WP 2014-12
April 2014

Working Paper

The Charles H. Dyson School of Applied Economics and Management
Cornell University, Ithaca, New York 14853-7801 USA

Minimum Wage Effects at Different Enforcement levels: Evidence from Employment Surveys in India

Vidhya Soundararajan

Minimum Wage Effects at Different Enforcement Levels: Evidence from Employment Surveys in India*

Vidhya Soundararajan†

April 2014

Abstract

I present the first piece of empirical evidence on the effects of minimum wage legislation throughout the minimum wage distribution across different enforcement levels. Instrumental variable estimates indicate a hump-shaped relationship between employment and minimum wage at median and higher enforcement levels, but a negative relationship at lower levels of enforcement. Between wages and minimum wage, a positive relationship uniformly emerges at median and higher levels of enforcement but only at the upper tail of the minimum wage distribution at low levels of enforcement. Results are consistent with a model of imperfect competition and imperfect enforcement.

JEL Classification: J30, J38.

Keywords: Minimum wage, enforcement, employment, monopsony

*I gratefully acknowledge the feedback provided by my doctoral commitee members, Ravi Kanbur, Nancy Chau, and Victoria Prowse. All errors are my own.

†B5, Warren Hall, Charles H. Dyson School of of Applied Economics and Management, Cornell University, Ithaca, NY 14853. Email: vs325@cornell.edu

1 Introduction

How do the effects of minimum wages on the labor market vary according to the level of enforcement? To date, no empirical study in the minimum wage literature has addressed this question. Empirical studies consistent with the standard competitive neo-classical model and monopsonisitc or oligopsonistic models assume perfect enforcement of the minimum wage legislation (Card and Krueger, 1994; Card and Krueger, 2000; Neumark and Wascher, 2000; Machin and Wilson, 2004; Dube, Lester and Reich, 2010). However, this assumption does not accord with the growing empirical evidence of non-compliance of labor regulations (including minimum wage) in both developed and developing countries. Important studies in this regard include Ashenfelter and Smith (1979) who found that compliance with the minimum wage law during the early 1970s in the United States was just 64%. Also, Ronconi (2010) reports that compliance with employment regulations in Argentina between 1995 and 2002 was just 48.26%.This evidence underscores that the enforcement of the minimum wage legislation is as important as the level of minimum wage itself.

With perfect enforcement, the standard competitive labor market model predicts that the response of employment to a binding minimum wage hike is uniformly negative. Contrarily, models of imperfect competition predict a positive response of employment, as long as the minimum wage is below a threshold (Stigler, 1946). However, recent theoretical work by Basu, Chau and Kanbur (2010), henceforth BCK, incorporating elements of imperfect enforcement in an imperfectly competitive labor market model predicts that the equilibrium response to minimum wages depends intricately on the interaction between enforcement and the minimum wage.

The above discussed theoretical results have empirical implications that beg to be tested, and the present study precisely investigates those implications in the Indian context. Specifically, it asks two questions: First, how does a minimum wage affect the level of employment, wage, and days of work across the minimum wage distribution? Second, do these relationships vary across the level of enforcement? Using a repeated-cross sectional dataset from the nationally representative employment surveys of India (administered by the National Sample Survey) for the years 2004, 2004-05, 2005-06, 2007-08, 2009-10, and 2011-12, this study estimates the interactive effect of minimum wages and enforcement on employment, wages and days of work

in the construction industry.

This paper contributes to the minimum wage literature in three key ways. First, evidence in the empirical minimum wage literature supports competitive labor market models as well as imperfectly competitive models and the issue still remains open for debate. Many recent and older studies based on developed countries and developing countries find negative employment effects supporting the competitive theory (Burkhauser, Couch and Wittenburg, 2000, Neumark and Wascher, 2000, Neumark, Schweitzer and Wascher, 2000, for the US; Machin, Manning and Rahman, 2002, for the UK; Abowd et al., 2000, for France; Bell (1997) for Mexico and Colombia, Montenegro and Pags (2004) for a group of Latin American countries). Positive or insignificant employment effects, supporting imperfectly competitive models, are also found in a number of old and new studies alike, both in developed and in developing countries (see Card and Krueger (1994) and Dube et al (2010) for United States, Lemos (2004) for Brazil; Dickens, Machin and Manning (1999) for the United Kingdom; Abowd et al., 2000, for United States). The nature of minimum wage effects (sign and significance of coefficients) on employment observed in this paper can point towards one labor market model versus the other, contributing directly to the above debate.

Second, this paper addresses a key weakness in the above literature - the lack of studies accounting for the imperfect nature of labor enforcement and non-compliance with labor laws. In developing countries, and to an extent in developed countries, there is high non-compliance with labor laws, and the de facto level of regulation is lower than the de jure level of regulation (Ronconi, 2005). Studies find non-compliance in United States (Ashenfelter and Smith, 1979), Argentina (Ronconi, 2010), South Africa (Bhorat, Kanbur, and Mayet, 2012), Brazil (Lemos, 2004, 2006), Costa Rica (Gindling and Terrell, 1995), Mexico (Bell, 1997), Trinidad and Tobago (Strobl and Walsh, 2001), Chile (Kanbur, Ronconi, and Wedenoja, 2013) and a selection of Latin American countries (Maloney and Nunez, 2004). The present study directly addresses this above weakness by controlling for enforcement and enforcement interacted with minimum wage in its empirical models.

Third, only few studies estimate minimum wage effects throughout the minimum wage distribution (Neumark, Schweitzer and Wascher, 200; Dickens, Machin and Manning, 1999) although theories predict non-linear effects (e.g. Stigler, 1946). This paper, in that spirit, without binding relationships to be linear, employs flexible form models to estimate minimum

wage effects throughout the distribution.

Gauging the effects of minimum wage increase throughout the minimum wage distribution at different levels of enforcement presented a few empirical challenges. First, the level of enforcement at the state level is possibly endogenous because factors determining labor market outcomes may also affect how strictly states enforce the minimum wage law. A candidate measure for the level of enforcement of minimum wages is the number of inspectors at the state level under The Minimum Wages Act, 1948. To address the endogeneity in this variable, number of inspectors under The Factories Act, another state-level regulation, is used as an instrument. The Factories Act, 1948, concerns health and safety violations in factories in the registered manufacturing industry. This is a relevant instrument because both factories and the minimum wage divisions, falling under the same state labor department, are subjected to similar shocks. Also, exclusionary criteria are plausibly satisfied because factories inspectors check health and safety violations of factory workers and do not deal with minimum wages in the construction industry.

The second challenge is in estimating non-linear minimum wages effects and interactive effects of minimum wages and enforcement as suggested by theories. Non-linear effects, particularly hump-shaped effects of minimum wages on employment, are suggested by Stigler (1946)s model of imperfect competition. The interaction effects capturing cross elasticities of labor market outcomes with respect to minimum wages and enforcement, are suggested by BCK who incorporated imperfect enforcement in Stiglers model of imperfect competition. BCK show that the effects of minimum wage depends intricately both on the level of minimum wage and its interaction with the level of enforcement. In this paper, I capture non-linear minimum wage effects by dummy variables representing various quartiles of minimum wages and interactive effects by explicitly interacting the minimum wage dummy variables with the continuous enforcement variable.

The present study focuses on the construction industry in India, the second largest employer (after agriculture) employing 32 million workers in 2009-10. It is a dynamic industry that contributed to 8% of the countrys Gross Domestic Product in 2012-13 (approximately $124 billion) and grew at 14.58% on average between 2000-01 and 2011-12 (a rise of $104 in the current U.S dollars or 6475 billion Indian rupees). Despite the growth and employment generation in the construction industry, a majority of workers receive wage payments below the

minimum wage. In 2009-10, 52% of the construction workers nationwide received wages below the minimum and state specific noncompliance varied from as low as 4% to as high as 90%. There is qualitative evidence that contractors employing workers exert considerable monopsony power in payment of wages (Self-Employed Womens Association, 2005).

Studying minimum wage effects across enforcement regimes in the Indian context, is worthwhile for a number of reasons. First, there is state-time variation in minimum wages in India. Minimum wages, under the Minimum Wage Act, 1949, are set and revised by the state governments and revisions occur once or at most twice every year. Second, there is evidence of imperfect enforcement in India. A comparison of minimum wage violations estimated from worker reported National Sample Survey data and government reports on detection of violation reveals the starkness of this phenomenon. According to the National Sample Survey, 37% of the workers working in all industries throughout India received wages below the minimum wage in 2009-10. In contrast, only 2.1% of inspections lead to discoveries of violations in the same year. Remarkably, only about one-fifth of violations are detected by the government. Further, enforcement also varies across state and time, a setting unique to India which provides a platform to study the interactive effects of minimum wages and enforcement.

Ordinary Least Squares regression and Instrumental Variables two-stage least squares regression methods are employed. Additionally, Probit and Instrumental Variable Probit regressions are employed to model binary employment outcomes. Two sets of results are striking. First, there is a hump-shaped relationship between employment (as measured by participation in the construction industry) and minimum wage at median and higher levels of enforcement (at the 50th and 75th percentiles). However, at lower levels of enforcement (the 25th percentile), there is a negative relationship between employment and minimum wage. Second, there is a positive and an increasing relationship between wages and minimum wages at median and higher levels of enforcement (at the 50th and 75th percentiles). However, at low levels of enforcement (the 25th percentile), there is a positive effect on wages but only at the upper tail of the minimum wage distribution. The non-linearly in the minimum wage effects and the role of enforcement in above estimated relationships is striking, particularly for employment effects.

The empirical results are largely consistent with a model of imperfect competition and imperfect enforcement (BCK) and contrary to the neoclassical model which predicts a uniform negative effect on employment. Stigler's model predicts that employment responses to mini-

mum wage are positive until a threshold (the competitive wage equilibrium in this case) and negative beyond that. BCK's model of imperfect competition and imperfect enforcement, built on Stiglers model, predicts that the turnaround threshold of the minimum wage at which employment response changes from positive to negative,changes based on the level of enforcement. The lower the level of enforcement, the smaller the threshold. This theory has clean testable implications. At high levels of enforcement, the upward sloping part of the employment response to minimum wage is to be observed for a relatively long interval of the minimum wage distribution. Consequently, the hump shape is very distinct at higher levels of enforcement. However, at low levels of enforcement, comparatively, the upward sloping part of employment response to minimum wages is to be observed for a relatively short interval. This could even be approximately observed as uniform negative effects at very low levels of enforcement, depending on the estimation methodology. [1] This is precisely what is observed in the empirical results. Uniform negative employment effects are observed in low levels of enforcement but a hump-shape emerges at higher levels of enforcement.

The rest of the paper is organized as follows. Section 2 describes the data; Section 3 provides institutional details on minimum wages and enforcement; Section 4 presents the econometric methodology; Section 5 presents the results and their interpretation; Section 6 presents robustness checks and results for specific demographic groups; Section 7 concludes the paper and discusses further research possibilities.

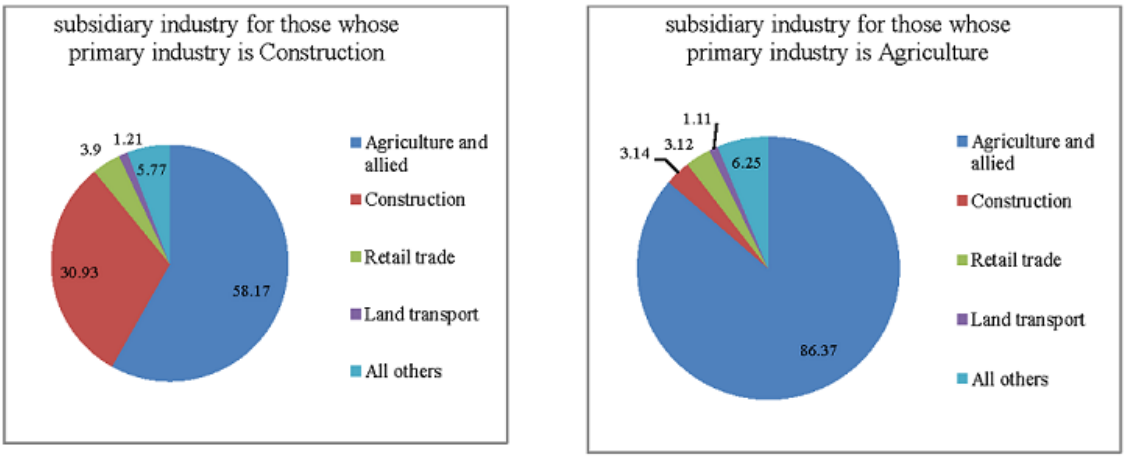
2 Data Description

The primary data source for this study are six rounds of the National Sample Surveys (NSS) administered in the years 2004, 2004-05, 2005-06, 2007-08, 2009-10, 2011-12. These surveys are conducted from July to June. For example, the 2004-05 survey is conducted from July 2004 to June 2005. The exception is the survey in 2004 which took place from January to June 2004. These are cross section surveys conducted at the household level, inquiring on characteristics of the household, the numerous demographic particulars of all individuals, their

[1] In Stigler's model of perfect enforcement, as long as the minimum wage is below the turnaround threshold, an increase in minimum wage decreases the marginal cost of labor. Hence, employment responses are positive below the threshold. Above the threshold, an increase in minimum wage increases marginal labor cost; consequently, employment responses are negative. The same argument holds in the case of imperfect enforcement in BCK, except now that we are looking at how expected marginal cost of labor changes below and above the threshold and consequently affects employment responses. The threshold itself is a function of enforcement, which is measured by the probability of detection of violation.

employment status and characteristics. Among other things, every member of the household is asked to report up to four activities they did in the last seven days, which can include looking for work (unemployed), not looking for work (not in the labor force), or working (employed), and if employed, the industry and occupation of the industry they were employed in. Additionally, the number of days spent in each activity and earnings from the previous week for wage earners are reported for the last week. The key outcomes variables considered in this paper are employment, wages, and days of work in the construction sector [2]. I describe these key variables below.

Figure 1: Principal and Subsidiary industry based on a weekly recall



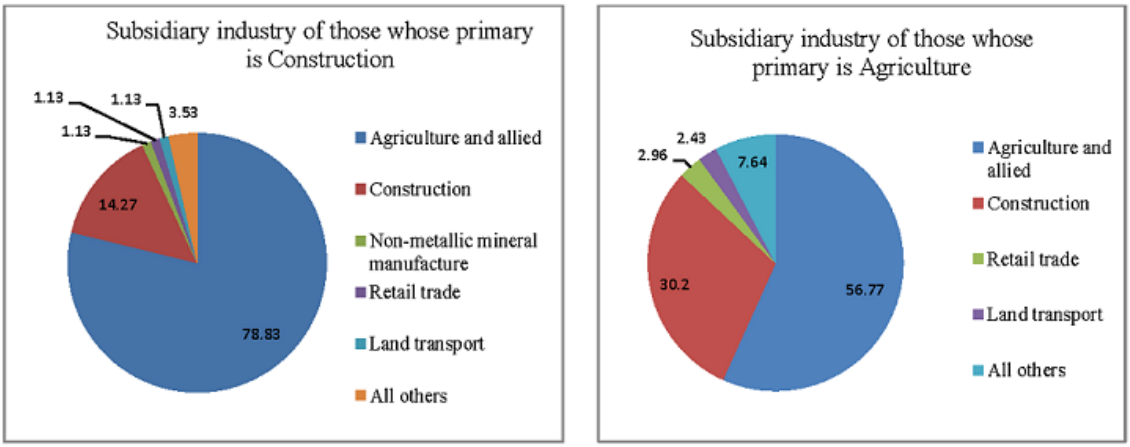
Note: Data from National Sample Survey for the years 2004, 2004-05, 2005-06, 2007-08, 2009-10, and 2011-12. Principal and subsidiary industries based on a weekly recall are determined based on a time criterion. Industry in which the most time was spent, is the principal industry.

A defining characteristic of the Indian low-wage labor force is that workers tend to be employed in multiple low paying jobs over the course of the year and within a week. For the purpose of this paper, I employ a neighbor criterion to measure employment in the construction industry. Employment in the construction industry is defined as a binary variable taking a value 1 if the worker works in the construction industry and 0 if the worker works in agriculture, the closest neighbor to the construction industry. Industry B as a neighbor to industry A if most workers working in A for their principal work, work in B for their subsidiary work, and vice-versa. Employment, defined this way captures extensive margin, not in the classical sense

[2]Household members also report labor market activities during the reference period of 365 days preceding the date of the survey (that is, a yearly recall period). They report principal and subsidiary employment in the last one year, but they do not report earnings or number of days of work from this recall.

of working versus not working, but rather working in the construction industry versus working in the neighboring industries. Figures 1 and 2 present pie-charts of employment in subsidiary industries for wage earners whose primary industry is construction or agriculture, based on a weekly and yearly recall period respectively. It is seen that, those engaged in the construction industry for their primary job, work predominantly in agriculture for their subsidiary job. Similarly, those engaged in agriculture as their primary job, tend to work in agriculture as their secondary job (perhaps plant another crop in the lean season) but a good majority of them are also engaged in construction (this is more obvious from the yearly recall).

Figure 2: Principal and Subsidiary industry based on a yearly recall



Note: Data from National Sample Survey for the years 2004, 2004-05, 2005-06, 2007-08, 2009-10, and 2011-12. Principal and subsidiary industries based on a weekly recall are determined based on a majority criterion. Industry in which the most time was spent, is the principal industry.

The final dataset consists of a homogenous group of workers who share similar social and demographic characteristics and for whom minimum wages are potentially binding. I consider unskilled construction and agriculture workers (classified based on the National Industrial Classification and National Classification of Occupation [3]), and who are educated below middle school, or illiterates. There are 37, 339 observations for all years and states altogether. 48% of the overall sample consists of construction workers and the rest are agriculture workers.

[3]Semi-skilled and unskilled workers are defined based on the occupational classification reported by the workers in the National Sample Survey. In this paper, occupational categories, 712, 713, 714 and 931, under Indias National Occupational Classification, 2004 are classified as unskilled and semi-skilled construction workers. Under NCO 1968 for survey years before 2007-08, occupational classifications 871, 931, 951 to 959 are considered unskilled. For Agriculture: 611 to 620 and 920 under NCO 2004 and 610 to 662, and 670 to 681 are considered unskilled.

3 Minimum wages and the enforcement machinery

The Minimum Wages Act 1948 of India legally grants a minimum wage (MW) for workers in many industries and they are defined in Rupees per day at the state level for each covered industry [4]. They are set, implemented and enforced by state (and a few cases, the central) governments [5]. Existence of a large number of minimum wages for different industries/occupation in each state across years makes Indias system of minimum wages complicated [6]. Further, it makes enforcement cumbersome, even in theory. State governments enforce the minimum wage law through a cadre of inspectors who randomly inspect construction sites within their jurisdiction. Assuming that a higher number of inspectors implies higher enforcement level or in other words higher likelihood of inspection and discovery (as in BCK), I measure enforcement by the number of minimum wage inspectors and this varies across state and time. This may not the most accurate measurement of enforcement because a quantitative measure as this might not reveal aspects of corruption and collusive agreements that could potentially exist between employers and inspectors (Basu, Chau, and Kanbur, 2010). However, assuming the quality and effectiveness of enforcement is uniform through the country and over time, number of inspectors could give a fair sense of enforcement.

Minimum wage and enforcement data are obtained from the Reports on the Working of the Minimum Wage Law published yearly by the Labor Bureau, Ministry of Labor & Employment, Government of India. These reports provide state-specific information on minimum wages set in different industries and on the enforcement machinery of the minimum wage legislation for all years[7].

This paper exploits variation in minimum wages across state and time to estimate its effects on labor market outcomes. Figure 3 presents spatial variation in minimum wages for construction industry in 2011-12. The lowest minimum wage is in Orissa (Rs. 93/day) and the

[4] Minimum wages are defined only for employments listed under the employment schedule of the Minimum Wages Act under the concerned government. Employments other than those listed are not covered under the law.

[5] The concerned government is either the state government or the central government depending on the industry and sector of work. Government owned enterprises and firms in the mining and railway sector belongs to the central sphere; all other firms fall under the state sphere.

[6] Besler and Rani (2011) report that the central government sets 48 minimum wages for different categories including mining, agriculture and oil extraction, or any corporation under its ownership. State governments altogether set minimum wages for 1,123 job categories making a grand total of about 1,171 different minimum wage rates in India.

[7] The minimum wage data are available in table 3 and the enforcement data are available in annexure II of the report.

highest is in Maharashtra (Rs. 229/day). Additionally, to provide a sense of level and variation in minimum wages and its change over time, Table 1 provides the mean and standard deviation of minimum wages across years. The state-time varying minimum wage data were mapped to the worker level dataset (described in section 2). Workers in the current year were mapped to MW effective as on December 31 of the preceding year[8]. For example, workers surveyed in 2004 (July to December) are mapped to the MW as on December 31, 2003; workers surveyed in 2005 (January to July 2005) are mapped to MW effective as on December 31, 2004. Using MW effective in the year proceeding the year of survey (rather than say after the year of survey), addresses endogeneity concerns because in this case, minimum wages were set before labor market outcomes were realized.

Table 1: Summary statistics of minimum wages across years

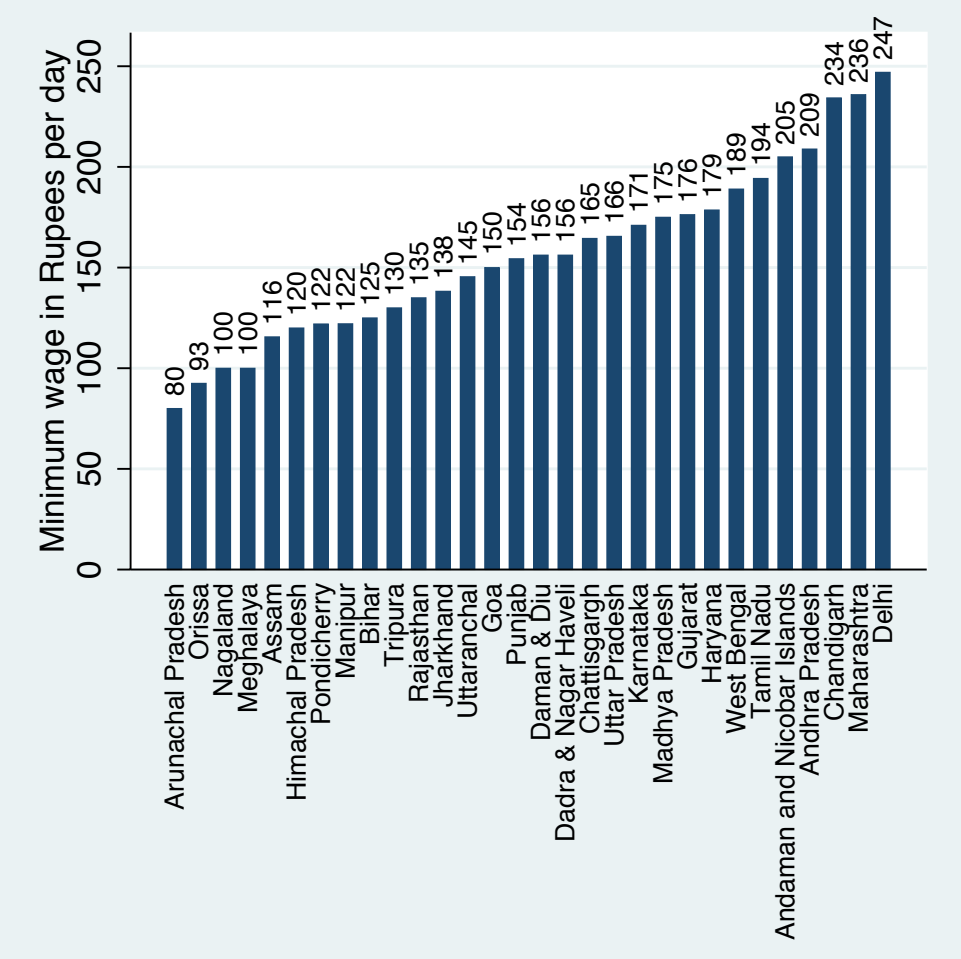
Year	Mean	Std. Deviation
2003	81.07	26.11
2004	85.41	24.02
2005	86.51	23.06
2006	94.86	32.23
2007	100.59	29.75
2008	117.38	39.3
2009	122.02	27.78
2010	149.32	38.4
2011	156.26	43.18

Source: Reports on the Working of the Minimum Wage Law, various years

Table 2 shows the extent of variability across time and states in the enforcement variable. Enforcement data for a survey year (which are parts of full year) is an average of number of inspectors corresponding to the two years constituting the survey. The average (across states) number of inspectors all of India has declined from 187 in 2003-04 to 183 in 2011-12. Further, the number of inspectors at the 25th percentile is at 33 inspectors, at the median is 123, and at 75th percentile is 361, giving a well spread out distribution of enforcement regimes across

[8]In each state, MW for an industry could change multiple times within a year. Tracking the details of each MW change could be challenging because revisions are done decentrally by state governments and such detailed documentation are not available digitally. Sometimes they are available only in a regional language.

Figure 3: State specific minimum wages in 2011



Source: Reports on the Working of the Minimum Wage Law, 2011

Table 2: Summary statistics of minimum wage inspectors across years

Year	Mean	Std. Deviation
2003-04	187.01	221.50
2004-05	189.25	212.60
2005-06	193.06	209.58
2007-08	198.80	207.66
2009-10	174.84	211.38
2011-12	183	214.13

Source: Reports on the Working of the Minimum Wage Law, various years

different states. Number of inspectors at the state level is obviously endogenous to labor market outcomes. An instrumental variable strategy is used to address this and is presented in section 4 below.

4 Econometric approach

As a starting point, I estimate a non-parametric bivariate model to obtain a descriptive picture of the relationship between employment and log minimum wages (Figure 4). The graph presents a non-linear picture with two humps, indicating that a linear Ordinary Least Squares regression model will be far from sufficient. A similar graph for real log daily wages (figure 5) and log of days of work (Figure 6) also indicate non-linear relationships with log minimum wages.

Figure 4: Lowess smoothing estimate of employment on log real minimum wage

Note:Blue dots are scatter plots; red lines are estimated relationships

Figure 5: Lowess smoothing estimate of log real wages on log real minimum wage

Note: Blue dots are scatter plots; red lines are estimated relationships

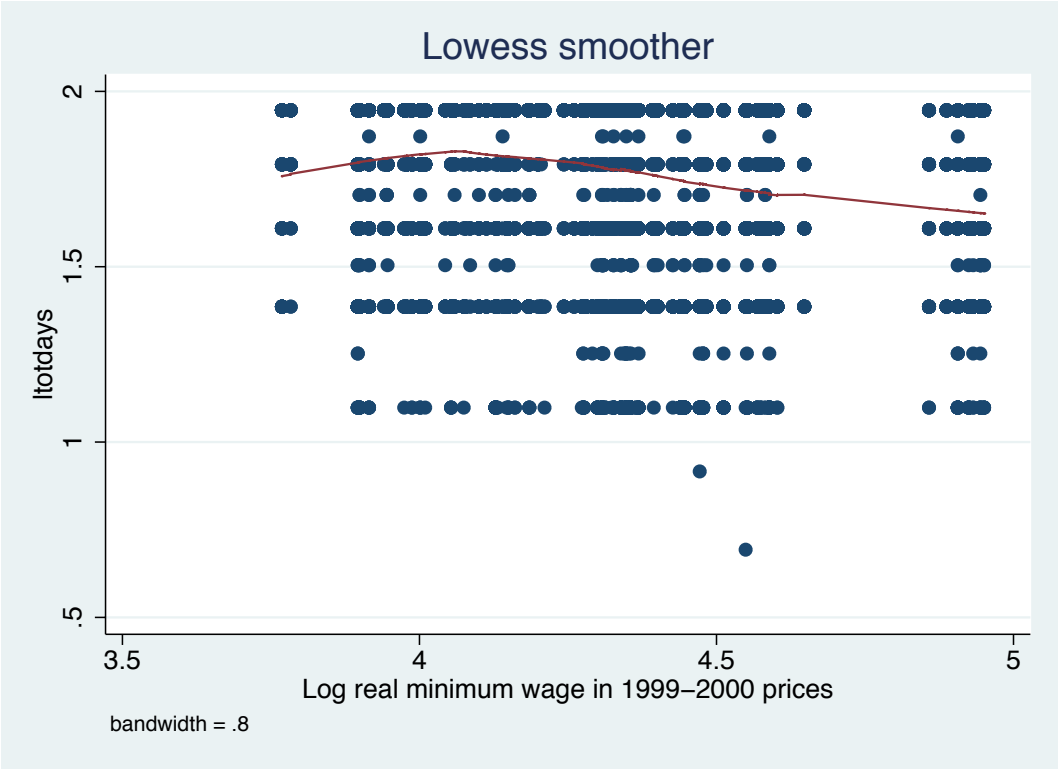
Taking cues from these preliminary diagnostics, I specify a flexible regression model allowing for these non-linearities as follows:

$$Y_{ist} = f(MW_{s(t-1)}, E_{st}, MW_{s(t-1)} * E_{st}) + \alpha * LGDP + \beta * X_{ist} + D_s + D_t$$

Y_{ist} , the outcome variable represents the individual level outcome for worker i working in state s at time t and could be either (1) Employment taking the value 1 if the worker is employed in the construction industry and 0 if in agriculture (neighbor industry); (2) log daily wage of a worker, conditional on working in the construction industry; or (3) log days of employment in the construction industry in the preceding week, conditional on working in the construction industry.

$f(.)$ is a nonlinear function of minimum wage, $MW_{s(t-1)}$ (the real minimum wage in state s in time $t-1$) and enforcement at state s at time t, E_{st}, measured by the number of inspectors, and the interaction of both. In the above specification, minimum wage appears as

Figure 6: Lowess smoothing estimate of log days on log real minimum wage



Note: Blue dots are scatter plots; red lines are estimated relationships

dummies representing various levels of minimum wages. Here, I consider four dummy variables representing four quartiles of the minimum wage distribution. The binary variable quartile 1 takes a value 1 if the minimum wage falls in the first quartile of the distribution and 0 otherwise. The binary variable quartile 2 takes a value 1 if the minimum wage falls in the second quartile of the distribution and 0 otherwise. The binary variable quartile 3 takes a value 1 if the minimum wage falls in the third quartile of the distribution and 0 otherwise. The binary variable quartile 4 takes a value 1 if the minimum wage falls in the last quartile of the distribution and 0 otherwise.

$LGDP_{st}$ is log per-worker real construction GDP in state s at time t and controls for aggregate demand conditions. X_{ist} represents individual demographic characteristics such as age, square of age, gender, social group, and sector. Gender is coded as dummy variable and the base category is females. Sector is either rural or urban and the base category in this case is rural. In India, social groups are classified into four major categories the scheduled caste,

scheduled tribes, other backward classes and other castes[9]. Social groups are coded as dummy variables, and the base category is Scheduled Tribes. The model also controls for year fixed effects (D_t) and state fixed effects (D_s).

The dummy variables (of MW) model for all three outcome variables, was estimated using an Ordinary Least Squared (OLS) and Instrumental Variable Two Stage Least Squares (IV-TS) regressions. Additionally, employment variable was also studied using Probit and Instrumental Variable Probit (IV Probit) regressions. The entire sample including construction workers and agriculture workers was used for the employment regression. Wage and days of work regression was based on a sample of workers, conditional on working in the construction industry. Table 2 provides the list of endogenous regressors and instruments for the dummy variables model with 4 dummies each taking the value 1 when the log real minimum wages falls in the first quartile, second quartile, third quartile, and fourth quartile of the distribution respectively, and 0 otherwise. Note that this is an exactly identified model with four endogenous regressors and four instruments. Table 3 lists down all the endogenous regressors and instruments in the dummy variables model considered here.

As a first step, instruments are tested for relevance. In a model with multiple endogenous regressors, Angrist and Pichske (2008) provide for the Angrist-Pischke multivariate F-test of excluded instruments, which corresponds to a test based on F-statistic from each first stage regression after netting out the effect of the remaining endogenous regressors. As a rule of thumb, an F-value above 10 is considered significant.

Table 3: Approach for the Instrumental variable strategy

Model	Endogenous regressors	Instruments
Dummy variables model	MW inspectors,	Factories inspectors,
A case of 4 dummies repre-	MW inspectors * quartile 2,	Factories inspectors * quartile 2,
senting each quartile.	MW inspectors * quartile 3,	Factories inspectors * quartile 3,
	MW inspectors * quartile 4.	Factories inspectors * quartile 4.

[9]The Scheduled Castes (SC) and Scheduled Tribes (STs) are two groups of historically-disadvantaged people recognized in the Constitution of India. Other Backward Class (OBC) is a collective term used by the Government of India to classify castes which are educationally and socially disadvantaged, but not as acutely as SCs and STs. All other castes are grouped as Forward caste. The lists of Forward, Other Backward and Scheduled castes, and Scheduled tribes are compiled by the government of India irrespective of religion.

5 Results and Interpretation

5.1 Main Results

Table 4 presents the statistics for instrument relevance from the first stage regressions for the dummy variables model based on quartiles of minimum wage distribution. The p-values for the Angrist-Pischke F-test in the employment model and wage/days of work model for each of the five endogenous regressors are reported. All p-values are 0.0, implying each of these regressors are individually identified[10].

Table 4: Tests for instrument relevance in the dummy-variables model

Endogenous regressors	P-value for employment regression	P-value for wage/days regression
(1)	(2)	(3)
MW Inspectors	0.0	0.0
MW Inspectors*quartile 1	0.00	0.00
MW Inspectors*quartile 2	0.00	0.00
MW Inspectors*quartile 3	0.00	0.00
MW Inspectors*quartile 4	0.00	0.00

Table 5 presents the effect of minimum wages on employment at different levels of enforcement using the linear probability model (OLS and IV two-stage method) in panel 1 and probit and IV probit models in panel 2. Ordinary Least Squares (OLS) regression results from columns 1 and 2 (panel 1) indicate a negative relationship between employment and minimum wages at low level of enforcement, say the 25th percentile. Compared to the base category of first quartile (0 to 25th percentile log MW), the likelihood of employment significantly declines by .23 in the second quartile, by .25 in the third quartile and by .18 in the fourth quartile. The Instrumental Variables two-state least squares regression (IV 2SLS) , which is my preferred specification, confirms these results, although the magnitude of the effect is different, especially in higher quartiles. Column 3 and 4 (panel 1) present the effects at the median level of enforcement, which are positive unlike at lower level of enforcement. The OLS results in column 3 shows that compared to the base category of 1st quartile, the likelihood of employment

[10] A linear-quadratic model was also estimated using minimum wage and a minimum wage squared term. This model has three endogenous regressors (MW Inspectors, MW Inspectors* log minimum wage, MW Inspectors * log minimum wage* log minimum wage) and three instruments (Factories inspectors, Factories inspectors * log minimum wage, Factories inspectors * log minimum wage * log minimum wage). The p-value obtained from the AP F-test for each of the three regressors is above .1, implying they are not individually identified by the instruments. Hence, the linear quadratic model was dropped from the main specification.

significantly increases by .28 in the second quartile, by .26 in the third quartile, and by .33 in the fourth quartile. But IV 2SLS results indicate that compared to the base category of 1st quartile, the likelihood of employment significantly increases by .25 in quartile 2, .27 in quartile 3, but drops to -.07 in quartile 4 (although the results are not significant at the fourth quartile). This indicates a hump-shaped relationship between employment and minimum wages. At very high levels of enforcement, say 75th percentile, OLS results (column 5) indicate that compared to quartile 1, the likelihood of employment in quartile 2, quartile 3 and quartile 4 are positive and increasing over the distribution of log minimum wages. But IV 2SLS results (column 6), indicate a clear and significant hump shaped relationship. Compared to the base category of quartile 1, the likelihood of employment in quartile 2 significantly increases by .93 in quartile 2, .92 in quartile 3, and .85 in quartile 4.

These results are robust to alternate specifications. Panel 2 in Table 5 presents the results using probit and IV probit regressions. The IV probit regressions, which are my preferred specifications because the predicted probabilities in this case are between between 0 and 1 (unlike the IV 2SLS model), indicate a uniform negative relationship at 25th percentile enforcement, a hump-shaped relationship at the median level of enforcement and higher levels of enforcement.

Table 6 presents minimum wage effects on log wages, conditional on working in the construction industry. Wage effects at 25th percentile of enforcement from both OLS and IV 2SLS indicates a negative effect in the second and third quartile and a positive effect in the fourth quartile. The IV 2SLS regression results (my preferred specification), indicates that compared to the base category of quartile 1, log wages in quartile 2 significantly decreased by .45 points in quartile 2, .42 points in quartile 3, and increased by .50 points in quartile 4. At the median level of enforcement, positive and significant effects are observed from OLS and IV regression results. The effects from IV regression are higher in magnitude, compared to OLS. Column 4 indicates that compared to the base category of quartile 1, log wages in quartile 2 are higher by .46 points, in quartile 3 by .39 points and in quartile 4 by 1.15 points. At even higher levels of enforcement (75th percentile), the wage effects are positive but are higher in magnitude compared to lower levels of enforcement. IV 2SLS results in column 6 indicates that compared to the base category of quartile 1, log wages in quartile 2 are higher by 1.77 points, in quartile 3 by 1.56 points and in quartile 4 by 2.09 points[11].

[11]OLS and IV 2SLS regressions were also estimated between between days of work and minimum wages using

Table 5: Effects on employment at different level of enforcement

	LINEAR PROBABILITY MODEL					
Enforcement	25th percentile		50th percentile		75th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)
Log minimum wage	OLS	IV 2SLS	OLS	IV 2SLS	OLS	IV 2SLS
Quartile 1	-	-	-	-	-	-
(base category)						
Quartile 2	-0.23***	-0.21***	0.28***	0.25***	1.02***	0.93***
	(0.03)	(0.06)	(0.03)	(0.06)	(0.07)	(0.21)
Quartile 3	-0.27***	-0.18**	0.26***	0.27***	1.02***	0.92***
	(0.03)	(0.07)	(0.03)	(0.06)	(0.07)	(0.22)
Quartile 4	-0.18***	-0.72***	0.33***	-0.07	1.07***	0.85***
	(0.03)	(0.10)	(0.03)	(0.10)	(0.07)	(0.23)
	PROBIT AND IV PROBIT REGRESSIONS					
Enforcement	25th percentile		50th percentile		75th percentile	
Log minimum wage	Probit	IV Probit	Probit	IV probit	Probit	IV Probit
Quartile 1	-	-	-	-	-	-
(base category)						
Quartile 2	-0.09	-0.28*	0.32***	0.35***	0.51***	0.65***
	(0.07)	(0.16)	(0.03)	(0.05)	(0.03)	(0.09)
Quartile 3	-0.22***	-0.29	0.24***	0.32***	0.50***	0.60***
	(0.06)	(0.18)	(0.03)	(0.05)	(0.04)	(0.08)
Quartile 4	0.01	-0.40**	0.42***	0.23**	0.60***	0.61***
	(0.08)	(0.17)	(0.04)	(0.11)	(0.03)	(0.06)

Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile 'i is the simply difference of predicted log wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

5.2 Interpretation of results

Results in section 5.1 indicates that the relationship between employment and minimum wage and between wages and minimum wages in the construction sector are distinctly different across enforcement levels, clarifying the importance of enforcement in this relationship. At high levels of enforcement (50th percentile and above),the likelihood of employment in the construction industry rises with an increase in minimum wage (quartiles) but declines at the upper tail.

the same specifications. However, insignificant results were obtained in the IV 2SLS regression throughout the minimum wage distribution.

Table 6: Effects on log wages at different level of enforcement

Enforcement	25th percentile		50th percentile		75th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)
Log minimum wage	OLS	IV	OLS	OLS	IV	OLS
Quartile 1 (base category)	-	-	-	-	-	-
Quartile 2	-0.02	-0.45***	0.18***	0.46***	0.48***	1.77***
	(0.04)	(0.08)	(0.04)	(0.09)	(0.09)	(0.31)
Quartile 3	-0.04	-0.42***	0.19***	0.39***	0.54***	1.56***
	(0.04)	(0.10)	(0.04)	(0.08)	(0.09)	(0.32)
Quartile 4	0.13***	0.50***	0.34***	1.15***	0.64***	2.09***
	(0.04)	(0.11)	(0.04)	(0.13)	(0.09)	(0.33)

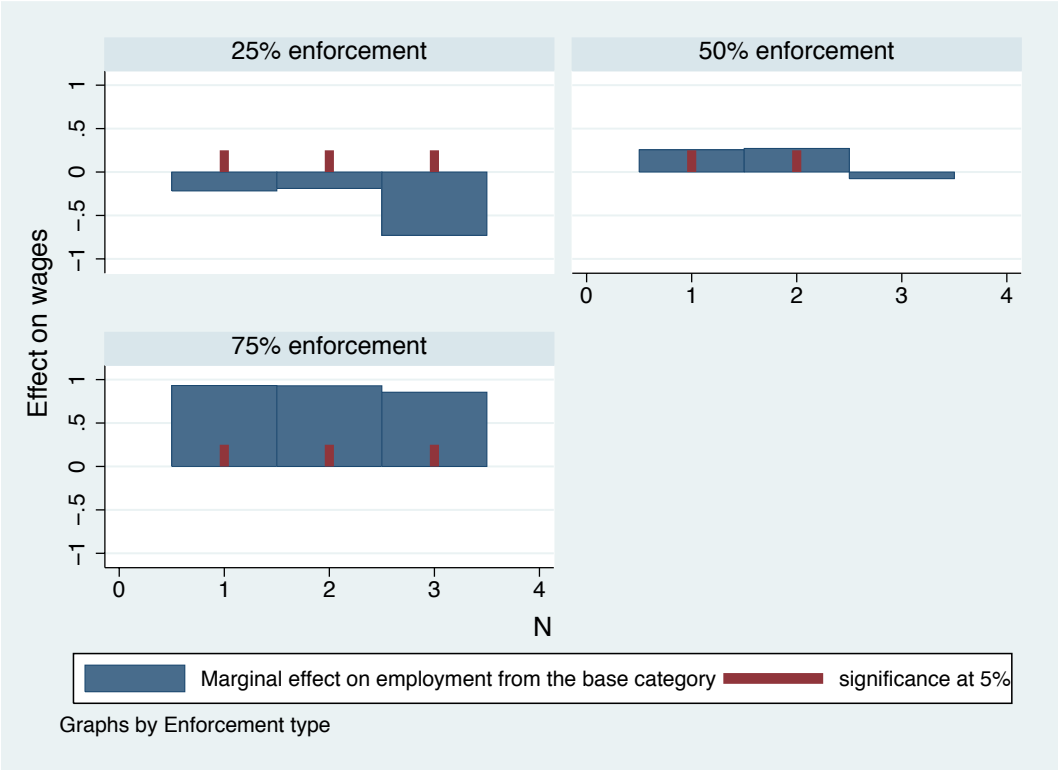
Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile 'i is the simply difference of predicted log wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

But at lower levels of enforcement (say 25th percentile), a rise in minimum wage decreases the likelihood of employment across all quartiles with a mild dent. Wage effects are negative at 25th percentile enforcement and at lower quartiles but are positive at 4th quartile. At higher levels of enforcement, wages effects are uniformly positive although with a mild dent in the third quartile. These results are summarized in a bar graph in figures 7 and 8 for employment and wages, respectively.

As mentioned earier, labor market model with imperfect competition and imperfect enforcement as in Basu, Chau and Kanbur (2010) provides a consistent theoretical explanation to these empirical results. BCKs model incorporates imperfect enforcement to Stigler (1946)s labor market model of imperfect competition.

In BCKs model, imperfect enforcement is modelled as the likelihood λ of inspection and discovery. Under perfect enforcement ($\lambda = 1$), comparative static responses in this model is exactly the same as Stiglers model, which is a hump shaped relationship with the turnaround threshold at the competitive wage equilibrium. The hump shape is predicted in Stigler(1946) and BCK because below the threshold, a perfectly enforced binding minimum wage decreases the marginal cost of labor, which causes employment to increase. However, above the threshold, a perfectly enforced binding minimum wage increases the marginal cost of labor and hence

Figure 7: Effect on employment at different levels of enforcement from IV-2SLS regressions

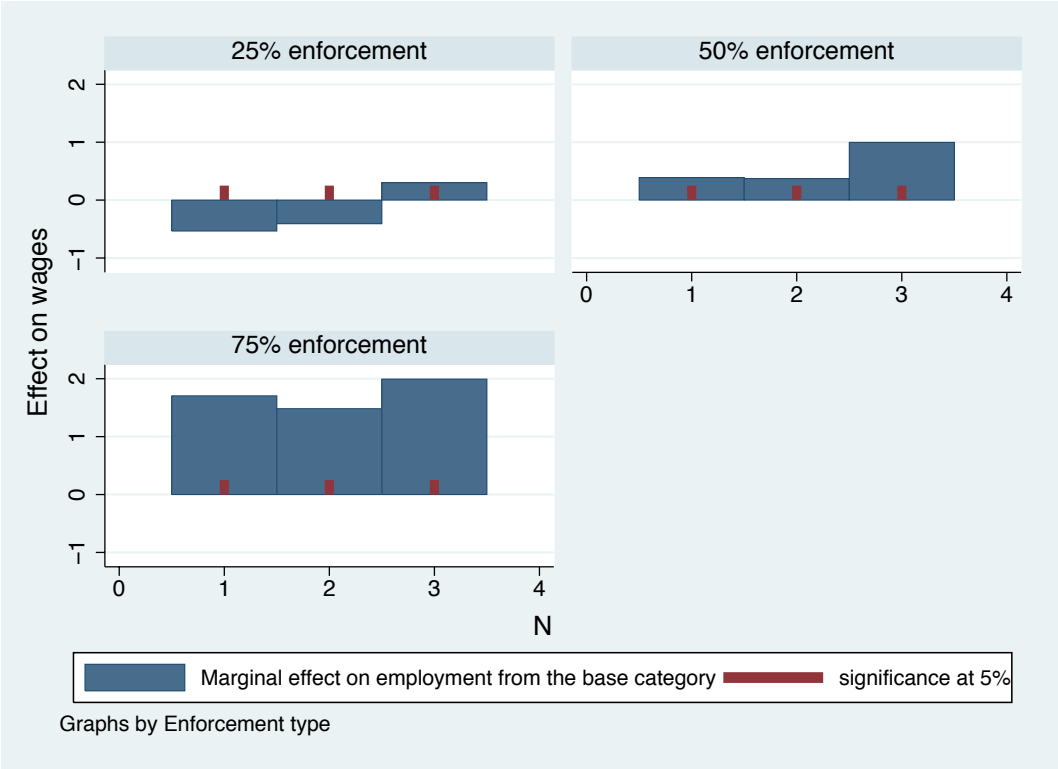


Red spike indicates that the estimate is significant at 5% level

causes employment to decline. With imperfect enforcement, the hump shape between employment and minimum wages are retained but the threshold for sign reversal is lower than the competitive-wage threshold(as in the case of perfect enforcement) and depends uniquely on λ, the enforcement level. With lower enforcement, the threshold at which the expected marginal cost changes from positive to negative with an increase in minimum wage, is lower. The threshold increases with an increase in enforcement. This implies that lower the level of enforcement, the shorter the interval of minimum wage for which employment responses to minimum wages are positive. It also implies that higher the enforcement, longer the interval of minimum wage for which employment responses are positive or more prominent is the hump shape.

This is precisely what we see in the results. The employment response at 25th percentile (low level) enforcement indicates a negative effect, indicating possibly that the upward sloping part of employment response is for a very short interval of minimum wage and that the downward-sloping response is for the longer interval. For higher levels of enforcement (50th

Figure 8: Effect on wages at different levels of enforcement from IV 2SLS regressions



Red spike indicates that the estimate is significant at 5% level

and 75th percentile in the Figure 7), the upward sloping part of employment is over a larger interval of minimum wage and is more pronounced, creating the hump shape.

Wage responses at higher levels of enforcement (50th and 75th percentile) are positive and increasing through the minimum wage distribution (Figure 8). At 25th percentile enforcement, wage effects are negative but very low in magnitude in quartile 2 and 3, but positive and low in magnitude in quartile 4. Firms tend to shirk complying with the law when there is low enforcement, and even reduce wages slightly by a marginal amount. But at higher levels of enforcement wage responses to minimum wage are comparatively more compliant and the magnitude of wage response are higher in the higher tail of the minimum wage distribution.

6 Robustness and results for specific demographic groups

6.1 Robustness

It is important to check if the results are robust to an alternate definition of the employment variable. In the main results in section 5.1, the employment variable was defined to take

the value 1 if the worker worked in the construction industry and 0 if the worker worked in agriculture. In the alternate definition, the 0 category now includes workers in agriculture, retail trade and land transport industries (next closest neighbors to construction after agriculture as in Figure 1 and 2). Table 7 shows the result, at 25^{th},50^{th} and 75^{th} percentile enforcement levels. At 50^{th} percentile enforcement level both IV 2SLS (column 3) and IV probit (column 4) models indicate that the hump shape is retained and is significant. At 25th percentile enforcement, there is a uniform negative effect similar to the main results in table 5 (columns 1 and 2), although with a slight dent, which is again similar to the main results. At 75th percentile enforcement, there is a hump shaped relationship from the IV 2SLS model as seen in column 5, which mimics the IV-2SLS results in table 6. IV Probit results in column 6 indicate an increasing and tapering effect again similar to that obtained in table 6 (panel 2 and column 6). This implies that the results are robust to alternate definitions of the employment variable.

Table 7: Effects on employment - altering the neighbor industry to include retail trade and land transport

Enforcement	25th percentile		50th percentile		75th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)
Log minimum wage	IV 2SLS	IVProbit	IV 2SLS	IVProbit	IV 2SLS	IVProbit
Quartile 1 (base category)	-	-	-	-	-	-
Quartile 2	-0.22***	-0.24**	0.40***	0.26***	1.29***	0.43***
	(0.08)	(0.10)	(0.08)	(0.03)	(0.28)	(0.06)
Quartile 3	-0.15	-0.16	0.43***	0.30***	1.28***	0.40***
	(0.09)	(0.12)	(0.07)	(0.03)	(0.29)	(0.06)
Quartile 4	-0.34***	-0.30**	0.32**	0.21***	1.27***	0.42***
	(0.11)	(0.13)	(0.12)	(0.08)	(0.30)	(0.05)

Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile i is the simply difference of predicted wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

6.2 Results for specific demographic groups

Table A1 and table A2 in the Appendix presents employment and wage effects respectively for a sample of workers who belong to the social group called scheduled tribes and scheduled castes.

The Scheduled Castes and Scheduled Tribes (STs) are two groups of historically-disadvantaged people recognized in the Constitution of India. Due to the relative disadvantages they face, employers could potentially exert market power on workers belonging to these groups. Results based on this sample mimic the main results for the entire sample in table 5 and table 6. Another group that can potentially face employers power are workers who reside in rural areas and commute or migrate for a short term to work in urban areas. Assuming, that a large majority of construction activity takes place in urban areas, traveling to work and incomplete information will be a defining factor for workers residing in rural areas. Employment and wage effects estimated using from a sample of rural workers are presented in table A3 and table A4 in the Appendix respectively. Here again, results are similar to those in table 5 and table 6.

7 Conclusion

There is growing empirical evidence of imperfect enforcement and high non-compliance of the minimum wage law in both developed and developing country settings. Despite this evidence, studies that estimate the effects of the minimum wage legislation accounting for imperfect enforcement, are missing. The present study addresses this gap by estimating the interactive effects of minimum wage and enforcement among construction industry workers in the Indian context. Regional and time varying minimum wage and enforcement in India provides a unique platform to study these effects.

Enforcement in this paper, is measured by the number of inspectors under the minimum wage law and is endogenous because of unobserved heterogeneity affecting enforcement and labor market outcomes at the state level. Further, reverse causality could exist that is, employment and wage levels can also drive the levels of enforcement. A unique instrument number of inspectors under the Factories Act, another law implemented and enforced by the states is employed to address this endogeneity.

The results from this paper strongly indicate that response of employment and wages to minimum wages vary starkly with the levels of enforcement. At low levels of enforcement, employment responses are uniformly negative, and at higher levels, there emerges a hump shaped relationship. These findings underscore the role of enforcement in studying the minimum law and the importance of enforcement as an institution in itself. Further, these results are consistent with models of imperfect competition and imperfect enforcement (Basu, Chau

and Kanbur, 2010).

These results raise a number of research and policy questions for further research. While the present paper studies minimum wage effects at different enforcement levels on average levels of employment, wages and days of work for all workers, it brings up an interesting question of whether and how minimum wage effects vary across different enforcements levels for sub-minimum wage workers. This is an important policy question because it strikes the heart of the matter by asking if the minimum wage policy benefits those workers whom it was intended to benefit. Another key issue in the realm of enforcement is whether enforcement by itself and/or in interaction with minimum wage affects the level of non-compliance at all in the Indian context. A few papers have addressed this question in other developing countries (Bhorat et al. (2012) and Ronconi (2010)). Additionally, enforcement could potentially affect the depth of non-compliance and the square of depth of non-compliance; these classes of measures would be similar to the Foster-Greer-Thorbecke generalized measures of poverty. A key issue in these type of research questions, as in the present paper, is to address endogeneity in the allocation of enforcement by the government.

With an understanding of how enforcement affects average and sub minimum wage labor market outcomes as well as generalized measures of non-compliance, it may be worthwhile to theoretically explore the optimal level of enforcement, and empirically test if the levels of enforcement are optimal in the Indian context (or other developing countries depending on the types of availability of data).

References

Abowd, John M., Francis Kramarz and David N. Margolis, 1999. "Minimum Wages and Employment in France and the United States," NBER Working Papers 6996, National Bureau of Economic Research, Cambridge, MA.

Almeida, Rita and Pedro Carneiro. 2009. Enforcement of labor regulation and firm size. *Journal of Comparative Economics* 37, no. 1: 28-46

Basu, Arnab. K., Nancy H. Chau and Ravi Kanbur. 2010. Turning a blind eye: costly enforcement, credible commitment and minimum wage laws. *The Economic Journal* 120 (March), issue 543: 244-269.

Bell, Linda. 1997. The impact of minimum wages in Mexico and Colombia. *Journal of Labor Economics* 15, no. 3, pt.2): S102S135.

Belser, Patrik, and Uma Rani. 2010. Extending the coverage of minimum wages in India: simulations from household data. Conditions of work and employment series no. 26. International labor office, Geneva.

Bhaskar. V, Alan Manning and Ted To. 2002. Oligopsony and monopsonistic competition in labor markets. *Journal of Economic Perspectives* 16, no. 2 (Spring):155174.

Bhorat, Haroon, Ravi Kanbur, Natasha Mayet. 2012. Estimating the Causal Effect of Enforcement on Minimum Wage Compliance: The Case of South Africa. *Review of Development Economics* 16:no. 4: pp 608-623.

Bhorat, Haroon, Ravi Kanbur, Natasha Mayet. 2013. The impact of sectoral minimum wage laws on employment, wages, and hours of work in South Africa. *IZA Journal of Labor and Development* 2:1.

Burkhauser, Richard.V, Kenneth A. Couch and David C. Wittenburg. 2000. A reassessment of the new economics of the minimum wage literature with monthly data from the current population survey. *Journal of Labor Economics* 18: 653680.

Card, David, and Alan B. Krueger.1994. Minimum wages and employment: A case study of the New Jersey and Pennsylvania fast food industries. *American Economic Review* 84:no. 4 (September): 772793.

Card, David and Alan B. Krueger. 2000. Minimum Wages and Employment: A case Study of the Fast- Food Industry in New Jersey and Pennsylvania: Reply. *American Economic*

Review 90:no. 5 (December): 13971420.

Dickens, Richard, Stephen Machin and Alan Manning. 1999. The effects of minimum wages on employment: Theory and evidence from Britain. *Journal of Labor Economics* 17: no. 1 (January):1-22.

Dube, Arindrajit, Suresh Naidu, and Michael Reich. 2007. The economic effects of a citywide minimum mage. *Industrial and Labor Relations Review* 60:no. 4: 522543.

Dube, Arindrajit, William Lester, and Michael Reich. 2010. Minimum wage effects across state borders: estimates using contiguous counties. *The Review of Economics and Statistics* 92: no. 4(November): 945964.

Gindling, Thomas. H and Katherine Terrell. 1995. The nature of minimum wages and their effectiveness as a wage floor in Costa Rica, 1976-1991. *World Development* 23:1439-58.

Harrison, Ann and Jason Scorse. 2004. The impact of globalization on compliance with labor standards: a plant- level study. In *Brookings Trade Forum 2003*, ed. Susan Collins and Dani Rodrik, Brookings Institution Press, Washington D.C.

Labor Bureau. 2010. Report on the working of The Minimum Wages Act, 1948 for the year 2010. Labor Bureau, Ministry of Labor and Employment, Government of India, Chandigarh/Shimla.

Lemos, Sara. 2006. Minimum wage effects in a developing country. Mimeo, University of Leicester.

Lemos, Sara. 2004. Minimum wage policy and employment effects: Evidence from Brazil. *Economia* 5: no. 1(Fall):219-66.

Machin, Stephen, Alan Manning and Lupin Rahman. 2002. Care home workers and the introduction of the UK national minimum wage. Mimeo, London Sschool of Economics.

Machin, Stephen and Joan Wilson. 2004. Minimum wages in a low wage labour market: Care homes in the UK. *Economic Journal* 114: C102-C109.

Maloney, William and Jairo Nunez Mendez. 2004. Measuring the impact of minimum wages: Evidence from Latin America. In *Law and Employment: Lessons from Latin America and the Caribbean*, ed. James Heckman and Carmen Pages. Chicago: University of Chicago Press

Madheswaran, S., D. Rajasekhar, D., and K.G. Gayathri Devi. 2005. A comprehensive study of status of beedi industry in Karnataka. Bangalore: Institute of Social and Economic

Change.

Montenegro, Claudio E, and Carmen Pags. 2004. Who Benefits from Labor Market Regulations? Chile, 1960-1998. In James Heckman and Carmen Pags, eds., Law and Employment: Lessons from Latin America and the Caribbean, National Bureau of Economic Research, Inc.

Neumark, David and William Wascher. 1992. Employment effects of minimum wages and subminimum wages: panel data on state minimum wage laws. *Industrial and Labor Relations Review* 46: no. 1 (October).

Neumark, David and William Wascher. 2000. Minimum wages and Employment: A case study of fast-food industry in New Jersey and Pennsylvania: comment. *American Economic Review* 90:no. 5 (October): 13621396.

Neumark, David, Mark Schweitzer and William Wascher. 2000. The effects of minimum wages throughout the wage distribution. Working paper No.7519, National Bureau of Economic Research, Cambridge, MA.

Ronconi, Lucas. 2010. Enforcement and Compliance with Labor Regulations.*Industrial and Labor Relations Review* 63: No. 4, article 9.

Strobl, Eric and Frank Walsh. 2001. Minimum wage and compliance: the case of Trinidad and Tobago. *Economic Development and Cultural Change* 51:no. 2: 427-50.

Stigler, George J. The economics of minimum wage legislation. *American Economic Review* 36: 358:65.

Shyam Sundar, K.R. 2007. Impact of labour regulations on industrial development and employment: A study of Maharashtra. Labor regulation in Indian industries series, No. 6. Institute for studies in Industrial development, New Delhi.

Shyam Sundar, K.R. 2010. Labour reforms and decent work in India: A study of labour inspection in India. Bookwell publishing house, New Delhi, India.

Shyam Sundar, K.R. 2010. Evaluation of labor inspections reforms in India. *Indian Journal of Labor economics* 53: no.3

Self Employed Women's Association. 2005. At the kadiyanaka: challenges faced by construction workers in Ahmedabad. `http://www.sewaresearch.org/eng-researches.htm` (accessed December 24, 2013.

Appendix

Table A1: Effects on employment for scheduled tribes and scheduled caste

Enforcement	25th percentile		50th percentile		75th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)
Log minimum wage	IV 2SLS	IVProbit	IV 2SLS	IVProbit	IV 2SLS	IVProbit
Quartile 1	-	-	-	-	-	-
(base category)						
Quartile 2	-0.06	-0.003	0.30***	0.45***	0.81***	0.60***
	(0.07)	(0.21)	(0.07)	(0.06)	(0.21)	(0.11)
Quartile 3	-0.10	-0.06	0.34***	0.48***	0.98***	0.74***
	(0.08)	(0.22)	(0.07)	(0.07)	(0.24)	(0.12)
Quartile 4	-0.9***	-0.47***	-0.18	-0.02	0.84***	0.57***
	(0.17)	(0.16)	(0.13)	(0.11)	(0.24)	(0.07)

Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile i is the simply difference of predicted wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

Table A2: Effects on wages for scheduled tribes and scheduled caste

Enforcement	25th percentile (1)	50th percentile (2)	75th percentile (3)
Log minimum wage	IV 2SLS	IV 2SLS	IV 2SLS
Quartile 1 (base category)	-	-	-
Quartile 2	-0.31***	-0.18	0.89***
	(0.11)	(0.12)	(0.38)
Quartile 3	-0.09	-0.15	0.50
	(0.14)	(0.10)	(0.39)
Quartile 4	0.63***	0.79***	1.02**
	(0.23)	(0.24)	(0.43)

Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile i is the simply difference of predicted wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

Table A3: Effects on employment for rural residents

Enforcement	25th percentile		50th percentile		75th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)
Log minimum wage	IV 2SLS	IVProbit	IV 2SLS	IVProbit	IV 2SLS	IVProbit
Quartile 1	-	-	-	-	-	-
(base category)						
Quartile 2	-0.15*	-0.23	0.27***	0.34***	0.90***	0.49***
	(0.08)	(0.2)	(0.07)	(0.05)	(0.25)	(0.10)
Quartile 3	-0.13	-0.25	0.28***	0.31***	0.87***	0.42***
	(0.09)	(0.22)	(0.07)	(0.05)	(0.26)	(0.08)
Quartile 4	-0.58***	-0.41*	0.0005	0.21*	0.84***	0.46***
	(0.12)	(0.22)	(0.11)	(0.11)	(0.27)	(0.07)

Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile i is the simply difference of predicted wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

Table A4: Effects on wages for rural residents

Enforcement	25th percentile (1)	50th percentile (2)	75th percentile (3)
Log minimum wage	IV 2SLS	IV 2SLS	IV 2SLS
Quartile 1 (base category)	-	-	-
Quartile 2	-0.53***	0.38***	1.7***
	(0.10)	(0.12)	(0.4)
Quartile 3	-0.4***	0.37***	1.48***
	(0.14)	(0.10)	(0.41)
Quartile 4	0.29**	0.99***	1.99***
	(0.13)	(0.15)	(0.42)

Note: *** - statistical significance at 1%; **- statistical significance at 5%; *- statistical significance at 10%; Robust standard errors in parentheses for all models; bootstrap standard errors are reported for IV probit regressions; controls in all regressions include (1) at the individual level: age, age-squared, social group, and sector (Rural/urban); (2) at the state level: per worker construction sector state net domestic product, time dummies and state dummies. Quartile i is a dummy for belonging to the i_{th} quartile of minimum wages and the base category is quartile 1. Effects in quartile i is the simply difference of predicted wages at quartile i from quartile 1. For the probit and IV probit models, effects were calculated by differencing the probit index function at quartile i from quartile 0.

OTHER A.E.M. WORKING PAPERS

WP No	Title	Fee (if applicable)	Author(s)
2014-11	Thresholds, Informality, and Partitions of Compliance		Kanbur, R. and M. Keen
2014-10	On the Political Economy of Guest Workers Programs in Agriculture		Richard, B.
2014-09	Groupings and the Gains from Tagging		Kanbur, R. and M. Tuomala
2014-08	Economic Policy in South Africa: Past, Present, and Future		Bhorat, H., Hirsch, A., Kanbur, R. and M. Ncube
2014-07	The Economics of China: Successes and Challenges		Fan, S., Kanbur, R., Wei, S. and X. Zhang
2014-06	Mindsets, Trends and the Informal Economy		Kanbur, R.
2014-05	Regulation and Non-Compliance: Magnitudes and Patterns for India's Factories Act		Chatterjee, U. and R. Kanbur
2014-04	Urbanization and Agglomeration Benefits: Gender Differentiated Impacts on Enterprise Creation in India's Information Sector		Ghani, E., Kanbur, R. and S. O'Connell
2014-03	Globalization and Inequality		Kanbur, R.
2014-02	Should Mineral Revenues be Used for Countercyclical Macroeconomic Policy in Kazakhstan?		Kyle, S.
2014-01	Performance of Thailand Banks after the 1997 East Asian Financial Crisis		Mahathanaseth, I. and L. Tauer
2013-20	What is a "Meal"? Comparing Methods to Determine Cooking Events		Harrell, S., Beltramo, T., Levine, D., Blalock, G. and A. Simons
2013-19	University Licensing of Patents for Varietal Innovations in Agriculture		Rickard, B., Richards, T. and J. Yan
2013-18	How Important Was Marxism for the Development of Mozambique and Angola?		Kyle, S.
2013-17	Social Protection, Poverty and the Post-2015 Agenda		Fiszbein, A., Kanbur, R. and R. Yemtsov

Paper copies are being replaced by electronic Portable Document Files (PDFs). To request PDFs of AEM publications, write to (be sure to include your e-mail address): Publications, Department of Applied Economics and Management, Warren Hall, Cornell University, Ithaca, NY 14853-7801. If a fee is indicated, please include a check or money order made payable to Cornell University for the amount of your purchase. Visit our Web site (*http://dyson.cornell.edu/research/wp.php)* for a more complete list of recent bulletins.