Labour Market Deregulation and Reallocation: Evidence from India

Sarthak Basu[1] Subash Sasidharan[2]

Abstract

This study investigates the impact of labour market deregulation on industrial employment, wage rates and within-industry labour reallocation. Using plant-level panel data from the Annual Survey of Industries and the difference-in-differences approach, the findings of our study reveal that reforms led to significant improvements in employment levels and wage rates across the states that implemented them. Additionally, the reforms facilitated labour reallocation within industries, resulting in more efficient utilization of labour resources and enhanced aggregate productivity. This reallocation stemmed from a reduction in labour distortions in more productive firms, likely driven by the relaxation of hiring and firing restrictions. Overall, these results highlight the role of labour market flexibility in efficient resource allocation and productivity gain.

[1] Department of Humanities and Social Sciences, Indian Institute of Technology Madras, Chennai, India

[2] Department of Humanities and Social Sciences, Indian Institute of Technology Madras, Chennai, India

1 Introduction

Currently, the Indian economy is facing significant employment challenges, driven by its expanding workforce.[3] Although the manufacturing sector has considerable potential for job creation due to its capacity to absorb a large workforce, especially in labour-intensive industries, numerous challenges hinder its growth potential, including regulatory burdens, inadequate infrastructure and skill mismatch in the workforce. Among regulatory costs, rigid labour laws are often cited as one of the contributing factors. Recognizing this barrier, some Indian states implemented numerous labour market reforms that eased hiring and firing regulations with the objective of enhancing labour market flexibility, thus raising the thresholds for compliance to certain labour laws and simplifying unionization rules. These reforms sought to reduce the regulatory costs incurred by firms, allowing businesses to expand and generate employment opportunities. Considering this context, this study seeks to examine the impact of these reforms on labour market outcomes. Specifically, we examine the effect of easing hiring and firing restrictions on formal employment, wages and misallocation of labour.[4]

Historically, the impact of labour laws on firm performance in India has long been a subject of debate among scholars. One group argues in favour of relaxing labour laws, emphasizing that it is likely to improve firm performance. For instance, Besley and Burgess (2004) found that the Indian states that adopted pro-worker regulations subsequently experienced lower growth in employment, productivity, output and investment in formal manufacturing. They argued that such regulations impose restrictions on firms, leading to operational inefficiencies, which in turn lower their growth potential. Similarly, Ahsan and Pages (2009) showed that labour laws that raise the cost of employment protection or dispute resolution lead to a decline in formal sector output and employment, even though the cost of industrial dispute resolution on the total output is larger. Mitra and Ural (2008) identified a positive relationship between trade liberalisation and productivity, especially in states with less rigid labour laws. Along these

[3] The Economic Survey (2023–24) highlights that India needs to create 7.85 million jobs annually until 2030 to sustain economic growth and promote social inclusion. The report further emphasizes that generating adequate employment opportunities, particularly in the non-farm sector, poses a crucial challenge to accommodating the country's rapidly expanding workforce.

[4] We seek to examine whether these reforms led to any changes in misallocation, which is closely linked to the overall allocative efficiency of resources and aggregate productivity within the organised manufacturing sector.

lines, Dougherty, Robles and Krishna (2011) found that, on average, plants in labour intensive industries located in more flexible labour markets attain higher total factor productivity (TFP) than their counterparts in more rigid labour markets. Hasan and Jandoc (2012) highlighted that stringent labour regulations negatively affect firm size distribution, finding that larger firms are more prevalent in states with flexible labour regulations. Furthermore, a study by Adhvaryu, Chari and Sharma (2013) tested the hypothesis that rigid firing restrictions reduce firms' ability to adjust their workforce during market fluctuations, revealing that industrial employment is more sensitive to shocks in places where the labour market is less rigid. Meanwhile, Ahluwalia et al. (2018) studied the impact of the abolition of quota restrictions in apparel and textile industries in 2005 on firm employment and wages. Using a difference-in-difference strategy, the researchers observed a significant increase in employment and wage in the apparel and textiles industry post-2005 in states with more flexible labour regulations. These gains were either less prominent or not present in labour-intensive industries other than apparel and textiles. In addition, Lee (2019) highlighted the absence of labour demand in regions with an inflexible labour market. Amirapu and Getcher (2020) found that rigid labour regulations increase labour costs by as much as 35%, which translates to higher financial burden on firms. They also provided evidence suggesting a positive correlation between labour regulation and corruption, resulting in further inefficiency.

In contrast, the other set of studies did not find any link between labour laws and firm growth. D'Souza (2010) found that employment protection regulation does not have a negative impact, since firms often adopt modified work practices and reorganised job boundaries to increase job flexibility, often taking advantage of the weak enforcement of laws. Furthermore, Roychowdhury (2019a) argued that labour laws cannot be held responsible for employment stagnation in organised manufacturing because they apply to less than 35% of total employment. Moreover, no evidence of hiring and firing restrictions leading to stagnation in the sector was identified. This study also detected a clear decline in workers' bargaining power based on various indicators. Roychowdhury (2019b) went on to claim that the theoretical basis for labour market flexibility is not sound. In the context of labour reforms in Gujarat, Deakin and Halder (2015) identified weak evidence connecting labour deregulation to growth.

Based on the above discussion, it is evident that the impact of labour reforms on firm-level outcomes is largely inconclusive. This lack of consensus among previous studies on labour market flexibility and firm performance stems from both the analytical approaches employed

and the corresponding methodological interpretations. For example, most existing studies used an index-based measure of labour market flexibility developed by Besley and Burgess (2004). However, such index-based measures have drawn criticism. Bhattacharya (2006) argued that these measures are entirely based on de jure indicators, which are highly misleading and inadequate for capturing a state's labour market flexibility. Addressing this issue, Roy, Dubey and Ramaiah (2020) constructed a measure of labour market flexibility by incorporating both de jure and de facto indicators of flexibility, finding no significant association between spatial differences in labour market flexibility and variations in employment growth. Notably, the study also found employment growth to be lower in less rigid states compared to more rigid states, indicating that higher flexibility is associated with a weaker employment outcome.

In this context, recent reforms in the labour laws of a few Indian states offer a unique quasi-natural setting for understanding the effect of labour market flexibility.[5] A pertinent question in this regard is whether these labour reforms impacted employment and wage rate in the organised manufacturing sector. If labour reforms act as an obstacle to firm growth, their impact is expected to be more pronounced in labour-intensive sectors, given that they rely heavily on labour-intensive processes. In contrast, sectors which are relatively less dependent on labour input and more dependent on capital and technology may exhibit a lower response to changes in labour laws. Therefore, the empirical analysis conducted in this study aims to capture the differences in the impact of reforms on manufacturing employment across industry types. Notably, it is impossible to predict the impact of reforms on employment a priori because, as posited by Hopenhayn and Rogerson (1993), it depends on the net effect (from job creation and job destruction).

Furthermore, this study analyses the impact of reforms on wage rates, which is essential not only from the perspective of employee welfare but also in terms of meeting policymakers' goal of achieving inclusive growth. If reforms enable previously constrained firms to hire more

[5] Based on the assumption that labour market regulation has adverse effects on firm growth and performance, some Indian states started adopting a series of labour reforms during 2014–2017. A number of reforms in labour laws were introduced, with the most significant changes being made to the Industrial Dispute Act (IDA), 1947. Previously, firms employing more than 100 regular workers were mandated to seek government approval to lay off workers or close down factories. Following the reforms, the threshold was increased from 100 to 300 regular workers. This study mainly focuses on the impact of the changes in IDA on labour market outcomes.

employees, both employment and wages can be expected to increase. In this context, an increase in the average wage rate is likely to lower wage disparities, improve the living standards of workers and contribute to poverty reduction. This, to some extent, can counter the increased job insecurity originating from the increased bargaining power of employers due to the reforms.

Another issue related to labour reforms is their impact on job reallocation. A growing body of literature has attempted to find evidence of how distortions in credit and input markets (capital and labour) lower allocative efficiency and contribute to misallocation (Restuccia and Rogerson, 2013). Among these studies, few attempted to find direct evidence of this phenomenon by analysing the impact of certain policy changes on misallocation and allocative efficiency. However, empirical evidence of the impact of labour market regulations on reallocation and allocative efficiency is still limited and inconclusive. In this context, some existing theoretical models have shown that labour regulations, such as hiring and firing costs and size-dependent policies that increase adjustment costs, have a negative impact on resource allocation and aggregate outcome (Bentolila and Bertola, 1990; Guner et al., 2008; Hopenhayn and Rogerson, 1993; Lagos, 2006). For instance, Hopenhayn and Rogerson (1993) developed a general equilibrium model to examine firm-level labour reallocation to find that firing taxes distort labour allocation across firms, with TFP losses of approximately 5% arising from these distortions. In line with these theoretical insights, empirical evidence has shown that rigid labour laws reduces allocative efficiency (Andrews & Cingano, 2014; Bassanini et al., 2009; González & Miles-Touya, 2012; Petrin & Sivadasan, 2013). Furthermore, studies conducted by Petrin and Sivadasan (2013) as well as González and Miles-Touya (2012) analysed resource misallocation at the firm level by focusing on the effects of changes in severance payments on allocative efficiency. Similarly, Gnocato et. al (2020) found that reforms aimed at apprenticeship contracts in Italy had a positive impact on allocative efficiency. In the context of India, Mohammed et. al (2021) showed that states with less rigid labour markets experience[6] lower misallocation. Furthermore, they found that reforms that enhanced labour market flexibility also allowed more productive firms to expand, with the impact being more pronounced in states with high informality. Therefore, building on the allocative

[6] As a measure of labour market flexibility, Muhammad et al. (2021) used the OECD index of changes in Employment Protection Legislation (EPL), further modified by Dougherty (2008). However, the OECD index has been criticised by Bhattacharya (2014) on several grounds. Refer to Bhattacharya (2008) for further details.

efficiency/misallocation literature, we examine the impact of labour reforms on within-industry reallocation and allocative efficiency in the latter half of the study. In particular, we explore whether labour deregulation has uneven effects with respect to employment and wages across firms with different productivity levels by comparing more and less productive firms. Furthermore, we assess whether deregulation has an allocative dimension that has implications for aggregate productivity gains within the organised manufacturing sector.

Finally, we look for heterogenous impacts and examine whether the outcomes are driven by specific mechanisms. In particular, we examine whether the heterogeneity stems from differences in the constraints faced by productive firms prior to reforms. This is because firms that were previously more constrained may benefit disproportionately from the easing of hiring and firing restrictions, since this would have reduced their regulatory costs. As a result, these firms would be likely to access more labour during the post-reform period.

In the context of India, Goswami and Paul (2021) analysed the impact of the easing of labour regulations in the state of Rajasthan in 2014 on industrial employment, reporting that the reforms did not increase employment in the state. Similarly, Chaudhary and Sharma (2022) examined the impact of labour reforms in Rajasthan on employment and firm-level labour distortions to find that the reforms led to a decrease in implicit regulatory costs associated with labour, but had no significant effect on the employment level. The current study differs from these previous studies in that the latter confined their focus to the experiences of a single state, Rajasthan, even when five other Indian states had also implemented similar reforms during the same period. As Goldar (2023a) noted, analysing reforms in just one state may limit findings, since it risks confounding the treatment effect caused by contemporaneous trends unrelated to the reform, thereby violating the parallel trends assumption (Baker et al., 2021). Therefore, maintaining a narrow focus may yield biased and misleading results. In contrast, the inclusion of multiple cases can help mitigate these confounding effects and offer more reliable conclusions. Furthermore, while Chaudhary and Sharma (2022) assessed the implicit regulatory cost of labour across all firms, the approach adopted in the current study enables a closer examination of within-industry reallocation. We compare changes in total labour and employment between more and less productive firms before and after the reforms across treated and control states, thereby providing direct evidence of any reallocation that may have occurred due to the reforms. Recently, Goldar (2024) analysed the impact of labour reforms on employment in six Indian states to find that the easing of labour regulations contributed

positively to job creation in Indian manufacturing. In this study, we extend the findings of Golder (2024) by incorporating industry heterogeneity into our analysis. Furthermore, apart from analysing employment effects, we also account for the effect of reforms on wage rates and within-firm reallocation.

To analyse the impact of labour reforms on employment and wage rates, we employed the difference-in-differences (DID) estimation approach. For the purpose of our analysis, we used the longitudinal version of the Annual Survey of Industries (ASI) from 2008–09 to 2019–20 using a common factory identifier. Notably, ASI is the principal source of industrial statistics in India. Its panel data set up allowed us to track changes in a plant's outcomes over time and across cross-sections. Furthermore, employing the DID approach served to address the limitations related to index-based measures of labour market flexibility by allowing for more robust and causal inferences.[7] At the same time, it also helped address some of the criticisms[8] directed at misallocation studies by attempting to identify the specific sources of misallocation, thereby offering valuable insights from a policy perspective.

Our findings emphasise that the impact of the reforms on employment and wages varied across industry types. We found that labour-intensive sectors experienced a significant increase in both overall and direct employment following the reforms. We also observed a significant positive impact of reforms on wage rates. In contrast, although a positive impact of reforms on employment and wages was identified in the case of less labour-intensive sectors, it was not statistically significant. With regard to the second research question, the reforms were found to have had a heterogenous impact on plants based on their productivity levels. For both labour-intensive and less labour-intensive sectors, the productive firms managed to employ a larger number of workers (both total and direct workers). In contrast, following the reforms, a significant decline was observed in the total number of workers employed by less productive firms. These firms also experienced a decline in the number of direct workers, although this

[7] Some scholars argue that changes in labour laws are influenced by various economic factors and that they do not directly determine economic indicators (Dutta Roy, 2004; Deakin & Sarkar, 2011). Employing DID can mitigate this concern by comparing the pre- and post-reform periods across the treated and control states.

[8] A common criticism in misallocation literature pertains to attributing all observed cross-sectional variations in the marginal products of inputs to misallocation. However, in presence of measurement errors, model mis-specifications, and adjustment costs, the observed misallocation may be biased upwards. Even when all these factors have been accounted for, studies have largely been silent about the specific sources of this misallocation.

effect was not statistically significant. Moreover, while examining the impact of the reforms on wage rates across firms with different levels of productivity, we found evidence of a significant increase in wage rates pertaining to more productive firms compared to less productive ones. These findings point to the possibility that, to some extent, wage differentials may have facilitated the movement of workers from less productive to more productive firms in the post-reform period.

We contribute to the ongoing debate concerning the impact of deregulation in the Indian manufacturing sector by providing evidence of the positive impact of labour reforms on employment and wage rate, especially in labour-intensive industries. We found that the impact of labour reforms was more pronounced in labour-intensive industries, which highlights the importance of accounting for industry heterogeneity while examining the impact of labour deregulation. Furthermore, we provide evidence of within-industry reallocation of resources from less productive to more productive firms. This reallocation can be linked to improved allocative efficiency, which has significant implications for enhancing aggregate productivity in the sector. It also emphasises the role of policy interventions in addressing factor allocation inefficiencies. Moreover, we contribute to the misallocation literature by gathering evidence of a reduction in firm-specific labour distortions due to labour deregulation, which enabled more productive firms to gain greater access to labour inputs. This finding can offer important insights into the role of misallocation in the context of a developing economy, such as India.

Furthermore, drawing on the misallocation literature, we sought to identify plausible reasons for the increase in employment observed among the more productive firms in comparison to their less productive counterparts during the post-reform period. We found that highly productive firms faced greater labour distortions than less productive firms during the pre-reform period, which might have acted as a constraint to accessing adequate amounts of labour. However, following the reforms, these distortions experienced by the more productive firms reduced significantly. Notably, this decline can possibly be linked to the easing of regulatory costs, which enabled the firms to hire more workers by offering higher wages. Moreover, as a robustness check, we conducted a placebo test to examine whether any pre-existing trends were driving our results. For this purpose, we considered the pre-reform period (2008–09 to 2013–14) and hypothetically assumed that the reforms were implemented in the six states in the year 2011, instead of on and after 2014. We found no significant impact of the hypothetical reform on employment and wages. Overall, the placebo tests further validated our main findings.

The rest of this study is structured as follows: The next section provides a brief summary of the changes in the labour laws of the six Indian states, Section 3 describes the data and lists the descriptive statistics, Section 4 outlines the empirical framework employed in this study, Section 5 discusses the results, Section 6 outlines the additional results obtained on examining the impact of reforms on firms that employed more than 300 regular workers in the pre-reform period and Section 7 explains the robustness checks implemented to validate to our main results. Finally, Section 8 concludes the study.

2 Summary of recent labour market reforms

Between 2014 and 2017, a series of reforms were introduced across six Indian states—Rajasthan (2014), Maharashtra (2015), Andhra Pradesh (2015), Haryana (2016), Jharkhand (2017) and Uttar Pradesh (2017)—with the assumption that it will contribute to formal job creation and overall growth in the Indian manufacturing sector. Rajasthan was the first state to initiate these reforms, followed by the other states. In November 2014, Rajasthan made several amendments to its industrial labour laws. One such key change was made to the Industrial Disputes Act (IDA), which raised the threshold employment size for requiring government permission to shut down or retrench workers from 100 to 300 workers (Chapter V-B). Furthermore, with respect to unionization, the minimum membership required to form a union was increased from 15% to 30% of the total workforce. Additionally, the time period within which workers can raise objection regarding their discharge or retrenchment was set to 3 years, whereas no time limit had existed previously. Two other labour-related laws were also amended. First, the Factories Act was revised to increase the threshold for coverage under the Act from 10 or more workers in a firm that uses electricity to 20 or more, and from 20 or more workers in a firm that does not use electricity to 40 or more. Second, the Contract Labour (Regulation and Abolition) Act was revised to be applicable to establishments employing 50 or more contractual workers, up from the previous threshold of 20 such workers.

3 Data source and descriptive statistics

In this study, we utilized plant-level panel data for the Indian manufacturing sector sourced from the ASI, which is conducted by the Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI). The ASI is a nationally representative survey of manufacturing plants and establishments registered under The Factories Act, 1948. This act plays a key role in regulating manufacturing activities in India, covering all establishments

using electricity that employ 10 or more workers or those not using electricity that employ 20 or more workers. Notably, the dataset for this study encompassed the formal manufacturing sector in India. In the ASI data, establishments are categorized into two groups: the census sector and the survey sector. The census sector includes plants with more than 100 workers, those that submit joint returns to the ASI, or those located in industrially underdeveloped regions, such as Manipur, Meghalaya, Nagaland, Tripura and the Andaman and Nicobar Islands. These plants are surveyed annually. The survey sector, on the other hand, includes plants that do not fall under the census sector and are selected through a systematic circular sampling technique based on the state, industry, sector and a 4-digit stratum. Our study incorporated data pertaining to manufacturing plants belonging to both the census and survey sectors.

This study covers the period from 2008–09 to 2019–20. We initially gathered around 7 lakh observations, after which the data were cleaned by accounting for the plants that reported non-negative values for gross value added, total labour, capital and materials. Notably, only those plants that were present both in the pre- and post-reform periods were included. For the regression analysis, plants that were accorded the operating status code "1" (currently operating) in the ASI dataset were taken into consideration. Subsequently, the output and input variables were deflated using the wholesale price index (WPI) established by the Central Statistics Office (CSO) to obtain the values in real terms. Analysis was conducted at the three-digit level of the National Industrial Classification (NIC). After the filtering process, the final dataset comprised around 2.4[9] lakh plant–year observations.

We defined the states as treated states if the reforms were implemented during our study period, which include the states of Rajasthan (2014), Maharashtra (2015), Andhra Pradesh (2015), Haryana (2016), Jharkhand (2017) and Uttar Pradesh (2017). Similar to Goldar (2024), the control states (those that did not implement reforms during the study period) chosen for the current study were West Bengal, Punjab, Karnataka, Gujarat, Chhattisgarh, Madhya Pradesh and Tamil Nadu. Table 1 below reports the summary statistics for the key variables used in our analysis.

Table 1: Descriptive Statistics

[9] 1 lakh equals 100 thousand.

Variables	No. of Obs.	Description	Mean	Std. Dev	Min.	Max.
Total employment	240,875	Average number of persons employed in the plant in year t.	287.81	832.83	1	87427
Direct employment	240,022	Average number of persons directly employed in the plant in year t	152.941	573.66	0	71587
Employed through contract	149.614	Average number of persons contractually employed in the plant in year t	129.126	352.81	0	23576
Wage rate (in thousands)	240,875	Ratio of total emoluments to the total number of persons engaged, deflated by the value added price index	125.095	196.26	0.877	3081
Capital (₹ in Billions, deflated)	240,875	Average of the opening and closing book values of fixed assets (net of depreciation)	0.410	4.18	0.0069	658.03
Output (₹ in Billions, deflated)	240,875	Sum of the gross value of products sold, changes in finished good and semi-finished good inventories, and all other sources of revenue	1.213	7.94	1.216027	792.12

Total factor productivity	240,875	Log of productivity, as per the semi-parametric proposed by Ackerberg et al. (2015)	9.52	1.02	0.56	17.20
Reform	240,875	Dummy variable that takes the value 1 if a particular state has implemented reforms at time t, or 0 otherwise	0.171	0.376	0	1
Size	240,875	Ratio of total employees to industry median employees	1.03	2.29	0.001	142.20
Age	240,875	Current year minus the year of establishment	21.53	16.27	1	216

Source: Author's computations based on ASI unit-level panel data for 13 states from 2008–09 to 2019–20.

As shown in Table 1, in our sample, the average number of workers engaged in a firm was around 287, with the highest number of employees in a firm being around 87000 workers. Furthermore, the average number of directly employed and contractual workers were round 152 and 129, respectively. As for the wage rate, the average annual salary per employee was ₹125,000, or approximately ₹10,500 per month. The mean log value of TFP was found to be 9.52, while the average firm age was around 21 years.

4 Empirical framework

We analysed the impact of labour market reforms on employment and wage rates using a DID strategy. Specifically, we compared the overall regular employment and overall wage rates of labour-intensive industries[10] with those of less labour-intensive ones. Notably, for this analysis,

[10] The classification of labour-intensive industries at the NIC 3-digit level is presented in Appendix 1. For this classification, we referred to the NILERD Report 1/2016 (Parida et al. 2016). In this study, industries were

we considered only those plants characterised by an average pre-reform direct employment of less than 300 workers. In the later part of our analysis, we also examined the employment outcomes for plants with an average pre-reform regular employment of more than 300 workers. We estimated the following panel regression model:

$$Outcome_{imst} = \mu + \beta_1 * Reform_{st} + \Gamma X_{it} + \delta_i + [\theta_m * \vartheta_t] + \emptyset_s + \varepsilon_{imst} \quad (1)$$

where *i* denotes plant, *m* refers to industry, *s* indicates state and *t* denotes time. Furthermore, $Outcome_{imst}$ refers to the variable of interest consisting of the log value of the total number of persons engaged, regular workers and contractual workers, while $Reform_{st}$ is a dummy variable that takes the value 1 if a particular state has implemented reforms at time *t*, and 0 otherwise. In other words, in this study, it took the value 1 for plants located in Rajasthan from 2013–14 to 2017–18, but took the value 0 for plants situated in Rajasthan for the observations from 2008–09 to 2013–14. In a similar manner, $Reform_{st}$ was assigned the value 1 or 0 for plants located in Andhra Pradesh, Jharkhand, Haryana, Maharashtra and Uttar Pradesh, which are the other five states that implemented labour reforms during 2015–17. In the case of the plants in the other states included in this study that did not implement labour reforms, $Reform_{st}$ was assigned the value 0 for the entire study period. Meanwhile, β_1 refers to the DID estimator that captures the impact of labour reform on employment. Notably, a positive and significant β_1 value implies an increase in the outcome variable of the treated states vis-a-via the control states post-reform. This may happen if the reforms result in lowering of the firm's frictions in terms of access to labour. X_{it} denotes the control variables, which include firm size, age (time since incorporation) and gross value added. Notably, we also included firm fixed effects (δ_i), industry times year fixed effects ($\theta_m * \vartheta_t$) and state fixed effects ($\emptyset_s$) to account for unobserved heterogeneity.

In the second part of our analysis, we examined whether the labour reforms had a heterogenous impact on plants based on their productivity. This allowed us to identify whether the reforms had an allocative dimension, which is likely when plants with different productivity levels (highly productive plants versus less productive plants) experience a post-reform differential effect in terms of their access to labour.

identified as labour intensive based on their labour intensity (labour to capital (L/K) ratio), which was then compared with the overall industry average.

To examine the effect of labour reforms on the allocation of resources across firms within industries, we estimated the following model following Bau and Matrey (2022):

$$Outcome_{imst} = \mu + \beta_1 * Reform_{st} + \beta_2 Reform_{st} * High\_Prod_i + \Gamma X_{it} + \delta_i + [\theta_m * \vartheta_t] + \emptyset_s + \varepsilon_{imst} \quad (2)$$

In this equation, $High\_Prod_i$ is an indicator variable that takes the value 1 if a plant had high pre-reform productivity,[11] and 0 otherwise. To determine whether a plant had high or low productivity prior to the reforms, we averaged the measures of productivity of each plant over 2008–09 to 2013–14 (the last year before the reforms) and then classified the plants as more productive if their average productivity was above the 3-digit industry-level median. Furthermore, β_2 – our main variable of interest – captures the differential effect of the reforms on more productive firms vis-à-vis less productive ones. A positive value of β_2 implies an increase in the outcome variable for more productive firms compared to less productive firms belonging to industries located in the treated states compared to industries situated in the control states. Meanwhile, in the case of the outcomes of a less productive firm, the β_1 estimates would be different. Similar to Equation 1, we included size, age and gross value added as the other controls, as well as firm fixed effects, industry times year fixed effects and state fixed effects to account for unobserved heterogeneity.

5 Results

Table 2 reports the results obtained on analysing the impact of reforms on employment and wages in plants with less than 300 regular workers in labour-intensive industries. As evident from Table 2, we identified a positive and significant increase in both total employment and regular employment in the post-reform period. We also found a statistically significant increase in wage rates during this period. In terms of magnitude, after the reforms, total employment increased by 8.1%, regular employment increased by 9.7%, and the wage rate increased by ₹4777.3 on an average. In contrast, no statistically significant impact of the reforms on employment and wages was observed for less labour-intensive industries. This finding confirms that the impact of the reforms varied with regard to industry heterogeneity, with the impact being more pronounced for labour-intensive industries.

[11] The TFP of each firm was calculated using the semi-parametric method following Ackerberg et al. (2015; ACF henceforth). The details of the estimation are provided in Appendix 2.

Table 3 present the results corresponding to Equation 2. Columns 1–3 of Table 3 pertain to the impact of the reforms on within-firm reallocation in labour-intensive industries, whereas Columns 4–6 relate to the impact in less labour-intensive industries. The results indicate that more productive firms in the treated states experienced an increase in overall direct employment and wage rates. In contrast, less productive firms experienced a decline in both overall employment and contractual employment. Notably, we did not find any significant differences in regular (direct) employment in the post-reform period compared to pre-reform outcomes. These results highlight that the effect of the reforms on within-industry reallocation was greater for labour-intensive industries than less-labour intensive industries. They further suggest that the reforms had an overall allocative impact, with labour resources shifting towards more productive firms, which likely increased allocative efficiency in the treated states. This, in turn, had positive implications for overall productivity in the organised manufacturing sector.

Table 2: Impact of Labour Reforms on Employment and Wages: Labour-Intensive Sectors versus Less Labour-Intensive Sectors

	Labour-Intensive Sectors			**Less Labour-Intensive Sectors**		
Variables	**Ln (Total Persons Engaged/Output) (1)**	**Ln (Directly Employed/Output) (2)**	**Wage rate (3)**	**Ln (Total Persons Engaged/Output) (1)**	**Ln (Directly Employed/Output) (2)**	**Wage rate (3)**
Reform_{st}	0.0811**	0.0974**	4777.3**	0.2487	0.0303	2797
	(0.0268)	(0.0371)	(2126.29)	(0.0192)	(0.0215)	(1917.72)
Size	0.4830***	0.2681***	-21523.29***	0.2797***	0.1394***	-17389.9***
	(0.0332)	(0.0332)	(0.0332)	(0.0472)	(0.0329)	(4218.087)
Ln_GVA	-0.5336***	-0.5461***	10044.73***	-0.5723***	-0.5803***	9179.02***
	(0.0148	(0.0315)	(1069.655)	(0.0195)	(0.0207)	(1206.573)
Age	0.0440***	0.0705***	3752.91	0.017	0.0402**	2717.227**
	(0.0109)	(0.0007)	(2279.207)	(0.0106)	(0.0137)	(1184.466)
Firm FE	YES	YES	YES	YES	YES	YES
Industry* Year FE	YES	YES	YES	YES	YES	YES
State FE	YES	YES	YES	YES	YES	YES
Observations	38,577	36,290	38,577	172,836	162,165	172,836

Clustered standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 3: Impact of Labour Reforms on Employment and Wages (More versus Less Productive Firms): Labour-Intensive Sectors versus Less Labour-Intensive Sectors

Variables	Labour-Intensive Sectors			Less Labour-Intensive Sectors		
	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage rate (3)	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage rate (3)
$Reform_{st}$	-0.0438 (0.0296)	-0.0283 (0.0428)	1202.095 (2430.005)	-0.0518** (0.019)	-0.023 (0.0223)	-3431.122 (2259.651)
$Reform_{st}$* High_Prod	0.2298*** (0.0492)	0.1281** (0.0478)	6546.86* (3433.584)	0.1427*** (0.0189)	0.0952*** (0.0171)	11566.13** (4501.185)
Size	0.4770*** (0.0969)	0.2647*** (0.0830)	-21695.93*** (6443.389)	0.2782*** (0.0469)	0.1383*** (0.0328)	-17514*** (4233.135)
Ln_GVA	-0.5301*** (0.0218)	-0.5442*** (0.0231)	10138.62*** (2264.2266)	-0.5701*** (0.0195)	-0.5788*** (0.0207)	9362.972*** (1220.564)
Age	0.0452** (0.0174)	0.0713*** (0.0133)	3805.827 (2264.266)	0.0176 (0.0107)	0.0406** (0.0138)	2756.849** (1203.067)
Firm FE	YES	YES	YES	YES	YES	YES
Industry* Year FE	YES	YES	YES	YES	YES	YES
State FE	YES	YES	YES	YES	YES	YES
Observations	38,577	36,290	38,577	172,836	162,165	172,836

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

Overall, the results show that while the labour reforms did not have a significant impact on overall employment or on specific types of employment (direct or contract) in organized manufacturing, they had a differential impact on firms based on their productivity levels. In particular, we observed reallocation of labour within industries, with more productive firms gaining labour at the expense of less productive ones located in the treated states in the post-reform period. This suggests that the labour reforms played a crucial role in improving allocative efficiency. A plausible explanation for this finding could be that the more productive firms faced greater constraints or distortions prior to the reforms, especially in accessing labour due to the high costs associated with hiring and firing. Consequently, although it would have been optimal for these productive firms to expand their workforce, the related costs acted as barriers. This explanation aligns with that expressed in the existing literature in the context of developing countries, where higher productivity firms are often disproportionately impacted by capital and labour distortions preventing them from fully scaling production to attain increased productivity levels (Hseih and Klenow, 2009). The labour reforms, which aimed at reducing regulatory costs for firms, may have relaxed these constraints, enabling more productive firms to access labour readily and at lower costs by reducing distortions. In the following sub-section, we examine if this was indeed the case.

5.1 Measuring firm-level labour distortions

First, we estimated firm-specific labour distortions by employing the standard approach proposed in the misallocation literature. According to existing studies (Hsieh and Klenow, 2009; Bau and Matrey, 2023), firm-level input distortion can be modelled as wedges on the prices of inputs. These wedges can be interpreted as implicit or explicit taxes or subsidies on the prices of inputs, such as capital or labour. The presence of these wedges can make inputs either costlier or cheaper than their true market value, ultimately impacting the firm's input utilization. They may either increase or decrease the use of inputs in comparison to a case where there are no input-specific distortions. These inefficiencies in input usage lead to misallocation, with some firms employing more while others employing less labour than they should, thus deviating from optimal allocation.

Supposing that firm *i* buys inputs, such as capital, labour and materials, it pays for input x $\in$ $\{K, L, M\}$, with each input having a market price p^x. In the presence of input-specific distortions, denoted by τ_i^x, firm *i* has to pay $(1+\tau_i^x)\ p^x$. In the absence of such distortions, all

firms will pay the same input prices, as a result of which distortions, represented by τ_i^x, will be 0. In this context, the profit equation for a single-product firm can be represented as follows:

$$\pi_i = p_i f_i(K_i, L_i, M_i) - \sum_{x \in \{K,L,M\}} (1 + \tau_i^x) p^x x_i$$

where $f_i(K_i, L_i, M_i)$ refers to the firm's production function, which exhibits diminishing marginal returns in each input. The first order condition with respect to input x_i can be expressed as follows:

$$p_i \frac{\partial f(K_i, L_i, M_i)}{\partial x_i} = (1 + \tau_i^x) p^x$$

Notably, the marginal revenue returns for input x_i (MRPX) is equal to the marginal cost of the input, which, in this case, is the cost of input x_i. This implies that the marginal revenue returns of input *x* is equal or proportional to its firm-level distortion.

In the case of labour, a higher marginal revenue return on labour (MRPL) implies more distortions encountered by firms in accessing labour, leading to higher labour misallocation. Meanwhile, a reduction in τ_i^x signifies a decrease in firm-specific labour distortion, which, in turn, would enable previously constrained firms to employ more labour. In fact, one of our motivations for conducting this analysis was the finding that more productive firms encountered higher labour distortion compared to less productive firms prior to the reforms. We observed an increase in labour for more productive firms following the reforms, which suggests that firm-level labour distortions may have declined during this period. This can likely be attributed to the easing of hiring and firing restrictions, which possibly reduced regulatory costs and allowed the firms to access labour more easily.

Measuring marginal revenue return on labour (MRPL)

Following the standard practice in production function literature, we assumed that firms operate using the Cobb-Douglas revenue production function, as shown below:

$$Revenue_{ijt} = A_{it} K_{ijt}^{\alpha_j^k} L_{ijt}^{\alpha_j^l} M_{ijt}^{\alpha_j^m}$$

where *i* represents a firm, *j* refers to an industry and *t* denotes a year. Furthermore, $Revenue_{ijt}$, $K_{ijt}^{\alpha_j^k}$, $L_{ijt}^{\alpha_j^l}$ and $M_{ijt}^{\alpha_j^m}$ denote firm revenue, capital, labour and materials, respectively, whereas A_{it} refers to firm-level productivity.

To estimate MRPL, we utilized a property of the Cobb-Douglas revenue production function: $MRPL = \frac{dRevenue_{it}}{dL_{it}} = \alpha_j^L \frac{Revenue_{it}}{L_{it}}$. This implies that $\frac{Revenue_{it}}{L_{it}}$ can be considered a within-industry measure of MRPL, assuming that all firms within an industry have the same α_j^L. After defining the measure for firm-level labour distortions according to the standard practice in the misallocation literature, we proceeded to find a potential explanation for the heterogenous impact of reforms on more and less productive firms.

First, we examined the association between firm-level labour distortions and productivity in the pre-reform period to find that, on average, more productive firms experienced more distortions compared to less productive firms. In terms of magnitude, we found that the more productive firms encountered 6.8% more distortions compared to less productive firms in the pre-reform period. These results are presented in Table 4. Considering the positive association between firm productivity and distortions, we proceeded to analyse whether there had been any changes in the distortions faced by more productive firms on account of the easing of firing restrictions, which may possibly explain the increase in their employment levels compared to less productive firms in the post-reform period. The results in Table 5 show that, on average, distortions faced by more productive firms reduced by 18.7% compared to less productive firms in labour-intensive sectors in the post-reform period. In contrast, the distortions faced by more productive firms reduced by 15.6% compared to less productive firms in less labour-intensive sectors. In the case of less productive firms in labour-intensive and less labour-intensive sectors, we observed an increase in distortions by 7.4% and 7.1%, respectively. Perhaps, a possible explanation for this result is the increase in wages and demand for labour on account of the reforms.

Table 4: Firm-level Labour Distortion and Productivity

Dependent Variable	**Ln (MRPL)**
	(1)

L.Productivity_dummy	0.068*** (0.013)
L.Size	0.0029 (0.0047)
L.ln_GVA	-0.0552*** (0.0085)
Age	-0.002 (0.0007)
Firm FE	YES
Industry*Year FE	YES
Observations	46,016

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

Table 5: Impact of Reforms on Firm-level Labour Distortion

Dependent Variable	**Labour Intensive**	**Less Labour Intensive**
	Ln (MRPL)	**Ln (MRPL)**
Reform_{st}	0.0747*** (0.022)	0.0719*** (0.0154)
Reform_{st}* High_Prod	-0.1879*** (0.0426)	-0.1560*** (0.0244)
Size	-0.0571*** (0.0139)	-0.3037*** (0.0514)
Ln_GVA	0.8598*** (0.0305)	0.8756*** (0.0096)
Age	-0.0571*** (0.0139)	-0.0552*** (0.0109)
Firm FE	YES	YES
Industry* Year FE	YES	YES
Observations	38,577	172,836

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

5.2 Placebo test

A placebo test was conducted to examine the validity of our main results with respect to employment and wages. If we assume homogeneity across time period, then we can expect similar results to hold before the treatment period. We performed the analysis for the pre-reform period of 2008–09 to 2013–14. Notably, we assumed that the reforms had been implemented

in the six states in 2011 instead of on and after 2014. In the presence of pre-existing trends, there should be a significant impact of the reforms on employment and wages in the pre-reform period. If the results showed an insignificant impact, it would prove the validity of our previous results. As reported in Table 6, we did not find any significant impact of the reforms on employment and wages. Similarly, as shown in Table 7, we found no evidence of more productive firms witnessing higher employment levels compared to less productive firms. Therefore, the results of the placebo tests strengthen the validity of our main results.

Table 6: Impact of Labour Reforms on Employment and Wages: Labour-Intensive Sectors versus Less Labour-Intensive Sectors (Placebo Test)

Variables	Labour Intensive Sectors			Less Labour-Intensive Sectors		
	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage Rate (3)	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage Rate (3)
Reform_{st}	0.0412 (0.0564)	0.0863 (0.0610)	4069.122 (5697.747)	-0.0131 (0.0205)	-0.0067 (0.0193)	2429.106 (5133.176)
Size	0.4042* (0.1486)	0.1890 (0.1145)	-19839.69*** (7018.041)	0.1777* (0.0728)	0.0783 (0.0526)	-11310.9 (6407.552)
Ln_GVA	-0.5405*** (0.0508)	-0.5562*** (0.0540)	7083.48*** (2213.685)	-0.5787*** (0.0306)	-0.5908*** (0.0328)	4790.204*** (1019.652)
Age	0.0183 (0.0440)	0.0659** (0.0229)	50.0903 (2002.077)	0.0248 (0.0182)	0.0560 (0.0294)	2140.511 (1954.284)
Firm FE	YES	YES	YES	YES	YES	YES
Industry* Year FE	YES	YES	YES	YES	YES	YES
State FE	YES	YES	YES	YES	YES	YES
Observations	10,533	9,846	10,533	44,371	41,864	44,371

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

Table 7: Impact of Labour Reforms on Employment and Wages (More versus Less Productive Firms): Labour-Intensive Sectors versus Less Labour-Intensive Sectors (Placebo Test)

Variables	Labour Intensive Sectors			Less Labour-Intensive Sectors		
	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage Rate (3)	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage Rate (3)
$Reform_{st}$	0.0167 (0.0767)	0.0815 (0.0767)	-2268.929 (2522.28)	-0.0438* (0.0209)	-0.0461 (0.0244)	-767.4142 (2780.837)
$Reform_{st}$* High_Prod	0.0526 (0.0630)	0.0093 (0.0761)	13564.8 (10782.6)	0.0590 (0.0334)	0.0825 (0.0475)	6766.105 (8305.764)
Size	0.4039* (0.1496)	0.1890 (0.1143)	-19946.35*** (7100.344)	0.1770* (0.0721)	0.0779 (0.0525)	-11332.48 (6408.99)
Ln_GVA	-0.5403*** (0.0527)	-0.5563*** (0.0537)	7119.436*** (2239.649)	-0.5745*** (0.0300)	-0.5910*** (0.0328)	4770.305** (1033.122)
Age	0.0187 (0.0443)	0.0659* (0.0254)	138.956 (2015.876)	0.0291 (0.0175)	0.0562 (0.0296)	2142.257 (1941.44)
Firm Fe	YES	YES	YES	YES	YES	YES
Industry* Year FE	YES	YES	YES	YES	YES	YES
State FE	YES	YES	YES	YES	YES	YES
Observations	10,533	9,846	10,533	44,371	41,864	44,371

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

5.3 Additional results

In this section, we examine the impact of the reforms on firms employing more than 300 regular workers. We expected the impact to be less pronounced for large firms, since the changes in labour laws, by and large, did not affect them directly. The results of this analysis are reported in Tables 8 and 9. As expected, we found no significant impact of the reforms on both overall and direct employment in large firms in both labour-intensive and less labour-intensive sectors. We also did not notice any significant changes in wage rates in these firms. Similarly, with respect to the impact of reforms on more productive firms in labour-intensive sectors, no significant impact on overall and direct employment was observed. However, we did identify changes in wage rates in more productive firms as compared to the less productive ones, likely driven by an increase in demand for labour among more productive firms in labour-intensive sectors. We also noticed a positive increase in overall employment among more productive firms in less labour-intensive sectors. Notably, these changes were not observed in the case of direct employment, which suggests that the increase in total employment may have been driven by a rise in contractual employment. In addition, no significant change was observed in the wage rates of the treated states post-reform. Overall, these findings indicate that the impact of the reforms was more pronounced for small- and medium-sized firms, especially in labour-intensive industries. In contrast, we found limited evidence of any significant impact on large firms. This can be attributed to the fact that the large firms were already operating under more stringent regulatory frameworks and, due to which the reforms did not require them to implement any changes to their existing regulatory environment. Therefore, their operations might have remained largely unaffected by the reforms.

Table 8: Impact of Labour Reforms on Employment and Wages in Plants with More than 300 Regular Workers: Less Labour-Intensive Sectors

Variables	Labour-Intensive Sectors			Less Labour-Intensive Sectors		
	Ln (Total Persons Engaged/Output) (1)	**Ln (Directly Employed/Output) (2)**	**Wage Rate (3)**	**Ln (Total Persons Engaged/Output) (1)**	**Ln (Directly Employed/Output) (2)**	**Wage Rate (3)**
Reform$_{st}$	-0.0134 (0.0306)	0.0396 (0.0566)	2975 (5454.625)	-0.0221 (0.0206)	-0.0211 (0.0229)	10507.14 (14006.39)
Size	0.0898*** (0.0159)	0.0732*** (0.0113)	- 5244.178*** (989.947)	0.0689*** (0.0082)	0.0451*** (0.0094)	-12939.12*** (2906.435)
Ln_GVA	-0.3218*** (0.0220)	-0.3253*** (0.0487)	11977.39*** (2346.35)	-0.3116*** (0.0225)	-0.2919*** (0.0196)	21717.79** (8668.45)
Age	0.0129 (0.0249)	0.0427 (0.0417)	5614.95 (3719.58)	0.0437* (0.0211)	0.0764*** (0.0193)	9367.787 (10647.74)
Firm Fe	YES	YES	YES	YES	YES	YES
Industry* Year FE	YES	YES	YES	YES	YES	YES
State FE	YES	YES	YES	YES	YES	YES
Observations	7848	7730	7848	19,262	18,526	19,262

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

Table 9: Impact of Labour Reforms on Employment and Wages in Plants (More versus Less Productive Firms) with More than 300 Regular Workers: Labour-Intensive Sectors versus Less Labour-Intensive Sectors

Variables	Labour-Intensive Sectors			Less Labour-Intensive Sectors		
	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage Rate (3)	Ln (Total Persons Engaged/Output) (1)	Ln (Directly Employed/Output) (2)	Wage Rate (3)
$Reform_{st}$	-0.0536 (0.0439)	-0.0284 (0.1036)	-4994.304 (9466.943)	-0.0816** (0.0357)	-0.0369 (0.0388)	-13200.23 (24358.56)
$Reform_{st}$* High_Prod	0.1062 (0.0639)	0.1375 (0.1117)	16132.46* (8204.316)	0.0971** (0.0429)	0.0270 (0.0422)	38951.57 (24748.61)
Size	0.0877*** (0.0136)	0.0726*** (0.0106)	-5295.759*** (1323.512)	0.0686*** (0.0082)	0.0451*** (0.0095)	-13046.96*** (2913.287)
Ln_GVA	-0.3215*** (0.0426)	-0.3232*** (0.0496)	12200.3 (1515.304)	-0.3103*** (0.0225)	-0.2917*** (0.0199)	22188.44** (8728.503)
Age	0.01602 (0.0393)	0.0395 (0.0455)	5233.873 (4167.865)	0.0441* (0.0212)	0.0760*** (0.0197)	9445.576 (10495.98)
Firm Fe	YES	YES	YES	YES	YES	YES
Industry* Year FE	YES	YES	YES	YES	YES	YES
State FE	YES	YES	YES	YES	YES	YES
Observations	7,848	7,730	7,848	19,262	18,526	19,262

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

6 Conclusion

This study examined the impact of recent labour market deregulation in select Indian states on labour market outcomes in the organised manufacturing sector. Specifically, we investigated the impact of these reforms on firm-level employment and wage rates, with a particular focus on differences between labour-intensive and less labour-intensive industries. Using a DID approach, we compared the labour market outcomes of the states that implemented labour reforms (treated states) during the post-reform period with those that did not (control states). The findings highlight that labour reforms led to significant positive changes in both employment and wages, particularly within labour-intensive industries in the treated states. This further suggests that the relaxation of labour regulations enabled firms in labour-intensive sectors to not only expand their workforce but also increase compensation levels.

In addition to examining the effects of the reforms on employment and wage, we also examined their impact on within-industry resource (labour) reallocation. For this purpose, we analysed the differential effects of the reforms on firms with varying productivity levels by comparing more and less productive firms. The results indicate that labour market deregulation facilitated a shift in labour resources in favour of more productive firms within industries. This reallocation, in turn, led to improved efficiency in the utilisation of labour resources, since more productive firms gained better access to labour, which enhanced their ability to scale operations and contribute to aggregate productivity growth. A closer look at the underlying mechanisms revealed that the observed reallocation can be attributed to a larger decrease in labour distortions achieved by more productive firms in the post-reform period compared to their less productive counterparts. Notably, the easing of hiring and firing restrictions likely enabled firms with higher productivity to overcome previous constraints arising from rigid labour laws and optimise their workforce composition. Overall, our study contributes to the ongoing debate on labour market flexibility in developing economies by providing empirical evidence of labour deregulation driving better labour market outcomes, particularly in labour-intensive industries. Furthermore, it was observed that the reforms enhanced within-industry resource allocation, thereby improving allocative efficiency. These findings highlight the potential of labour market reforms in driving economic growth by allowing firms, especially the more productive ones, to access labour resources more effectively.

References

Ahsan, A., & Pagés, C. (2009). Are all labor regulations equal? Evidence from Indian manufacturing. *Journal of Comparative Economics, 37*(1), 62–75. https://doi.org/10.1016/j.jce.2008.08.004

Adhvaryu, A., Chari, A. V., & Sharma, S. (2013). Firing costs and flexibility: Evidence from firms' employment responses to shocks in India. *Review of Economics and Statistics, 95*(3), 725–740. https://doi.org/10.1162/REST_a_00284

Ahluwalia, R., Hasan, R., Kapoor, M., & Panagariya, A. (2018). The impact of labor regulations on jobs and wages in India: Evidence from a natural experiment. *Working Paper*.

Amirapu, A., & Gechter, M. (2020). Labor regulations and the cost of corruption: Evidence from the Indian firm size distribution. *Review of Economics and Statistics, 102*(1), 34–48. https://doi.org/10.1162/rest_a_00816

Andrews, D., & Cingano, F. (2014). Public policy and resource allocation: Evidence from firms in OECD countries. *Economic Policy, 29*(78), 253–296. https://doi.org/10.1111/1468-0327.12030

Bassanini, A., Booth, A. L., Brunello, G., De Paola, M., & Leuven, E. (2007). Workplace training in Europe. In G. Brunello, P. Garibaldi, & E. Wasmer (Eds.), *Education and training in Europe*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199267660.001.0001

Bassanini, A., Nunziata, L., & Venn, D. (2009). Job protection legislation and productivity growth in OECD countries. *Economic Policy, 24*(58), 349–402. https://doi.org/10.1111/j.1468-0327.2009.00222.

Bentolila, S., & Bertola, G. (1990). Firing costs and labour demand: How bad is eurosclerosis? *Review of Economic Studies, 57*(3), 381–402. https://doi.org/10.2307/2298020

Besley, T., & Burgess, R. (2004). Can labor regulation hinder economic performance? Evidence from India. *The Quarterly Journal of Economics, 119*(1), 91–134. https://doi.org/10.1162/003355304772839533

Bhattacharjea, A. (2006). Labour market regulation and industrial performance in India: A critical review of the empirical evidence. *Indian Journal of Labour Economics, 49*(2), 211–232.

Bhattacharjea, A. (2009). The effects of employment protection legislation on Indian manufacturing. *Economic and Political Weekly*, *44*(22), 55–62.

Bhattacharjea, A. (2014). Comments (on Sean Dougherty, Veronica Frisancho, and Kala Krishna, state-level labor reform and firm-level productivity in India). In S. Shah, B. Bosworth, & A. Panagariya (Eds.), *India Policy Forum, 2013–2014* (Vol. 10, pp. 49–52). Sage.

Deakin, S., & Sarkar, P. (2011). Indian labour law and its impact on unemployment, 1970-2006: A leximetric study. *Cambridge: Centre for Business Research, University of Cambridge.*

Dougherty, S., Frisancho Robles, V. C., & Krishna, K. (2011). Employment protection legislation and plant-level productivity in India (No. w17693). *National Bureau of Economic Research*. https://doi.org/10.3386/w17693

D'Souza, E. (2010). The employment effects of labour legislation in India: A critical essay. *Industrial Relations Journal, 41*(2), 122–135. https://doi.org/10.1111/j.1468-2338.2009.00558.x

Gnocato, N., Modena, F., & Tomasi, C. (2020). Labor market reforms and allocative efficiency in Italy. *Labour Economics, 67*, Article 101954. https://doi.org/10.1016/j.labeco.2020.101954

Gonzàlez, X., & Miles-Touya, D. (2012). Labor market rigidities and economic efficiency: Evidence from Spain. *Labour Economics, 19*(6), 833–845. https://doi.org/10.1016/j.labeco.2012.08.002

Guner, N., Ventura, G., & Xu, Y. (2008). Macroeconomic implications of size-dependent policies. *Review of Economic Dynamics, 11*(4), 721–744. https://doi.org/10.1016/j.red.2008.05.002

Hasan, R., & Jandoc, K. R. L. (2012). Labour regulations and the firm size distribution in Indian manufacturing. *School of International and Public Affairs, Columbia University*.

Hopenhayn, H., & Rogerson, R. (1993). Job turnover and policy evaluation: A general equilibrium analysis. *Journal of Political Economy, 101*(5), 915–938. https://doi.org/10.1086/261757

Lagos, R. (2006). A model of TFP. *Review of Economic Studies, 73*(4), 983–1007. https://doi.org/10.1111/j.1467-937X.2006.00411.x

Lee, W. (2019). The role of labor market flexibility in the job matching process in India: An analysis of the matching function using state-level panel data. *Emerging Markets Finance and Trade, 55*(4), 934–949. https://doi.org/10.1080/1540496X.2018.1524341

Mitra, D., & Ural, B. P. (2008). Indian manufacturing: A slow sector in a rapidly growing economy. *The Journal of International Trade & Economic Development, 17*(4), 525–559. https://doi.org/10.1080/09638190802324020

Parida, P. C., Pradhan, K. C., & Sarangi, T. (2016). Employment, productivity and output growth of labour-intensive manufacturing industries in India *(Report No. 1/2016). NITI Aayog, Government of India.*

Petrin, A., & Sivadasan, J. (2013). Estimating lost output from allocative inefficiency, with an application to Chile and firing costs. *Review of Economics and Statistics, 95*(1), 286–301. https://doi.org/10.1162/REST_a_00260

Restuccia, D., & Rogerson, R. (2013). Misallocation and productivity. *Review of Economic Dynamics, 16*(1), 1–10. https://doi.org/10.1016/j.red.2012.11.003

Roy, G. K., Dubey, A., & Ramaiah, S. (2020). Labour market flexibility and changes in employment: Spatial and temporal evidence from Indian manufacturing. *Indian Journal of Labour Economics, 63*(1), 81–98. https://doi.org/10.1007/s41027-020-00216-3

Roychowdhury, A. (2019a). Application of job security laws, workers' bargaining power and employment outcomes in India. *Economic and Labour Relations Review, 30*(1), 120–141. https://doi.org/10.1177/1035304619834834

Roychowdhury, A. (2019b). An inquiry into the theoretical structure underlying the labour market flexibility argument in India. *Economic and Political Weekly, 54*(18), 4–11.

Appendix 1

Labour Intensive Manufacturing Industries in India

Serial Number	Manufacturing Industries	NIC (2008)
1	Producer of Tobacco items	120
2	Producer of games and toys	324
3	Producer of wearing apparel	141
4	Producer of military fighting vehicles	304
5	Processing and preservation of fish, shellfish, molluscs, and their derived products	102
6	Recovery of materials	383
7	Manufacture of jewellery items	321
8	Producer of transport equipment	309
9	Producer of knitted and crocheted garments	143
10	Producer of processed animal meat	108
11	Producer of musical instruments	322
12	Repair of fabricated metal products, machinery, and equipment	331
13	Producer of structural metal products, tanks, reservoir and steam generators	251
14	Producer of weapons and ammunition	252
15	Producer of optical instruments and equipment	267
16	Producer of furniture	310
17	Producer of industrial machinery and equipment	332
18	Producer of articles of fur	142
19	Producer of medical, dental instruments, and supplies	325
20	Processing and preservation of meat	101
21	Producer of sports items	323
22	Producer of other food items	107

Appendix 2

Firm-level production function estimation

First Stage

TFP estimation process begins with implementing the conventional Cobb-Douglas (C-D) production function in its logarithmic form. Considering the logarithm of a C-D production function, the estimation equation for firm *i* in industry *j* at time *t* is represented as:

$$y_{it} = \beta_0 + \beta_w w_{it} + \beta_s s_{it} + \omega_{it} + \varepsilon_{it} \quad (1)$$

where y_{it}, stands for output, w_{it} stands for variable input (labour and intermediate inputs), s_{it} stands for state variable (capital), ε_{it} stand for normally distributed idiosyncratic pure random variable, whereas ω_{it} represents the unobserved productivity shock (observable only to a firm manager but not unobservable to an econometrician) likely to be correlated with the firm input choices. ω_{it} is assumed to follow exogenous first-order Markov process:

$$w_{it} = E(w_{it}|w_{it-1}) + \mu_{it} = g(w_{it-1}) + \mu_{it} \quad (2)$$

where μ_{it} is random term uncorrelated with either the state or the free variables.

In the above equation, the subscript *i*, *t* denotes firm *i,* and time *t*. Using OLS to estimate the above production function will lead to biased estimates of β_l, and β_k due to the assumption of strict exogeneity between error term and the independent variables. However, in reality, firms make their input choices based on the level of productivity. Therefore, not including the unobserved productivity variable into the regression equation will lead to endogeneity arising from simultaneity bias (Olley and Pakes (OP),1996). In order to correct for the endogeneity, Levinsohn and Petrin (LP) (2003), suggested using the intermediate input such as materials, energy, fuel to proxy for the unobserved productivity. Under the control function approach suggested by LP (2003), demand function for the proxy variable can be written as: $m_{it} = f(K_{it}, \omega_{it})$. Under the assumption of scalar unobservable and strictly monotonicity, the demand function for the proxy variable is invertible in ω_{it} i.e., $\omega_{it}=f^{-1}(m_{it}, K_{it}) = h(m_{it}, K_{it})$. Plugging the inverse demand function for the proxy variable into the production function (1) we obtain:

$$y_{it} = \beta_0 + \beta_w w_{it} + \beta_k s_{it} + h(m_{it}, K_{it}) + \varepsilon_{it} \quad (3)$$

$$= \beta_0 + \beta_w w_{it} + \emptyset_{ijt}(m_{it}, K_{it}) + \varepsilon_{ijt} \quad (4)$$

where $\emptyset_{ijt}(m_{it}, K_{it})$ is defined as: $\emptyset_{ijt}(m_{it}, K_{it}) = \beta_k s_{ijt} + h(m_{it}, K_{it})$. Note that this solves the endogeneity problem since unobserved ω_{ijt} can now be observed. Estimation of Equation 4 yields to obtain a consistent estimate of $\widehat{\beta_w}$. Additionally, we also obtain estimates of the composite function, $\widehat{\emptyset_{it}}$.

Second Stage

Using the estimated coefficient from the first stage, and making use of the moment conditions, the coefficient of the capital variable can be obtained by estimating the following equation:

$$y_{it} - \widehat{\beta_w} w_{it} = \beta_0 + \beta_k s_{it} + g(\widehat{\emptyset_{it-1}} - \beta_k k_{it-1} - \beta_m m_{it-1}) + \varepsilon_{it} \quad (5)$$

Note that in order to estimate the both OP (1996) and LP (2003) use Generalized Method of moments (GMM) or Non-Linear Least Square (NLLS).

Once consistent estimates of both labour and capital variables are obtained, the productivity variable is obtained as a residual as follows:

$$\widehat{TFP_{it}} = \exp\widehat{\omega_{it}} = \exp(y_{it} - \widehat{\beta_k} k_{it} - \widehat{\beta_l} l_{it} - \widehat{\beta_m} m_{it}) \quad (6)$$

One of the criticisms of the OP (1996) and LP (2003) model, as put forward by ACF (2015) is that both assume that there is no adjustment cost to labour variable. However, in presence of unobservable adjustment cost (for example, hiring and firing cost, or long-term contracts) to the labour variable, there will be multicollinearity and identification issues with the labour variable. In such a case, the labour should actually be considered as a state variable and enter as an argument in demand function for proxy along with unobserved productivity as follows: $m_{it} = f(K_{it}, \omega_{it}, l_{it})$. As a result, under the ACF (2015) methodology, the labour coefficient along with other input coefficients are identified in the second stage by applying either GMM or NLLS.