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Abstract

Labour regulations like employment protection legislation in India are size-dependent rules and therefore constitute a basis for threshold effects. Firms could use non-permanent workers to stay below the legal establishment size threshold of 100 workers. This strategy is expected to cause the ratio of non-permanent to total workers to peak at size close to the legal threshold size. The study is based on a large nationally representative unbalanced panel of manufacturing plants in the formal sector covering 25 states and 5 union territories of India spanning the period 1998-2008. The average contract-worker intensity of factories in size group 50-99 is found to be significantly higher in general and particularly in labour intensive industries located in states categorized as inflexible. Contrary to the job security enhancing intention of labour regulation the employment status of average workers in establishments close to or just above the threshold size appear to be more vulnerable.

Keywords: labour regulation threshold firm size distribution employment

JEL Code: L11, K31 and J58

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1. Introduction and Context

The effect of labour market regulation on employment growth, productivity and firm size distribution has been the subject of many studies in the recent past both in developed and developing countries. Employment Protection legislation (EPL) and other related labour regulations are widely perceived to raise the expected cost of employment adjustment in firms covered by legislation causing the emergence of dualism or missing middle in firm size distributions. In France firms with 50 employees or more face substantially more regulation than firms with less than 50 and that has been observed to have resulted in many firms with exactly 49 employees (Gourio and Roys 2012). India's manufacturing sector has been a striking example of policy induced dualism with a large small-scale enterprise sector coexisting with a small large-enterprise sector in manufacturing. Labour regulations apply rules with respect to conditions of service, lay-off, retrenchment and closure to firms above a specified employment size. This is argued to raise labour adjustment costs and create pressures on firms to stay below the legal threshold size. Note that the regulations take effect as firm size grows and it generates an implicit tax. As the regulations are defined with reference to few finite points the literature refers to them as "threshold effects" (see Gourio and Roys 2012). In brief, labour regulations impose compliance costs once firms reach the specified employment size and act as disincentive for natural growth of firms. Tybout (2000) observed that for many developing countries, "…the size distribution exhibits a 'missing middle' because it never pays to be just large enough to attract enforcement". Firms are often observed to use contract workers (secondary workers and labour

outsourcing) to stay below the legal threshold size to escape labour regulations. Size-dependent regulations that reduce the average firm size have been shown to have output and productivity effects using calibrated growth models (Guner et al 2008; Gourio and Roys 2012). Threshold effects are an outcome of change of behavior firms with employment size close to the legal cut-off size. Econometric evidence for threshold effects has been very few in developing country contexts. The objective of this paper is to fill this gap in the literature. It makes two contributions. First, I provide evidence of threshold effect in terms of changing workforce composition within firms that has created a two-tier workforce consisting of regular and non-permanent workers. India is well-known for its EPL whose coverage was widened through a reduction of the employment size threshold from 300 workers to 100 workers in 1982.Second, I examine the issue of threshold effects using firm level panel data in the context of geographic variations in labour regulations within a single developing country that avoids the problems associated with cross-country regressions.

It may be useful to summarize the key features of size distribution of manufacturing factories in India. Dhar and Lydall (1961) were the first to observe missing middle in the data, the thin share of employment size class 50 to 499 in Indian manufacturing employment[1]. A recent comparative study of manufacturing enterprises in Asia observes that the size group of 6-49 workers accounts for more than 55 percent of total non-household manufacturing in 2005 (Mazumdar and Sarkar 2013). The share of large factories with more than 500 workers was close to 20 percent and the remaining 25 percent is the share of size group with 50-499 workers in the same year. Another study estimates that in 2005 nearly 85 percent are employed in enterprises with less than 50 workers if we include own-account/household enterprises in total

[1] A later study by Little, Mazumdar and Page (1982) confirmed the problem of missing middle in Indian manufacturing. See Mazumdar and Sarkar (2008), chapter 9 for a detailed discussion of dualism in Indian manufacturing.

manufacturing employment (Hasan and Jandoc 2012). This dualistic size structure in manufacturing has remained unchanged over the last two decades. More importantly, within the formal sector employment of contract workers (not subjected to labour regulations) has substantially increased in recent years. The share of contract workers in total workers employed in manufacturing has gone up to 32 percent in 2009-10 from little less than 20 percent in 1999-00.

In this background the present paper asks how firms have responded to size-dependent labour regulations. Has it led to greater intensity of use of contract-workers in firms falling below the specified employment/workforce size? Is this behavior more significant in labour intensive industries and in those States of India with more rigid rules? My study is based on panel data of factories in the manufacturing sector over a period of 10 years between 1998-9 to 2007-8 (hereafter 1998-2008). I employ a definition of firm size consistent with labour laws. The key findings are (a) contract-worker intensity is higher in the size class 50-99 relative other employment size groups (b) average contract-worker intensity is relatively higher in labour intensive industries and in inflexible states (c) the relationship between contract-worker intensity and firm size is non-linear. Contract-worker intensity first declines, reaches a peak and then declines again.

1.2. Review of Earlier Studies

In this brief review studies of Indian manufacturing that have taken into account firm size or used the data on both large and small factories will be covered. Studies investigating the causes of persistent dualism and possible outcomes in manufacturing have been severely constrained by their lack of access to firm level data. Firm level data was not disclosed due to confidentiality clauses in the collection of statistics act. Only very recently such data with firm

identification numbers have been made available to researchers in India. Fallon and Lucas (1993) were the first to study the impact of labour regulations on large firms in India. Their study used annual observations on 36 industries for the period 1959-82 on census sector that covered factories with more than 50 workers. Their results showed that the amendment to the IDA in 1976 which imposed government permission for firms employing more than 300 workers negatively affected employment. The decline in employment was shown to be higher in sectors where the fraction of employees in private sector enterprises with more than 300 workers was higher.

Hasan and Jandoc (2012) have assembled three large establishment level data sets that encompass formal and informal manufacturing to study size distribution over time. They compare firm size distribution across Indian States for three selected years, namely, 1994-95, 2000-01, and 2004-05. They partition Indian States into 'rigid' and 'flexible' labour regulation states after making some modification to the approach of Burgess and Besley (2004). They distinguish five size groups 1-9, 10-49, 50-99,100-199 and firms with more than 200 workers. They do not find a significant difference in how employment shares vary across the different size groups for the two sets of states. In the sub-group of labour intensive industries greater prevalence of larger enterprises in flexible states was observed. In all the three years contract intensity peaked in the size class 50-99 in both labour intensive as well as all industries taken together. However, the size classes are measured by all production workers (regular plus contract) which deviated from the definition used in the context of labour regulations. The difference in mean contract intensity was not subjected to statistical tests.

Adhvaryu et al (2013) used establishment data from ASI for 1987, 1990 and 1994 to test the prediction that the degree of employment response to shocks vary inversely with the degree

of employment protection. Their study found that firms adjust to demand fluctuations by making adjustment to labour in flexible states than in inflexible states. In restrictive states firms are found to make adjustments to non-labour inputs in response to shocks measured by variation in agricultural incomes at the district level. However they do not touch upon the mode of adjustment of labour in terms of work-force composition. Dougherty et al (2011) study the impact of employment protection legislation on total factor productivity (TFP) and labor productivity using plant level panel data. TFP estimation is carried out using a restricted sample of plants with more than 200 workers and a classification of states based on labour reforms based on Dougherty (2008). TFP gains are found to be more for labour intensive plants in states with lax regulations.

Including this introduction this paper is divided into 5 sections. Section 2 presents the set of propositions that would be tested. Section 3 discusses the data base, measurement problems and issues related to classification of states and industry groups. Results are discussed in Section 4. Conclusions of the study are presented in Section 5.

2. Testable Propositions

In India firms graduating into the formal sector face different regulatory costs of formality at different employment size levels. First, the Factory Act that contains rules to regulate occupational health and safety of workers if the firm has employed above 10 workers and if they are using electricity or 20 workers if they are not. Second, Chapter V-A of the Industrial Disputes Act (IDA) requires notice and compensation for lay-off, retrenchment and closure if the firm employs not less than 50 workers. Third, Chapter V-B requires notice, compensation and permission from government for lay-off, retrenchment and closure, if it employs more than 100 workers. Others like the Industrial Employment (Standing Orders) Act

that lays down terms and conditions of work come into force if the firm employs more than 100 workers or less depending on the state law in which the firm is located. The Chapter V-B of IDA that requires permission from government authority for lay-off, termination and closure has been the most contentious provision in the context of Indian labour market rigidity debate. The size threshold is defined in terms of number of permanent workers in a given factory whose names appear in its muster roll. In other words, non-permanent workers could be employed to stay below the legal cut-off size. The dominant category of non-permanent workers is the contract workers or workers employed through a contractor. IDA is not applicable to contract workers hence their lay-off or termination does not require notice, compensation or permission. In addition firms are widely observed to pay contract-workers wages that are less than that is paid to regular workers and constitute additional cost savings for firms close to legal threshold employment size.

Compliance capability of firms will vary with firm size and it depends on their marginal profitability relative to marginal adjustment costs. As compliance costs start biting after a legally defined workforce size is attained we can expect greater effort on the part of firms to search for flexibility or ways to reduce potential adjustment costs. This aspect can be captured by the concept of contract-worker intensity. Contract-worker intensity is the share of contract workers in total number of workers in a firm.

Given this framework, I look for threshold effects in the following ways;

(i) Whether average contract-worker intensity is higher in the employment size group 50-99. This is expected if the objective of the firm is to stay below the size threshold of 100 workers. Here the employment size class is measured by number of permanent or regular workers in order to be consistent with the definition of IDA and other labour laws. (ii) Is there a non-linear

relationship between contract-worker intensity and firm size? In other word, non-linearity could occur because the productivity advantage of size could outweigh compliance costs thus reducing the incentive to hire non-permanent workers. In order to capture the economies of scale effect, I measure size by total employment (regular workers + contract workers), a widely accepted measure of plant size. (iii) Is the average contract-worker intensity higher in labour intensive industries? It may be argued that adjustment costs imposed by labour regulations would be greater in industries with high ratio of labour to capital. In addition if labour intensive industries are export-market oriented industries and exporting firms are subject to greater demand uncertainty and seasonal fluctuations in demand or market order-size then they are relatively adversely affected by rigid labour laws.(iv) Is contract-worker intensity higher in labour intensive industries located in inflexible states? Compliance costs can be expected to have greater bite in states within India that are supposed to be relatively inflexible in terms of their approach as revealed in the state-level amendments as argued in the literature (Besley and Burgess 2004).

3. Data and Measurement Issues

The source of data is the Annual Survey of Industries (ASI) conducted by the Ministry of Statistics and Programme Implementation (MOSPI) of the Government of India. I utilize unit level panel data spanning the ten year period 1998-2008.The advantage is that ASI has recently made available factory identifiers such that an unbalanced panel of manufacturing factories can be set up as the data base[2]. Dougherty et al (2011) is another important study that has used a data set that is identical to that of the present study.

[2] I wish to record that confidentiality of the unit level data was maintained and adequate precautions have been taken to avoid disclosing the identity of the units directly or indirectly.

We started with raw data that contained 358,036 observations on open factories. All observations (15,080) on non-manufacturing activities are dropped. They are: cotton-ginning and agriculture, recycling, electricity generation and distribution, water, construction, repair of motor vehicles and personal goods, and other business services. Three manufacturing activities Aircraft, Nuclear plants and Fur production are dropped as they contained very few observations (140). For the remaining observations the following criteria was applied after dropping duplicate observations (observations recorded twice for the same factory in the same year). Observations are dropped if data on total output, fixed capital, total employment, total basic inputs and total non-basic inputs are found to be missing. Further those observations with negative fixed capital, zero values for total output, total employment, total basic and non-basic inputs; wrong or missing codes for rural or urban areas, type of organization, type of ownership, state identification and those with initial year of production greater than 2008 have been dropped. This data cleaning has left us with a total of 251,856 observations in the panel (Table 1).

My data set contains data on 25 states and 5 union territories (UT hereafter). In India labour law is a concurrent list, where both the central and the state government formulate and enforce different labour laws. Firms in union territories are also subject to central government laws administered by their respective labour departments. The cleaned data set contains no observation on the following states and UT; Arunachal Pradesh, Lakshadweep, Sikkim, and Mizoram. Observations from the UT of Andaman and Nicobar Islands have been dropped. The frequency distribution in terms of the number of years that a factory appears in our panel is shown in the appendix Table A1. I have 102,076 factories in the panel.

The ASI frame is based on the lists of registered factories/units maintained by the Chief Inspector of Factories (CIF) in each State/Union Territory. It includes all factories employing 10

or more workers if using power and if not using power the criterion is 20 or more workers on any day of the preceding 12 months. The ASI frame is revised once in three years and further divides the sampling frame into two components, called census sector and the sample sector. All factories with 100 or more workers were fully enumerated and covered under the census sector and the remaining factories were covered on a sampling basis using an efficient sampling design (Saluja and Yadav, 2011).

Table 1: Sample Size and Percent Lost after Data Cleaning

Year	Original Sample	Used Sample	Deleted	Percent Lost
1999	23693	15864	7829	33.0
2000	24733	17060	7673	31.0
2001	31121	21950	9171	29.5
2002	33461	23925	9536	28.5
2003	33854	24397	9457	27.9
2004	45494	31951	13543	29.8
2005	39760	27965	11795	29.7
2006	43738	30411	13327	30.5
2007	43381	30597	12784	29.5
2008	38801	27736	11065	28.5
	358036	251856	106180	29.7

Source: ASI Unit level panel data 1998-2008

It is important to note that once a factory is categorized as belonging to census or sample, it remains in the same category unless warranted by change in the number of workers. The definition of census sector changed later as follows. For the period between 1997-98 to 1999-2000 the census sector included (a) all factories with 200 or more workers (b) selected "significant units" with fewer than 200 workers which "contributed significantly to the value of output" in ASI between 1993-94 and 1995-96 and (c) all plants in 12 industrially backward

districts and all public sector undertakings. Effective from 2000-01, the definition of census sector was modified to include all factories with more than 100 workers and all factories in the following 5 industrially backward states/union territories; Manipur, Meghalaya, Nagaland, Tripura and Andaman and Nicobar Islands. As a consequence one could observe entry and exit consistently only for factories with at least 200 workers in our data set. This is not a limitation as analysis of plant entry and exit is not the objective of the present study. The employment size distribution of sample units over the time period of the panel 1998-2008 is presented in the appendix Table A2.

Factory size is often measured by number of workers employed. Workers are divided into two categories, regular and contract. Regular workers are those directly employed by the factory and enjoy job-security benefits. Contract workers are those employed by the factory through an intermediary, that is a labour contractor or agent and they are not on the muster roll of the factory. Total workers in a factory refer to the sum of regular and contract workers. The threshold limit of 100 workers stipulated by the IDA refers to total number of regular workers. The ASI publishes size distribution of factories that uses total workers employed as the definition of employment size. We need to use total number of regular workers as the definition of firm size as our objective is to measure the impact of labour regulations. In our data set we found that a large proportion of firms has reported only regular workers and have not reported the number of contract workers. The data entered under the category total workers is often found to contain only the figures on regular workers. I have estimated the number of contract workers in each factory in the following way. The time-series data on mean ratio of contract workers to regular workers for the period 1998-2008 for all the 53 three-digit National Industrial Classification (NIC) industries is reported by the Labour Bureau (Labour Bureau 2011). I have estimated the

number of contract workers in each factory (factory with a missing observation on contract workers) by applying the mean ratio of contract to regular workers. Wherever both contract and regular workers have been reported we have used the original figures. The total number of workers is re-estimated by adding the estimated number of contract workers to the reported number of regular workers in each factory. Further 13,000 factories have not reported the number of regular workers. They were considered as having only contract workers and zero direct workers. Following this estimation we carried out the estimation of size distribution of factories using regular workers employed as the size criterion. The key focus variable in our analysis is the ratio of contract to total workers called contract-worker intensity of production. The basic descriptive statistics of the main sample of factories is presented in two parts in Table 2. Part A is based on all observations with estimates for missing data on contract workers and regular workers. Part-B is based on all observations but excluding observations with missing data. Notice that the average number of all three types of workers per factory is lower in Part-A compared to Part-B. However the average number of direct and total workers per factory is very similar.

All observations have a five-digit National Industrial Classification (NIC 2004) code to identify the industry of the sample factory. For the sake of convenience I have collapsed these five-digit industry codes into manageable three-digit industry codes. I have relied upon the classification used in Hasan and Jandoc (2012) to select the set of labour intensive industries. They have used the criterion of ratio of total employment to net total assets excluding land and buildings as a measure of capital intensity and classified industries into labour intensive and capital intensive industries. Industries not falling into either of the two categories are classified as others. The labour intensive industries are; Beverages, tobacco, wearing apparel, leather,

footwear, saw-milling, wood-products including furniture, glass and glass-products, non-metallic mineral products and others that include watches and sports goods. The remaining 3 digit industry groups are grouped as 'Others'.

Table 2: Descriptive Statistics: All Years and All Plants

	A:Using all observations with estimates for missing observations*				
Variable	Observations	Mean	Std.Dev	Min	Max
Contract Workers	251856	56.1	499.5	0	44641
Regular Workers	251856	113.4	492.5	0	49692
Total Workers	251856	169.4	800.7	1	70059
Ratio of Contract to Total Workers	251856	0.30	0.26	0	1
	B**:**Using all observations after excluding missing observation				
Variable	Observations	Mean	Std.Dev	Min	Max
Contract Workers	74341	133.8	864.9	0	44641
Regular Workers	238553	119.7	505.3	1	49692
Total Workers	251856	152.8	714.4	1	49692
Ratio of Contract to Total Workers	NE	NE	NE	NE	NE

Note: * See text for explanation
NE: Not Estimated

Source: ASI unit level panel data 1998-2008

3.1 Sample Distribution by State Groups

The distribution of sample observations by states and UT is shown in Table A3 in the appendix. One important approach to measure the impact of labour regulations is to take advantage of inter-state variations in labour regulations first suggested by Besley and Burgess (2004).Under the Indian constitution both state and central (federal) government can legislate over subjects

under the concurrent list. Labour laws like IDA, Factories Act, and CLRA etc. are central acts but each state can make amendments to them. Besley and Burgess (BB hereafter) used inter-state variations in IDA to capture inter-state differences in labor regulation. BB classified each state-level amendment to IDA in 15 major states of India during 1949 to 1992. They assigned each amendment in these states a value of -1 (pro-employer), +1 (pro-worker) and zero (neutral). BB used net direction of change if a state was found to have passed multiple amendments in a given year. An index of labour regulation for each state is estimated as cumulated value of its annual scores up to the year 1992.This method yielded an index of labor regulation for each state that indicated the extent of strictness in the stance of a state towards labour regulations (inflexible or flexible). The BB approach has been criticized and evaluated in detail by Bhattacharjea (2006 and 2009) and other studies have attempted to make corrections to the original BB index based on his criticism (Ahsan and Pages 2009 and Gupta, Hasan and Kumar 2009).Two important examples are Gujarat and Uttara Pradesh. Gujarat was designated as pro-worker (inflexible) by BB on the basis of a solitary amendment in 1973 that imposed a penalty on employers for not nominating representatives to firm level joint management councils (Bhattacharjea 2006). Uttara Pradesh was also classified as pro-worker state by BB as "they found that Uttara Pradesh had made no amendments to the central IDA over the entire 35 year period of their study…" (Bhattacharjea, 2006). It was pointed out by Bhattacharjea (2006) that Uttara Pradesh had amended its own 1947 IDA in 1983 and had set the threshold for permission for lay-offs, retrenchment and closure at 300 workers in contradistinction to threshold limit of 100 workers set by the central IDA amendment of 1982. This clearly suggested that a modification of the original BB classification is necessary.

After 1992, there has been very limited state-level amendment activity except in three cases, namely, Gujarat, Uttar Pradesh and Andhra Pradesh. Gujarat in March 2004 amended the IDA as applied to Gujarat by amending section V-D that said chapters V-A and V-B are not applicable to establishments declared to be in SEZ (special economic zones) by the Government of India. This amendment takes worker termination in an SEZ out of the purview of industrial dispute definition as defined by IDA. However such establishments are required to give one month notice and a compensation of 45 days' pay for every year of continuous service. Andhra Pradesh in August 2003 amended the Contract Labour Regulation and Abolition (CLRA) Act of 1970 by permitting employment of contract labour in a host of activities that are not considered to be core activity of an establishment. Uttara Pradesh amended the IDA in 2002 by changing the threshold for retrenchment from 300 workers to 100 workers thereby bringing the Uttara Pradesh IDA in line with the central amendment of 1982. By this amendment Uttara Pradesh can be said to have tightened the labour regulations after having maintained the threshold at 300 workers since 1983.

Given this background, I have classified the following six states as flexible states. They are Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu, Rajasthan and Uttara Pradesh. Of this Andhra Pradesh, Karnataka, Tamil Nadu and Rajasthan have been classified as pro-employer by BB and as flexible by Gupta, Kumar and Hasan (2009). Gujarat by the most recent amendment of 2004 can be classified as pro-employer or flexible. Only Uttara Pradesh is somewhat ambiguous as noted above due to its raising threshold amendment of 2002. However, given its record of maintaining higher threshold for 19 years I classify Uttara Pradesh as flexible. In other words, my set of six flexible states has been by and large unambiguous. Of the remaining 24 States and UTs, I classify 14 of them as 'inflexible' and the remaining have been grouped as

'Others'. This classification is shown in the appendix Table A4 and the corresponding distribution of sample observations is shown in Table A4.1. Econometric analysis is based on observations belonging only to two groups, namely, flexible and inflexible states.

4. Results

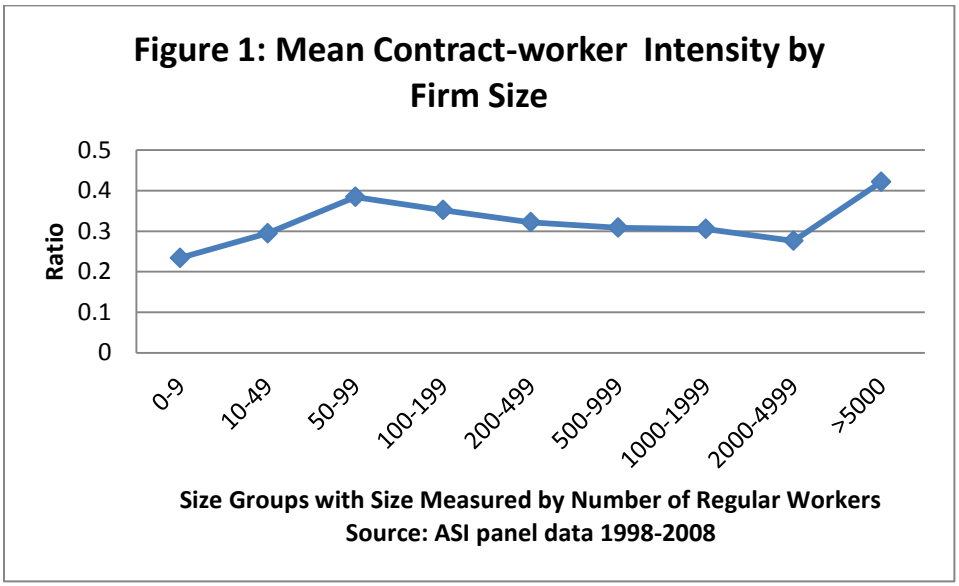
4.1 Descriptive Statistics and Threshold Size Group

As we noted earlier it is important to measure firm size by the number of regular workers to be consistent with IDA definition. Table 3 shows the distribution of median total-worker size by firm size groups defined in terms of regular workers. Nine employment size groups have been created. The two size groups of interest to us are 10-49 and 50-99.The median total-worker size in the size class 50-99 is closer to the upper limit of the size class that clearly suggests existence of large number of firms with above 100 workers in this size class. In other words firms are employing contract workers to stay below the threshold size of 100 as per IDA V-B. Similarly inference can be drawn that the size-class 10-49 has number of firms above 50 even though the median total-worker size is closer to the mid-point of the size class.

Table 3: Median Firm by Employment Size Group

Size-Class*	Median Firm Size measured by Total Workers**	No. of Observations
0-9	7	54,831
10-49	23	91,814
50-99	78	30,274
100-199	154	31,795
200-499	325	28,391
500-999	705	9,423
1000-1999	1422	3,348
2000-4999	3051	1,626
5000+	11124	354
All	37	251,856

*Size classes defined by Regular Workers
** Total Workers=Regular + Contract-Workers
Source: ASI unit level panel data 1998-2008



In Figure 1 average contract intensity by employment size groups is graphed. Contract intensity peaks in the size group 50-99 underlining the importance of threshold effect. This threshold size is required to be tested separately in a regression framework. In addition the impact of differences in factor intensity (labour intensity of the industry) and regulatory stance of the state (flexible versus inflexible) can be tested after controlling for year-specific effects in the panel data. The size group 100-199, which is just above the legal cut-off size of 100 workers, is having mean contract intensity 0.35 that is higher than the sample average of 0.30. Simple mean contract-worker intensity is found to be higher in labour intensive industries (0.38) but similar in two industry groups, namely, flexible (0.29) and inflexible (0.30). Related descriptive statistics are not presented to save space.

4.2 Contract-worker Intensity: Role of Firm Size, Industry-Labour-Intensity and Inflexible-States

A simple dummy variable regression model is estimated for the pooled data with logarithm of contract-worker intensity as the dependent variable. The econometric model takes the form:

$$\ln(CW_{eist}) = \alpha + \beta_1(S_{eist}) + \beta_2(LI_i) + \beta_3(Flex_s) + \beta_4(S_{eist} \times LI_i) + \beta_5(S_{eist} \times Flex_s) + \beta_6(LI_i \times Flex_s) + \beta_7(S_{eist} \times LI_i \times Flex_s) + \lambda T + \varepsilon_{eist} \quad (1)$$

Where ln (CW_{eist}) is the log of contract-worker intensity of establishment e in i^{th} industry and in s^{th} state in year t. (S_{eist}) are establishment size dummies that take the value 1 if the establishment falls in the size group 50-99 and zero otherwise. Note that S_{eist} captures an establishment characteristic, which is size of workforce. (IL_i) are labour-intensity dummies that takes the value 1 if the industry belongs to the category labour-intensive industry and zero otherwise, ($Flex_s$) are the state specific labour flexibility indicators that takes the value 1 for states in the group inflexible-states and zero otherwise. ($S_{eist} \times LI_i$), ($S_{eist} \times Flex_s$), ($LI_i \times Flex_s$) and ($S_{eist} \times LI_i \times Flex_s$) are the four interaction dummies that capture the interaction of size and labour-intensive industry, size and flexibility indicator, labour-intensity and flexibility indicator and finally the interaction of size, labour-intensive industry and flexibility indicator. T denotes year fixed effects and ε_{eist} is an error term that is assumed to satisfy the standard properties. In actual estimation of equation (1) year dummy is interacted with industry and state dummies to control for industry-year and state-year fixed effects. A positive coefficient of the four dummy variables would indicate that mean contract-worker intensity is higher in their respective groups relative to other excluded groups after controlling for year-specific effects.

Table 4: Regression of Contract Intensity on Employment Size-group, Industry Labour-intensity and State-specific Flexibility Indicators Dependent variable: $\log(CW_{eist})$	
S_{eist} (Size-group 50-99)	0.092*** (11.4)
IL_i (Industry-labour-intensity)	0.188*** (30.8)
$Flex_s$ (State-specific-flexibility)	0.021*** (6.1)
S_{eist} x LI_i (Size x Industry-labour-intensity)	0.013 (0.68)
S_{eist} x $Flex_s$ (Size x State-specific-flexibility)	0.076*** (6.7)
LI_i x $Flex_s$ (Industry-labour-intensity x State-specific-flexibility)	0.082*** (9.9)
S_{eist} x IL_i x $Flex_s$ (Size x Industry-labour-intensity x State-specific-flexibility)	0.12*** (4.9)
State-Year FE	YES
Industry-Year FE	YES
Constant	-1.840*** (-265.3)
Observations	225572
R^2	0.08
F(25,245458)	831***
*Significant at 10%, **Significant at 5%, ***Significant at 1% Note: Robust 't' statistics in brackets	

In Table 4 the results of estimating equation (1) is presented[3]. The coefficients of three independent dummies are positive and highly significant. The significance of thresh old effects of labour regulations is indicated by the positive coefficient of size group 50-99. Similarly the average contract-worker intensity is significantly higher in labour-intensive industries and in inflexible states relative to the omitted group. Three of the four interaction dummies are significant. The interaction dummy for size group 50-99 and industry labour intensity is positive but insignificant. However, interaction term (Size x Industry-labour-intensity x State-specific

[3] It may be noted that many firms have zero contract labour and log specification forces them to be dropped. This may bias the coefficient estimates. As a robustness check, I have estimated equation (1) without using the log specification for the dependent variable. The estimates are presented in Table A4.2 in the appendix.

flexibility) is positive and significant that clearly indicates that firms in the size-group 50-99 in labour-intensive industries located in inflexible-states have higher contract-worker intensity. This result is consistent with the threshold effects of labour regulations.

The relationship between contract-workers intensity and firm size could be non-linear as compliance capability varies with firm size. Large establishments could have lower average costs due to economies of scale and this could enable them to meet higher compliance costs of labour legislation. In this context, how contract-worker intensity varies with the size of total workforce (regular + contract) is important. There would be firm specific time-invariant unobserved factors that affect the dependent variable that is contract-worker intensity in our case. This requires a fixed effect model. With unit level panel data it is possible to test this hypothesis in a fixed effect (FE) model with state-year and industry-year specific effects. It is perhaps reasonable to postulate that contract-worker intensity and firm size takes the form of a cubic function. I estimate the following fixed effect model.

$$\ln(CW_{eist}) = \alpha_{eis} + \beta_1 \ln (ES_{eist}) + \beta_2(\ln ES_{eist})^2 + \beta_3(\ln ES_{eist})^3 + \mu_{st} + \eta_{it} + \varepsilon_{eist} \quad (2)$$

Where, ln (CW_{eist}) is the log contract-worker intensity of establishment e in i^{th} industry and in s^{th} state in year t. ln (ES_{eist}) is log total employment, followed by the square of the log total employment and cube of the log employment. The signs of the three slope coefficients $\beta_1, \beta_2, \beta_3$ will indicate the curvature of the non-linear relationship between contract-worker intensity and firm size. α_{eis} are firm specific fixed effects that captures time-invariant unobserved heterogeneity that affect the dependent variable. In addition there would be time-variant unobserved factors common to all firms within a state like population growth or urbanization. Similarly, there would be time-variant unobserved factors common to all firms within industries like technological change or access to raw material. μ_{st} and η_{it} are the state-year and industry-

year fixed effects introduced to account for such factors that may impact contract-worker intensity. ε_{eist} is the error term with standard properties. Firm size is assumed to be exogenously determined by technology and is not influenced by measured contract-worker intensity that is a behavioural outcome variable.

In Table 5 the estimates of equation (2) are shown[4]. The coefficient of size is negative, size-squared is positive and size-cubed is negative and all the three coefficients are highly significant. This suggests that contract-worker intensity first declines, reaches a maximum and then declines again. This finding is consistent with the expectation that after reaching some level of establishment size the benefits of size expansion outweighs costs of regulatory compliance decreasing the incentive to hire contract workers.

Table 5: Regression of Contract Intensity on Employment Size, Size-squared and Size-cubed: **Fixed Effects Model** Dependent variable: $\log(CW_{eist})$	
$\ln(ES_{eist})$	-0.462*** (-13.0)
$\ln(ES_{eist})^2$	0.138*** (15.5)
$\ln(ES_{eist})^3$	-0.009*** (-13.2)
State-Year FE	YES
Industry-Year FE	YES
Constant	-0.531*** (-34.5)
Observations	225572
R^2	0.13
*Significant at 10%, **Significant at 5%, ***Significant at 1% Note: Robust 't' statistics in brackets	

[4] All observations with zero regular workers have been dropped because of log specification.

5. Conclusions

This paper perhaps for the first time in the literature on Indian manufacturing tested the hypothesis of threshold effects using establishment level panel data. Labour regulations are size-dependent rules and therefore constitute a basis for threshold effects. Firms could use non-permanent workers to escape from higher adjustment costs of larger firm size. I measured this outcome by contract-worker intensity. Contract-worker intensity is found to be higher in size class 50-99 relative to others supporting the conjecture that firms use non-permanent workers to stay below the size threshold of 100. The average contract-worker intensity of factories in size group 50-99 is found to be higher in labour intensive industries located in states categorized as inflexible.

My results have two implications. First, the presence of significant threshold effect suggest loss of potential output gains. Size-dependent labour regulation perhaps restricts the emergence of large firms in labour intensive industries in Indian manufacturing. Second, they do not necessarily improve access to good jobs. Contrary to the job security enhancing intension of EPL the employment status of average workers in establishments close to or just above the employment size of 100 workers appear to be worse and more vulnerable because of stricter size-dependent regulations.

This paper can be extended in several directions for further verification and analysis. First, one would like to know what proportion of new entrants in manufacturing belongs to employment size below the legal threshold and what proportion graduate into larger size? Second, one may examine the relationship between initial employment size and employment growth of firms over time in flexible states relative to inflexible states. These issues are important and will be addressed in the future.

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APPENDIX TABLES

Table A1: Sample Distribution of Factories by Number of Years of appearance in the Data set

Number of Years	Frequency	Percent
1	51,921	50.87
2	17,457	17.1
3	12,017	11.77
4	6,305	6.18
5	3,512	3.44
6	2,551	2.5
7	2,041	2
8	2,235	2.19
9	1,653	1.62
10	2,384	2.34
Total	102,076	100

Source: ASI unit level panel data 1998-2008

Table A2: Distribution of Sample units by Year and Employment Size*

	Employment Size class								
Year	0-9	10-49	50-99	100-199	200-499	500-999	1000-1999	2000-4999	'5000+
1999	3,953	5,640	1,486	1,317	2,219	770	291	142	46
2000	4,421	6,340	1,566	1,240	2,182	832	298	141	40
2001	4,897	7,437	2,690	3,012	2,579	850	295	153	37
2002	4,502	8,610	3,499	3,413	2,617	829	277	143	35
2003	4,317	8,636	3,742	3,659	2,716	853	295	148	31
2004	7,074	12,497	4,102	4,038	2,857	906	304	142	31
2005	6,684	10,034	2,779	3,965	3,017	967	334	155	30
2006	7,050	11,173	3,434	3,892	3,235	1,059	371	167	30
2007	6,708	11,522	3,558	3,632	3,408	1,123	416	197	33
2008	5,225	9,925	3,418	3,627	3,561	1,234	467	238	41
All	54,831	91,814	30,274	31,795	28,391	9,423	3,348	1,626	354

Source: ASI unit level panel data 1998-2008

Note:* Employment size is defined by the number of regular workers in a factory

Table A3: Sample Distribution by State: All Plants and all Years

Sr.No.	State	No.of Observations
1	Jammu & Kashmir	2,534
2	Himachal Pradesh	3,509
3	Punjab	14,585
4	Chandigarh (UT)	1,396
5	Uttarakhand	3,354
6	Haryana	11,222
7	Delhi (UT)	6,977
8	Rajasthan	10,805
9	Uttar Pradesh	20,344
10	Bihar	3,909
11	Nagaland	659
12	Manipur	280
13	Tripura	1,899
14	Meghalaya	403
15	Assam	5,838
16	West Bengal	12,727
17	Jharkhand	4,101
18	Orissa	5,053
19	Chattisgarh	4,176
20	Madhya Pradesh	7,536
21	Gujarat	20,156
22	Daman& Diu (UT)	3,667
23	Dadra & Nagar Haveli (UT)	3,375
24	Maharashtra	28,956
25	Andhra Pradesh	17,397
26	Karnataka	14,330
27	Goa	2,968
28	Kerala	8,680
29	Tamil Nadu	28,162
30	Pondicherry (UT)	2,858
	Total	251,856

Note: UT=Union Territory
Source: ASI unit level panel data 1998-2008

Table A4: Classification of States based on Labour Regulations

Flexible	**Inflexible**	**Others**
Andhra Pradesh	Assam	Chandigarh (UT)
Gujarat	Bihar	Dadar NH (UT)
Karnataka	Jharkhand	Daman (UT)
Rajasthan	Delhi (UT)	Jammu &Kashmir
Uttara Pradesh	Goa	Manipur
Tamil Nadu	Haryana	Meghalaya
	Himachal Pradesh	Nagaland
	Kerala	Tripura
	Madhya Pradesh	Pondicherry (UT)
	Chhattisgarh	Uttara Khand
	Maharashtra	
	Orissa	
	Punjab	
	West Bengal	

Note: UT=Union Territory

Source: Authors' classification see text

Table A4.1: Sample Distribution by State Group		
State-Group	Frequency	Percent
Others	20,425	8.1
Flexible States	111,194	44.1
Inflexible States	120,237	47.7
Total	251,856	100
Source: ASI unit level panel data 1998-2008		

Table A4.2: Regression of Contract Intensity on Employment Size-group, Industry-Labour-Intensity and State-specific-Flexibility Indicators

Dependent variable: CW_{eist}

S_{eist} (Size-group 50-99)	0.454*** (16.3)
IL_i (Industry-labour-intensity)	0.073*** (34.9)
$Flex_s$ (State-specific-flexibility)	-0.001 (-1.1)
S_{eist} x LI_i (Size x Industry-labour-intensity)	0.026*** (3.7)
S_{eist} x $Flex_s$ (Size x State-specific-flexibility)	0.028*** (7.2)
LI_i x $Flex_s$ (Industry-labour-intensity x State-specific-flexibility)	0.020*** (7.1)
S_{eist} x IL_i x $Flex_s$ (Size x Industry-labour-intensity x State-specific-flexibility)	0.083*** (8.5)
State-Year FE	YES
Industry-Year FE	YES
Constant	0.201*** (100.0)
Observations	231431
R^2	0.07
F(25,245458)	627***

*Significant at 10%, **Significant at 5%, ***Significant at 1%
Note: Robust 't' statistics in brackets