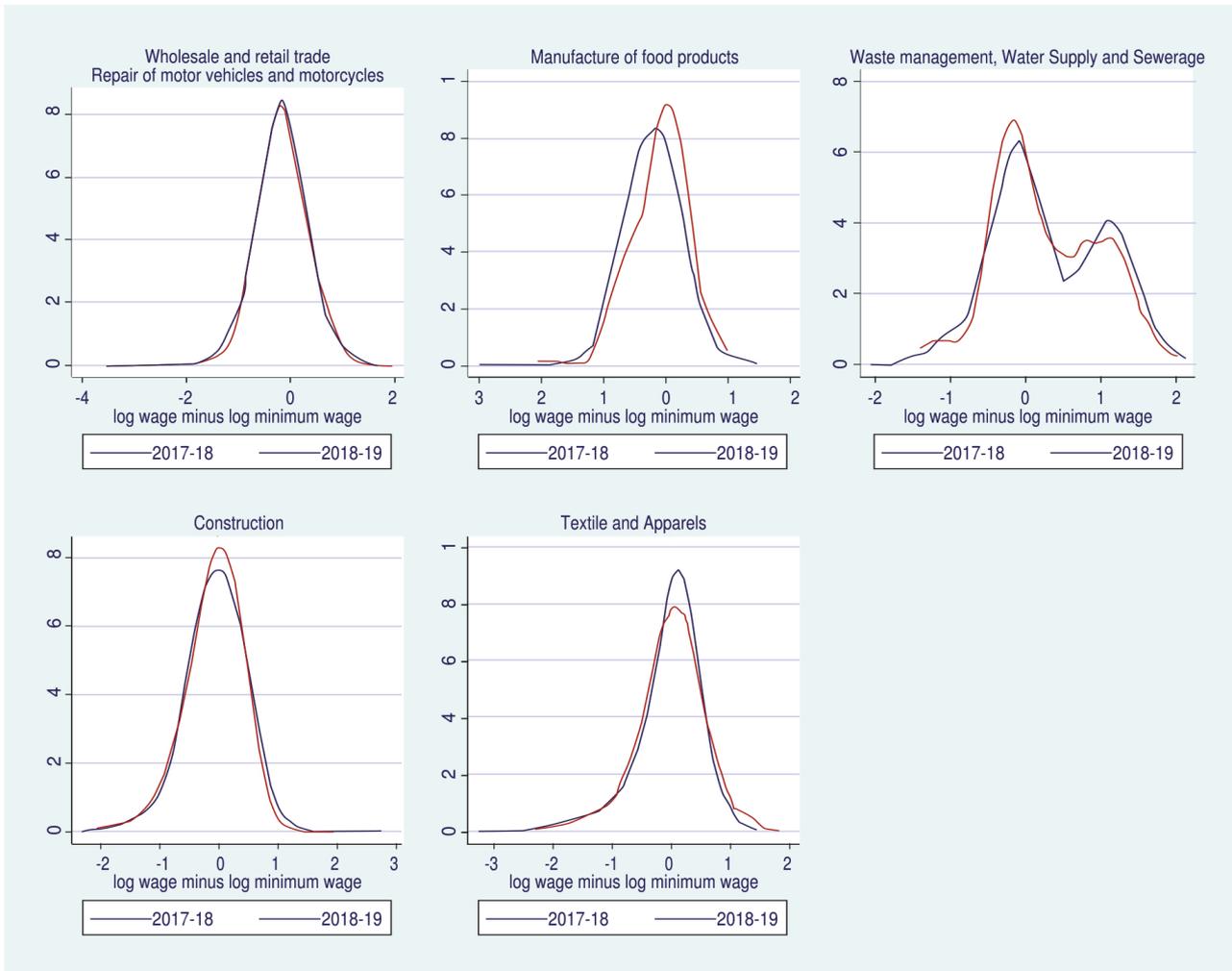


Figure 3 provides KDPs for five industrial groups, namely (a) Manufacture of food products and beverages; (b) Textiles and Apparels; (c) Water supply, sewage, and waste management; (d) Construction; (e) Wholesale and retail trade, repair of motor vehicles. Wages of all the low-skilled workers from urban regions spread across 13 states are considered to plot industry-wise KDPs. The plots are drawn for the year 2017-18 and 2018-19 using PLFS (2017-18) and PLFS (2018-19), respectively. The Y-axis of the plot provides information about the density of workers, and the x-axis shows the differences in market wages and minimum wages after undertaking the respective log transformation for both the market wages and minimum wages. Therefore, the value of 0 on the x-axis is the point where market wages are equivalent to minimum wages. With a high level of compliance, the KDPs would be truncated at the value of 0, and then skewed at the right hand side of the distribution. As we have high levels of non-compliance this is not the case. Furthermore, clustering of market wages for the majority of workers near 0 would imply that minimum wages are acting as a focal point for wage bargaining. Ideally, if the curve is steep on both sides of the value 0, then that would imply minimum wages are impacting the market wages.

We have found that for most of the industrial groups considered in this study, the curve is steeper on both sides, and the peak of the curve is at or near to the just left or right of the point where market wages are equivalent to minimum wages. This broadly implies that minimum wages do seem to impact the distribution of market wages. For instance, in wholesale and retail trade & repair of motor vehicles and motorcycles, the peak is just to the left of the point where market wages are equivalent to minimum wages. In the case of Wholesale and Retail Trade & Repair of Motor Vehicles and Motorcycles, this implies that non-compliance is an issue in this sector where most of the workers are getting wages just below the minimum wages. It can be postulated that if an increase in minimum wages complements effective enforcement, then that can impact both on market wages and employment.

For Textiles and Apparels, the peak is just to the right of the point where market wages are equivalent to minimum wages. This implies that market wages are clustered very near to minimum wages, and increasing minimum wages can have a positive impact on market wages and maybe, in turn, employment. For the construction sector and manufacture of food products, the peak is almost at the point where market wages are equivalent to minimum wages. For these sectors, the rise in minimum wages is expected to have an impact on market wages and, in turn, employment.

The KDP for waste management, water supply, sewerage, and sanitation is interesting. We have two peaks in this case, one just to the left of the point where market wages are equivalent to minimum wages and one on the far right of the same point. This implies that in this sector, a significant number of workers are receiving wages at or below the minimum wages, and another considerable number of workers are receiving wages well above the minimum wages. The workers on the right-hand peak

are maybe the workers hired by municipal corporations across states as permanent employees with formal benefits or workers employed in the formal sector. Moreover, the left peak might be informal workers with no access to social security benefits. In this case, the rise in minimum wages cannot have any impact on the wages of the workers present on the right peak. However, there is a possibility that it might have some impact on the wages of the workers currently on the left peak.

5.2 Regression analyses

State-time variation in statutory minimum wages can be utilised to identify the relationship between minimum wages and urban market wages & employment of unskilled and semi-skilled workers residing in urban areas. The availability of PLFS data allows us to do that for two time periods, 2017-18 and 2018-19. However, the new sampling frame of PLFS data allows us where many households have been revisited every quarter in urban areas and will enable us to have a panel for a total of eight quarters, four in each year. For our regression analyses, we have used a quarter as the period to create a panel.

In the literature, there are two regression specifications, (a) two-way fixed effect model and (b) border discontinuity designs. In this study, we will use both these specifications to analyse the impact of minimum wages on wages and employment—the outcome variable of interest is average wages and average work hours. The latter is used as an outcome for employment. Most of the control variables such as gender, socio-economic group, general education levels, marital status, religion, household size, and age of workers are listed in table 2. Apart from these control variables, we have also included the population of a state and state per capita net domestic product to account for demand conditions in all the regressions.

The first regression specification which we have used to estimate the impact of minimum wages on wages and employment is as follows:

$$Y_{ist} = \beta_0 + \beta_1 LnMW_{st} + \beta_2 X_{ist} + \beta_3 \gamma_{st} + D_t + D_s + \mu_{ist} \quad \text{eq (1)}$$

Where y_{ist} is the outcome variable for worker i in state s and at time t . The outcome variables are a log of semi-skilled and unskilled workers' wages. $LnMW_{st}$ is the statutory nominal minimum wage change of workers at the state level. X_{ist} is the set of control variables such as workers' education, social group, age, religion, household size, and marital status of the worker at the state level. γ_{st} corresponds to population and state net domestic product per capita to reflect the demand conditions. D_t and D_s are the time and state-fixed effects, respectively. We have considered yearly-quarters for time fixed effects. Ordinary Least Square (OLS) regression is utilised, and standard errors are clustered at the state level to account for the spatial correlation over time within the states (Bertrand et al., 2004; Abadie et al. 2017; Soundarajan, 2019). The coefficient β_1 captures the relationship between market wages or working hours and minimum wages.

Table 2: Summary statistics of essential control and outcome variables used in regression

Variable	Mean	Min	Max
A. Control Variables			
Gender			
Male	90.7%	0	1
Female	9.3%	0	1
Socio-Economic Group			
Scheduled tribe	5.2%	0	1
Scheduled caste	28.6%	0	1
Other backward communities	43.1%	0	1
Other castes	23.1%	0	1
General Education Levels			
Illiterate	26.8%	0	1
Below Primary school	8.3%	0	1
Completed Primary school	23.0%	0	1
Completed Middle school	41.9%	0	1
Marital Status			
Married	70.2%	0	1
Unmarried	29.8%	0	1
Religion			
Hindu	80.8%	0	1
Islam	18.2%	0	1
Christianity	.50%	0	1
Other religion	.50%	0	1
Household size	5.22	1	18
Average age of workers	35.54	15	65
B. Outcome Variables			
Average wage (in Rupees/day)	302.95	52	4230.77
Average work hours (per day)	7.54	0.5	18.86
Observations	15475		

Source: Author's estimation using Periodic Labour Force Survey (PLFS) 2017-18 and 2018-19

Moving forward, we first introduced district-level fixed effects, D_d , in eq (1), to account for district-level effects. The following regression specification is used for the same.

$$y_{ist} = \beta_0 + \beta_1 \text{LnMW}_{st} + \beta_2 X_{1st} + \beta_3 X_{2st} + D_t + D_d + \mu_{idt} \quad \text{eq (2)}$$

Table 3 and 4 provide estimates using eq (1) and eq (2), respectively. Looking at the results provided in table 3, we can infer a positive impact of minimum wages on both the market wages and employment. In both cases, the impact of minimum wages on wages is statistically significant at the 5 percent level. However, the impact of minimum wages on employment in the case of eq (1) is statistically significant at a 5 percent level of significance, and in the case of eq (2) At 10 percent level of significance. This gives evidence towards an overall positive impact of minimum

wages on employment. Theoretically, Stigler (1946) has argued that in the case of a monopsony, positive employment effects are seen at low minimum wages, and adverse employment effects are seen at higher minimum wages. In India, minimum wages for most of the states, as shown in figure 1 in section 3, are low enough to catalyse positive employment effects with their rise. Therefore, one could expect a positive employment effect. The coefficient on Ln minimum wages for the model (2) in table 3 and table 4 gives us the elasticity of employment concerning minimum wages. Using specifications given by eq (1) and eq (2), we have found that a 1 percent increase in minimum wages increases employment by 0.623% and 0.582% (table 3 and table 4 respectively), where the latter provides the results after accounting for both district and state fixed effects along with time fixed effects.

Table 3: Impact of minimum wages on wages and employment

	(1) Ln wage	(2) Ln hours worked
Ln min wage	0.351** (0.152)	0.623** (0.283)
Male	0.314*** (0.066)	0.086* (0.043)
Scheduled tribe	-0.068* (0.033)	-0.071*** (0.018)
Scheduled caste	-0.113*** (0.019)	-0.107*** (0.011)
Other backward communities	-0.086*** (0.022)	-0.056*** (0.010)
Age	0.029*** (0.003)	0.002 (0.002)
Age squared	-0.000*** (0.000)	-0.000 (0.000)
Illiterate	-0.090*** (0.013)	-0.074*** (0.018)
Below primary	-0.045* (0.023)	-0.029* (0.016)
Primary	-0.033* (0.016)	-0.030** (0.013)
Married	0.082*** (0.015)	0.005 (0.009)
Hindu	-0.156*** (0.048)	0.002 (0.039)
Islam	-0.211*** (0.048)	-0.045 (0.038)

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Christianity	-0.123*	-0.024
	(0.060)	(0.032)
Household size	-0.007**	-0.004**
	(0.003)	(0.001)
Ln population	0.130	-5.766
	(4.061)	(5.287)
Ln state net domestic product	1.800	1.451*
	(1.169)	(0.704)
Constant	-17.46	85.50
	(76.87)	(96.76)
Observations	15475	15421
R ²	0.239	0.133

Note: Standard errors in parentheses. Robust standard errors are clustered at the state level, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Impact of minimum wages on wages and employment - District fixed effects

	(1) Ln wage	(2) Ln hours worked
Ln min wage	0.297** (0.151)	0.582* (0.286)
Male	0.316*** (0.068)	0.093* (0.048)
Scheduled tribe	-0.043 (0.029)	-0.072*** (0.011)
Scheduled caste	-0.089*** (0.014)	-0.093*** (0.011)
Other backward communities	-0.070*** (0.018)	-0.055*** (0.011)
Age	0.028*** (0.003)	0.001 (0.001)
Age squared	-0.000*** (0.000)	-0.000 (0.000)
Illiterate	-0.075*** (0.012)	-0.066*** (0.013)
Below primary	-0.042** (0.018)	-0.029* (0.015)
Primary	-0.030* (0.014)	-0.034*** (0.010)
Married	0.068*** (0.013)	-0.009 (0.008)

Hindu	-0.062	0.019
	(0.048)	(0.039)
Islam	-0.093*	-0.005
	(0.050)	(0.037)
Christianity	-0.115*	-0.060
	(0.058)	(0.035)
Household size	-0.008***	-0.002
	(0.002)	(0.002)
Ln population	-0.326	-7.076
	(4.150)	(5.136)
Ln state net domestic product	0.675	0.460
	(0.703)	(1.147)
Constant	3.775	120.5
	(78.28)	(94.12)
Observations	15475	15421
R²	0.349	0.251

Note: Standard errors in parentheses. Robust standard errors are clustered at the state level,

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the following specification, eq (3), we use border discontinuity design (BDD) to analyse the impact of minimum wages on wages and employment. This approach has gained credibility over the years in the field of minimum wage research. Moreover, it has been an integral part of the “credibility revolution” that has become integral to empirical research in the file of labour economics and applied micro econometrics. This approach works by introducing local area or regional controls in the regression design, which can be used to control heterogeneity and policy discontinuities present in different states (Allegretto et al., 2013). The regression specification using BDD is given as follows and represented by eq (3),

$$y_{ist} = \beta_0 + \beta_1 \text{LnMW}_{st} + \beta_2 X_{ist} + \beta_3 y_t + D_t + D_d + D_p + \mu_{idt} \quad \text{eq (3)}$$

We prepared a border district database using districts of 13 states. The 13 states used in this study are spatially distributed in the north, north-west, the eastern and central belt of India. These states covered some of the largest states in terms of population, such as Uttar Pradesh, Madhya Pradesh, Rajasthan, etc. There is a total of 377 districts in 13 states. 69 percent of the districts share borders with other districts. Theoretically, there is a possibility of each district bordering with another districts. If a district is bordering two districts, then the workers present in the master district will have to repeat twice while merging the data with PLFS. Each district pair

database has to be stacked together to form one large dataset, which can hence be used to conduct regression analyses. D_p in regression eq (3) is the district border pair fixed effects. When district border pair fixed effects are introduced with district fixed effects, it sweeps away all the other heterogeneity and keeps only the heterogeneity present in border pair districts. That way, BDD design can be used to study the impact of minimum wage increases on wages and employment using ‘treatment’ and ‘control’ quasi-experimental settings. The assumption is that bordering districts are socio and economically similar; therefore, different levels of minimum wages can help to analyse its impact on the intended outcome variables. As the individuals are repeating in the master BDD database, robust standard errors are clustered by state and border pairs (Allegretto et al., 2013).

Using Border District Discontinuity design, we found that minimum wage positively impacts market wages and employment. Table 5 shows the minimum wage coefficient value of 0.273 and 0.512 when the outcome variable is wages and employment, respectively, both of which are significant at the 10 percent level of significance. That implies a 1 percent increase in minimum wages that increases the wages by 0.273% and employment by 0.512%.

Table 5: Impact of minimum wages on wages and employment using Border District Discontinuity Design (BDD)

	(1) Ln wage	(2) Ln hours worked
Ln min wage	0.273* (0.133)	0.512* (0.276)
Male	0.304*** (0.057)	0.084** (0.038)
Scheduled tribe	-0.059** (0.025)	-0.096*** (0.013)
Scheduled caste	-0.104*** (0.014)	-0.103*** (0.014)
Other backward communities	-0.079*** (0.016)	-0.063*** (0.011)
Other castes	0 (1.15e-10)	0 (0.000)
Age	0.026*** (0.003)	0.000 (0.002)
Age squared	-0.000*** (0.000)	-0.000 (0.000)
Illiterate	-0.086*** (0.013)	-0.068*** (0.013)
Below primary	-0.048** (0.018)	-0.032* (0.015)
Primary	-0.028* (0.015)	-0.032** (0.011)
Middle	0 (2.53e-11)	0 (5.12e-11)
Married	0.080*** (0.013)	-0.001 (0.007)
Hindu	-0.052 (0.047)	0.015 (0.033)
Islam	-0.091 (0.052)	-0.008 (0.029)
Christianity	-0.123* (0.057)	-0.033 (0.040)
Household size	-0.008*** (0.002)	-0.001 (0.002)
Ln population	-2.519 (3.815)	-6.847 (4.438)
Ln state net domestic product	1.035 (1.292)	0.814 (0.869)
Constant	39.16 (72.75)	112.7 (82.42)
Observations	20472	20442
R ²	0.374	0.251

Standard errors in parentheses. Robust standard errors are clustered at the state level and by border pair,
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

▶ Conclusion

The minimum wage system in India, where State governments set minimum wages independently from other States, seems to be an appropriate environment to use cross-state variations to estimate minimum wage effects, accounting for time-varying heterogeneity. This study using both a two-way fixed-effects model and a border discontinuity design provides an insightful approach to estimate minimum wage – employment and wage – elasticities in the Indian context.

The results provide evidence that minimum wage impacts both positively wages and employment on five industrial groups: Manufacture of food products and beverages; Textiles and Apparels; Water supply, sewage, and waste

management; Construction; and Wholesale and retail trade, repair of motor vehicles. These findings are based on state minimum wage changes between 2017-18 and 2018-19, for thirteen States in India. The analysis also shows a high level of minimum wage non-compliance, with few exceptions such as Rajasthan and Himachal Pradesh.

The Code on Wages in India, provides an opportunity to extend the minimum wage coverage to all wage earners, and enforce minimum wage provisions to increase the degree of compliance. Future research will show whether the impacts of minimum wages will differ with higher levels of enforcement.

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