Working Paper

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Public-Private Wage Gap in the Indian Mining and Quarrying Industry

Smrutirekha Mohanty

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Website : www.spiesr.ac.in

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Smrutirekha Mohanty*

Abstract

The mineral sector has remained one of the strategic sectors in the growth of several natural resource-rich nations. India's case, therefore, is no different. However, mining in India is contentious with respect to a number of issues: power devolution between the state and the centre, tribal rights on mineral rich lands, land encroachment by the state in the pretext of eminent domain and sovereignty, and so on. Since New Economic Policy adopted in 1991, India has witnessed increasing erosion of public sector mines replaced by gradual emergence of private sector mines. However, consequent upon this rise of private actors, the generation of employment from the mines has rather declined. In the current scenario, there is an ongoing debate on the conditions of mining workers. In this context, it may be interesting to examine the current state of mining workers with respect to their wages. This paper examines if there is any wage gap between the workers in the public and the private sector mines in India, using the data gathered from three quin quennial rounds (2004-05, 2009-10, and 2011-12) of the nationally representative household survey on employment and unemployment situation in India. We use linear regression and quantile regression to estimate the public-private wage differential in the Indian mining industry. The OLS results suggest that workers in the public sector mines earn 59 per cent higher wages than their private counterparts. However, the wage gap doesn't remain uniform across the wage distribution. The quantile regression results show that the wage gap happens to be higher at lower tail of the distribution and lower at the upper tail.

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Public-Private Wage Gap in the Indian Mining and Quarrying Industry

1. Introduction

Mining industry has remained one of the strategic industries in many developing as well as developed countries due to the immense importance it carries for the development of the upstream industries of today's world. The Indian case is no exception; it is the mining industry that constitutes the backbone of India's industrial development in past. During the post-independence time period of India, industrialisation received the most attention in the policy framework to ensure sustainable economic growth and development. In different Plan periods, the development of mining and quarrying industry was provided impetus in order to guarantee an uninterrupted supply of raw materials to many other industries.

With the liberalization of the economy in 1991, the mining sector was deregulated. Even as enhancing mineral output was considered important for large scale industrialisation, technological backwardness in both mineral extraction and subsequent processing plagued the industry. In 1994, for the first time, the mineral sector was opened up for the private sector, both domestic and foreign. In 2008, the New Mineral Policy allowed 100 per cent Foreign Direct Investment (FDI) in mining projects that led to a rising share of private mining activities in the country. The increasing erosion of public sector mines replaced by gradual emergence of private sector mines has raised certain issues with regard to labour conditions in the mining industry, such as health and safety issues, lower and delayed wages, living and working conditions, denial of minimum labour entitlements, exploitative labour sub-contracting arrangements etc. (Nair, 2002; Adduci, 2017). Although the labour condition is a multidimensional concept, we focus on one particular dimension i.e. worker's wage. This study aims to examine if there is any wage gap between the workers in the public and the private sector mines in India. While examining the public-private wage gap has become quite an empirical regularity in industrialized nations, the literature seems meagre in case of India. The notable studies that explore the existence of wage differentials between public and private sector workers in India

are: Duraiswamy and Duraiswamy (1995), Lakshmanasamy and Ramasamy (1999), Madheswaran (1998), Madheswaran and Shroff (2000), Glinskaya and Lokshin (2007) and, Azam and Prakash (2015).

We use the unit-level data provided by the National Sample Survey (NSS) Organization covering the period 2004-2011. Using linear regression, our study estimates the mean wage differential between workers in the public and private sector mines while the quantile regression estimates the wage differential at various quantiles on the conditional wage distribution. The study finds that there exists a significant earnings differential between the workers in public and private sector mines in India across the entire wage distribution.

The rest of the paper is structured as follows. Section 2 discusses the theoretical background on the public-private wage gap and reviews the related literature. Section 3 presents the empirical strategy. Section 4 presents the background information on the Indian mineral sector and also the data and summary statistics. Section 5 discusses the empirical results, and Section 6 concludes the paper.

2. Related Literature

2.1 Theories on public-private wage gap

In this section, we provide a brief discussion on the existing theories dealing with the issue of wage differential between public and private sectors across the world. The prominent theories are: the supply-demand model, the utility model, vote and budget maximization model, human capital model, bargaining model, and compensating differential model.

The supply-demand model proposes that the wage differential is caused by the distinct nature of goods and services produced in public and private sectors. The private sector, driven by the objective of profit maximization, fixes wages of its workers according to their marginal productivities. In the public sector, on the other hand, the connection between wages and productivity is loose (Rees and Shah, 1995). It is argued that wages of public sector workers are fixed at a level higher than their marginal productivity. The ability of the public sector to adjust this gap emerges from the nature of goods it produces. The public goods being essential and

non-substitutable and the demand for such goods being inelastic, the public sector has the power of passing the hike in wages of the public workers on to the consumers through taxes (Rees and Shah, 1995).

The utility and vote maximization model perceives the government as a maximizing economic agent which maximizes its utility subject to certain constraints. The utility maximization model developed by Ehrenberg (1973) holds that the utility of government is a function of public sector goods and services produced. The amount of public goods and services is determined by the volume of public sector employment, which in turn is a function of per capita wage of the workers. Thus in maximizing utility in the public sector, higher wages of the public sector workers are evident. Reder (1975) and Borjas (1980) use the vote maximization models to explain the public sector wage premium. Reder models the utility of the government as a function of expected number of votes and some ideological factors. The voting outcome, in turn, is a function of employment and wages among others. Borjas considers that the public sector employees are political interest groups and that they form the major chunk of voters among the masses. Therefore, the government in power works in the interest of its employees by paying higher wages to freeze votes for its party. The budget maximization model proposed by Niskanen (1975) views bureaucrats as budget maximizing agents and wages of the public employees as one of the major sources of the budgetary expenditure. He argues that the increase in wages of public employees is one of the important components in maximizing the budget function.

According to the human capital model, one of the objectives of the state and central governments is to produce and sustain quality governance for which qualified, trained and experienced workforce is a prerequisite. In order to attract and retain such a workforce, the public sector usually provides higher wages than the private sector.

The bargaining model observes that it is the presence of trade unions and collective bargaining that significantly influences the wage setting procedure in the public sector which is quite different from that of the private one (Gunderson,1979; Holmlund,1993). Moore and Raisian (1991) put forward the theory of compensating

differentials as one of the explanations for the wage differential between the public and private sectors.

2.2 Empirical evidence on public-private wage gap

The first formal study, focusing on public-private wage gap, was undertaken by Smith (1976). This study estimates the differential in wages between the federal and private sector workers in the USA. A number of empirical studies observe a premium for public sector employees (Hospido and Moral-Benito 2016; Chamberlain, 2015; Depalo et al., 2015). However, there also exist some studies providing evidence on public sector wage penalty, and some reporting small magnitude of public sector premium that vanishes over time. Bargain and Melly (2008) estimated the French public sector wage premium to be very small in the short-run that vanished in the long-run. Adamchik and Bedi (2000), in case of Poland, observed wage premium for private sector workers with university level education. In case of USA, Keefe (2012) reports that both the state and local government employees are not overpaid rather they are slightly under compensated compared to their private counterparts. Adding significant value to the extant literature on this topic, several past studies also focus on estimating the wage gap between the public and private sectors at different points on the wage distribution. A strand of literature utilizing the quantile regression technique reports that the wage premium for public sector workers tends to be higher at the bottom of the wage distribution and lower at the upper tails (Rahona-Lopez et al., 2016; Azam and Prakash, 2015; Depalo et al., 2015; Ramos et al., 2014; Christofides and Michael, 2013; Bargain and Melly, 2008; Lucifora and Meurs, 2006; Jurges, 2002; Nielsen and Rosholm, 2001; Mueller, 1998). However, Mizala et al. (2011) for Latin America and Blackaby et al. (1999) for U.K. observe that the public sector workers at the highest wage percentile earn less than their private counterparts.

The related literature on public-private wage differential in case of India is sparse, starting with Duraisamy and Duraisamy(1995) that used the data from the survey on Degree Holders and Technical Personnel (DHTP), 1981. This study held that a wage penalty did exist for public sector workers in India. A few studies that followed

Duraisamy and Duraisamy (1995) and used the same data arrived at similar conclusions (Lakshmanasamy and Ramasamy, 1999; Madheswaran, 1998; Madheswaran and Shroff, 2000). However, a few recent studies in case of India point to a wage premium for public sector workers. For example, applying three different econometric specifications (Ordinary Least Squares (OLS), Selection Bias Correction and Propensity Score Matching) on the NSS employment data for 1993-94 and 1999-2000, Glinskaya and Lokshin (2007) arrived at the single conclusion that there are large wage gaps among the three sectors (public sector, private formal and private informal sector). The study reports that the public sector wage premium ranges from 62 per cent to 102 per cent for private-formal sector and from 164 per cent to 259 per cent for private informal sector, depending on the choice of econometric specification. Azam and Prakash (2015) estimates that the public sector wage premium is 90 log points for rural India and 85 log points for urban India at the mean level. This study concludes that there is a public sector wage premium across the whole wage distribution.

3. Empirical strategy

Is there a wage differential between workers in the public sector and the private sector mines in India? To this end, we have estimated a linear two-way fixed-effects error components model to investigate the average earnings difference of workers in the public and private mines. Further, we have used quantile regression technique to sketch the pattern of earnings difference over the entire wage distribution.

Estimating a consistent effect of ownership status of the mines on the workers' wage is challenging as the ownership status is often endogenous. In our study, we estimate the impact of ownership on wage outcome under strict the exogeneity condition. Conventionally, the common strategies to deal with endogeneity–inclusion of fixed-effects, lagged dependent variables, and/or a vector of wide range of controls– rely on strong assumptions about conditional independence. For our OLS estimation, allowing two way fixed-effects, we ensure to take care of a limited form of endogeneity as the unobserved effects (as) are allowed to be correlated with the covariates of wage. To deal with heteroscedasticity and serial autocorrelation of the

error term, we cluster the standard errors at the state level.

Following the Mincerian type wage equation, we specify our linear fixed-effects model as:

$$W_{it} = \alpha_s + \gamma P_{it} + \beta X_{it} + \delta_t + \epsilon_{it} \quad (1)$$

where W_{it} denotes log of real daily wage of worker i in time period t. α_s and δ_t capture the state and year fixed-effects, respectively. P_{it} denotes the sector of employment (public mine/ private mine) of the worker i in the year t, γ captures the impact of ownership status of mines on workers' wage. X represents the vector of explanatory variables, β indicates the associated coefficient values for the vector of explanatory variables and ϵ_{it} is the random error term.

The quantile regression model developed by Koenkar and Bassett (1978) used in our analysis is of the following form:

$$W_i = \alpha_\theta + X_i \beta_\theta + \epsilon_{\theta_i} \quad (2)$$

where θ denotes various quantiles (0.1, 0.25,0.5, 0.75 and 0.9) on the conditional distribution of wages (W) given the vector of worker characteristics (X).

4. The Data

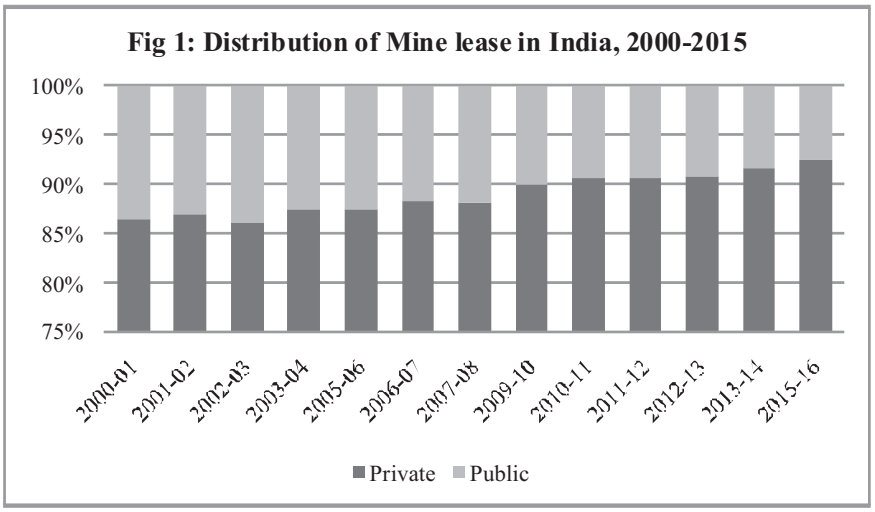
The data for this study come from two sources: National Sample Survey (NSS) and Indian Bureau of Mines (IBM). The NSSO regularly canvasses the employment and unemployment surveys in order to assess the labour market situation in India. The survey contains detailed information on respondent's socio-economic, demographic and household characteristics. We use the unit level data of the employment and unemployment schedules to estimate the level of employment in public and private mines. For regression analysis, information of workers' wage and their personal and household characteristics have also been extracted from these unit-level records. By pooling the information for mining and quarrying workers over three quinquennial rounds of NSS for time periods:2004-05, 2009-10 and 2011-12, we have constructed our final dataset. Since the NSSO doesn't provide information on the wages of those who are self-employed, the resultant dataset includes regular and casual workers and excludes the self-employed. Relevant data have been collected from various

publications of the Indian Bureau of Mines (IBM) in order to analyse certain aspects of mining in public and private sectors, such as allotment of mining leases and grant of area under the allotted leases.

4.1 Mining Industry in India: Some key indicators

Sector-wise distribution of Mining Leases

The relative distribution of mining leases in the country between the public and private entities show that the private firms share a sizeable percentage(92 per cent) of the total mining leases granted for operation in 2015-16.

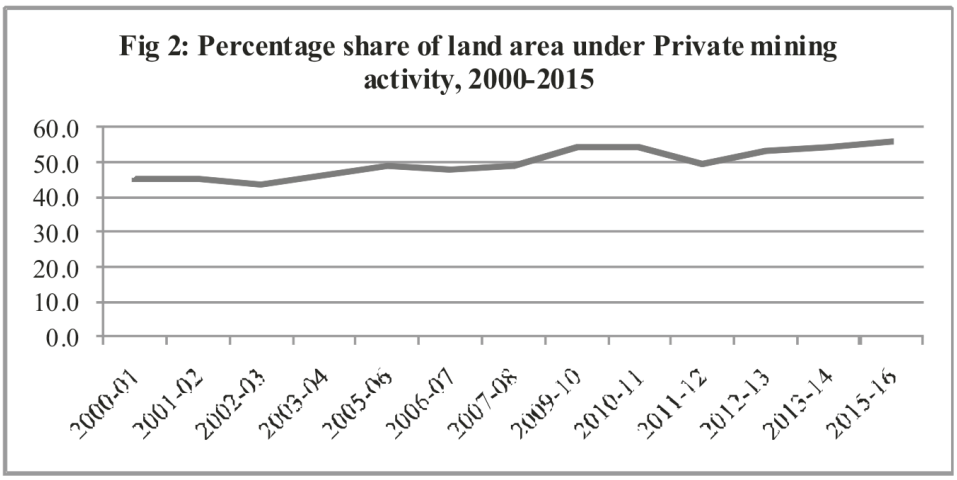


Source: Indian Bureau of Mines, various issues

In 2000-01, the private sector shares a significant portion of the total mining leases as high as 86 per cent, while the public sector shares meagre 14 per cent. Over the period 2000-2015, we observe a declining trend in the share of public entities and that of a corresponding rise in the share of private sector mines with respect to the allotment of mining leases. In terms of absolute figures, the private entities were allotted 8448 mining leases in 1998, which increased to 10567 in 2015 indicating an average annual growth rate of about 25 per cent.

Area under the Mining Leases

With the above observations of increasing entry of private players into the mineral sector of India, we notice that not only the share of private firms has increased with respect to number of allotted mines; the area under the mining leases for private operation has also increased (see Fig 2).



Source: Indian Bureau of Mines, various issues

In 2015, the private sector shares 56 per cent of the area allotted for mining and the rest was shared by the public sector. However, considering the absolute area under mining leases, we notice a declining trend for both public and private sectors. In 2015, the area under private mining stood at 325784 hectares and that of the public sector stood at 256216 hectares. These numbers stood at 406989 hectares for private sector and 496056 hectares for public sector, respectively during 2000.

Employment in Mines

Table 1 presents the estimates of employment in the public and the private sector mines in India at three time points: 2004-05, 2009-10 and 2011-12. We have applied the definition of Usual Principal and Subsidiary Status to identify workers in the mining and quarrying industry. According to the UPSS, if a person was engaged in any economic activity for 30 days or more during the 365 days preceding the date of survey, he/she is considered as a worker. In 2011-12, the estimated number of

workers engaged in public mines was 488936 and that of private mines was 1734376. From the estimated figures, we observe that higher proportions of workers are engaged in private mines than public for all the three time periods under consideration. Looking at the employment trend, we find that there has been a slight decline in the share of workers in public mines from 23.2 per cent in 2004-05 to 22.0 per cent in 2011-12 accompanied by a small increase in the share of workers in private mines from 76.8 per cent to 78.0 per cent for the same time period. This observation indicates that the role of private sector mines is expanding in creating employment opportunities, though the rate of employment generation is sluggish.

Table 1: Estimates of workers (15-59 age group) in the Mining & Quarrying industry

Year	Public mine	Private mine	Total
2004-05	521955	1729561	2251515
2009-10	601375	1844506	2445880
2011-12	488936	1734376	2223312

Source: Computed from NSS unit records

4.2 Construction of variables

This sub-section demonstrates the construction of dependent variable, the main explanatory variable, and the controls used in our empirical analysis. We consider relevant controls in accordance with the extant literature (Azam and Prakash, 2015; Glinskaya and Lokshin, 2007).

Dependent variable

The NSS provides information regarding wages and salaries of workers accrued both in terms of cash and kind for the reference week. The weekly wages are converted into daily wages. The natural logarithm of real daily wage of the individual worker is the dependent variable for our regression.

Independent variables

To define the types of the sector: public and private, we utilize information from the variable 'enterprise type' available in the NSS questionnaire on employment and unemployment situation in India. This question is put to the workers to categorize themselves in various types of enterprise: proprietary, partnership, government/public sector, public/private limited company, co-operative societies/ trusts/other non-profit institutions, employer's household and others[1]. The previously mentioned enterprise types, except 'government/public' category, constitute the private sector. For the type of sector, we create a dummy variable 'Public mine', where workers working in private mines form the base category.

We consider the standard human capital (education and experience), socio-demographic (gender and social group), and employment (occupation, status of job contract) variables as controls in our econometric models. We obtain six categories of educational attainment by clubbing the original twelve categories given by the NSS. The education of workers is expressed in the form of dummy variables suggesting different levels of completed schooling, with the 'not-literate' group of workers as the base category. Following the relevant literature (Altonji and Blank, 1999), we calculate the experience of a worker as follows:

Experience = Age of the person-Years of education-5

It is assumed that individuals start their schooling at the age of 5 and enter the labour market after completing schooling. The non-linear relationship between earnings and experience is captured by squaring the experience variable. For ease of interpretation, the square of experience is scaled down by dividing 100.

The gender of a worker is captured by the dummy variable 'Male', where female workers constitute the base group. The NSS classifies social group of respondents under four distinct categories: Scheduled Tribe (ST), Scheduled Caste (SC), Other Backward Class (OBC), and Others. Workers belonging to ST form the base category for our study. Accordingly, we have created three dummies for social group. There

[1] Some of the enterprise types may not be applicable to mining industry

are two employment-related variables: occupation of the worker and status of job contract. The occupations in the mining industry are divided under four broad categories: managers, administrators and executives; clerks, personal care and protective services; miner, shot-firers and other production workers; and mining labourers. These are denoted in terms of dummy variables, where 'managers, administrators and executives' form the omitted category. The dummy variable 'job contract' takes value 1 if the worker has no job contract, takes the value 0 otherwise.

4.3 Descriptive Statistics

Table 2 presents the descriptive statistics for the sample of workers in the public sector mines and the private sector mines. The total sample size of mining and quarrying workers is 2928, which includes 924 workers from public sector mines and 2004 workers from private sector mines. It is observed that, on an average, workers in the public mines earn significantly higher wages than their counterparts in the private mines. The gender composition of the workforce in the mines reveals that male workers are overly represented both in the public and the private mines, while the share of male workers is higher in the public mines (95 per cent). The educational profile of workers reflects vast differences between the two types mine. The proportion of workers having 'secondary/higher secondary/ other specialized studies' in public sector mines is 52 per cent, while the figure is only 11 per cent in the private sector. We find workers in public mines have higher average years of work experience than their counterparts in the private mines. We also observe that workers in the private mines are mainly concentrated in 'mining labour' occupation (41 per cent) and around only 4 per cent (compared to 11 per cent in public mines) are in 'clerks, personal care and security services' occupation. Consider job contract of the worker with the employer, we find a major share of workers in the private mines does not have any job contract (84 per cent) compared to 24 per cent in the public mines. Public mines in India have a higher proportion of 'Non-ST/SC/OBC' workers in its workforce compared to the private mines.

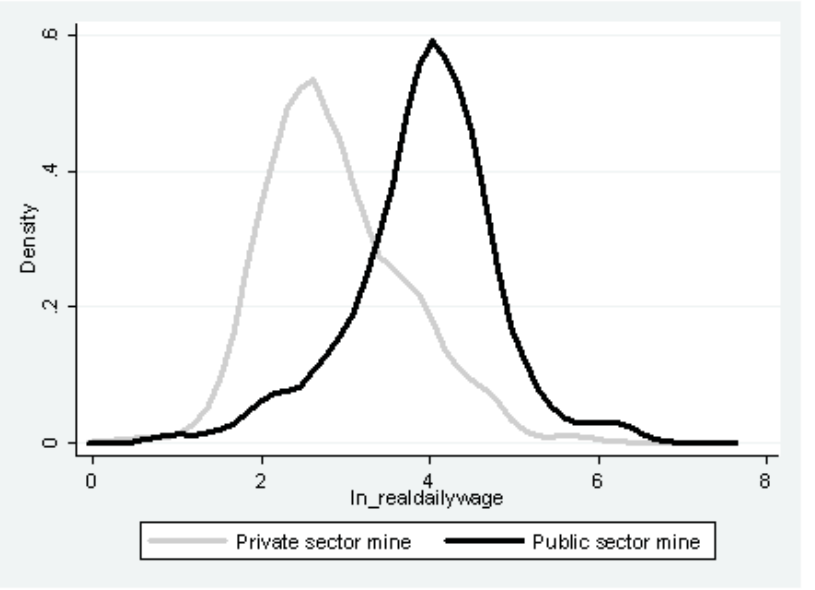
Table 2: Descriptive Statistics

Variable	[1] Full sample	[2] Public sector Mine	[3] Private sector Mine
Log of real daily wage	3.209	3.926	2.878
	(0.982)	(0.864)	(0.848)
Male	0.891	0.953	0.862
	(0.311)	(0.210)	(0.344)
Education			
Below primary	0.120	0.086	0.136
	(0.325)	(0.281)	(0.343)
Primary	0.136	0.104	0.151
	(0.343)	(0.305)	(0.358)
Middle	0.150	0.133	0.158
	(0.357)	(0.340)	(0.365)
Secondary	0.109	0.155	0.088
	(0.312)	(0.362)	(0.283)
Higher secondary	0.072	0.107	0.056
	(0.259)	(0.309)	(0.231)
Other higher studies	0.136	0.262	0.078
	(0.343)	(0.440)	(0.269)
Experience			
Experience	27.0	30.1	25.6
	(12.372)	(11.013)	(12.698)
Clerk, personal care and protective services	0.064	0.112	0.041
	(0.244)	(0.316)	(0.199)
Miner, shot-firer and other production worker	0.512	0.543	0.497
	(0.499)	(0.498)	(0.500)
Mining labourer	0.351	0.220	0.412
	(0.477)	(0.414)	(0.492)
Job contract			
No written job contract	0.648	0.244	0.835
	(0.477)	(0.430)	(0.370)
Social group			
Scheduled Caste (SC)	0.212	0.213	0.211
	(0.408)	(0.409)	(0.408)
Other Backward Class (OBC)	0.367	0.362	0.370
	(0.482)	(0.480)	(0.483)
Non-ST/SC/OBC	0.237	0.309	0.204
	(0.425)	(0.462)	(0.403)
Number of observations	2928	924	2004

Note: Standard deviations are reported in parentheses

Figure 3 demonstrates the first-hand impression of the distribution of wage of sampled workers in the public and the private mines. The density functions were estimated using an Epanechnikov kernel estimator. As evident from the figure, the mode value of log real daily wage for private mines is lower than that of the public mines, and the earnings density graph of the private mine lies left to that of the public mine. These observations indicate that the workers in the private mines earn less than their public counterparts.

Figure 3. Kernel density of log real daily wage, 2004-12



Note: Epanechnikov kernel density estimates are used

5. Estimation Results

5.1 OLS Estimates

Table 3 estimates the impact of ownership status of mine on workers' wage. We have run five different OLS models: Model 1 (Column [1]) is the baseline regression; Model 2(Column [2]) includes all covariates without state and year dummies; Model 3 (Column [3]) includes all covariates and year dummies without state dummies; Model 4 (Column [4]) includes all covariates and state dummies without year dummies; and finally, Model 5 (Column [5]) includes all covariates with state and year dummies.

Table 3: Public-Private wage differential: Mean regression

	[1]	[2]	[3]	[4]	[5]
Public mine	1.047**	0.349***	0.353***	0.450***	0.463***
	(0.100)	(0.065)	(0.053)	(0.063)	(0.048)
Male		0.321***	0.320***	0.345***	0.345***
		(0.082)	(0.065)	(0.073)	(0.058)
Below primary		0.227***	0.241***	0.133***	0.150***
		(0.047)	(0.049)	(0.026)	(0.036)
Primary		0.288***	0.303***	0.148***	0.170***
		(0.056)	(0.076)	(0.044)	(0.045)
Middle		0.377***	0.408***	0.233***	0.264***
		(0.087)	(0.102)	(0.043)	(0.056)
Secondary		0.474***	0.517***	0.362***	0.413***
		(0.053)	(0.076)	(0.066)	(0.069)
Higher secondary		0.518***	0.563***	0.471***	0.523***
		(0.086)	(0.081)	(0.089)	(0.078)
Other higher studies		0.730***	0.807***	0.678***	0.759***
		(0.053)	(0.077)	(0.070)	(0.070)
Experience		0.027***	0.028***	0.028***	0.029***
		(0.004)	(0.004)	(0.004)	(0.004)
Experience squared/100		-0.027**	-0.027**	-0.029**	-0.029**
		(0.009)	(0.008)	(0.007)	(0.007)
Clerk, Personal care and Protective services		-0.568**	-0.498**	-0.423**	-0.352**
		(0.152)	(0.150)	(0.145)	(0.139)
Miner, Shot-firer and Other production worker		-0.433**	-0.406**	-0.335**	-0.314**
		(0.130)	(0.128)	(0.114)	(0.110)
Mining labourer		-0.732**	-0.661**	-0.602**	-0.518**
		(0.130)	(0.128)	(0.121)	(0.113)
No job contract		-0.596**	-0.550**	-0.663**	-0.619**
		(0.059)	(0.056)	(0.041)	(0.044)
SC		-0.021	-0.020	0.090	0.098
		(0.145)	(0.141)	(0.075)	(0.060)
OBC		0.134	0.099	0.198***	0.175**
		(0.142)	(0.142)	(0.068)	(0.059)
Non-ST\SC\OBC		0.128	0.123	0.198**	0.197**
		(0.140)	(0.137)	(0.081)	(0.076)
Year dummies		No	Yes	No	Yes
State dummies		No	No	Yes	Yes
Constant	2.878**	2.829***	2.819***	2.913***	3.100***
	(0.076)	(0.213)	(0.211)	(0.165)	(0.164)
Observations	2928	2903	2903	2903	2903
R-squared	0.245	0.516	0.572	0.592	0.650

Notes: ***, ** and * represent significance levels at 1 per cent, 5 per cent and 10 per cent, respectively. Standard errors are clustered at the state level and are reported in parentheses.

Column[1] shows that the raw wage gap between the workers in public sector mines and private sector mines is 1.047 or 185 per cent [calculated as the antilog of 1.047-1], without controlling for any other explanatory factors. The estimate for the wage gap falls to 35 log points or 42 per cent once we introduce the controls (Column [2]). In Column [3], time dummies are entered as additional controls to check the effect of time-variant unobservables, however, this doesn't yield any significant effect on the point estimate of the interest variable. A comparatively higher value of the coefficient on the sector dummy in Model 4 vis-à-vis Model 2 indicates that state level unobservables such as state labour policies, state level price variations and so on, have a significant impact on workers' wage.

In our final and preferred specification, the estimate reported in Column [5] shows that, ceteris paribus, workers in the public sector mines earn a mark-up of an order of 46 log points (58.8 per cent) compared to their counterparts in private sector mines. Broadly, this estimate of public-private wage gap is similar to Glinskaya and Lokshin (2007) with respect to sign and significance.

With regard to controls, Table 3 shows that most of them are correctly signed. The large and significant coefficient value on the male dummy (34 log points or 41 per cent) in Column[5] of Table 3 indicates sharp gender wage gaps in the Indian mining industry. This finding is similar to those of Duraisamy and Duraisamy (2016) and Deshpande et al. (2018), to mention a few from the voluminous research on gender wage discrimination in India. The magnitudes of coefficients on various education dummies increase with higher levels of education, projecting a strong convex education-earnings profile of workers in the mining industry. Simply put, additional education has a much stronger proportionate impact on earnings at the higher levels of education than lower levels. On an average, a worker with professional education earns significantly higher wage of an order 76 log points than those who have no education, 61 log points than the below-primary literates, 59 log points than the primary literates, 50 log points than those with middle level of education, 35 log points than those with secondary education, and 24 log points higher wage than those with higher secondary education.

Workers with more years of experience earn higher wages: one additional year of experience increases the real daily wage by 3 per cent. Our result also implies that experience has a diminishing effect on the earnings of the workers as the quadratic of experience takes a parabolic shape. We find that occupation has a significant impact on workers' wage. The estimates on occupation dummies reflect that workers in the bottom of the occupational hierarchy are lesser paid than those at the top. The role of job contract in the determination of workers' wage is important. Workers with no job contract earn 85.7 per cent less than those who have some type of job contract. Column [5] of Table 3 reveals a strong caste based wage differentiation in the Indian mines, where workers belonging to general castes (Non-ST\SC\OBC) earn fairly high wages (20 log points) than the historically marginalized STs, a finding consistent with recent studies in India (Madheswaran and Attewal, 2007).

Table 4: Public-Private wage differential: Quantile regression

Variable	[1]	[2]	[3]	[4]	[5]
	Q10	Q25	Q50	Q75	Q90
Public mine	0.429***	0.475***	0.375***	0.309***	0.310***
	(0.083)	(0.060)	(0.036)	(0.050)	(0.062)
Male	0.294***	0.269***	0.370***	0.341***	0.205**
	(0.076)	(0.046)	(0.044)	(0.088)	(0.085)
Below primary	0.073	0.133**	0.189***	0.281***	0.305***
	(0.086)	(0.057)	(0.038)	(0.059)	(0.070)
Primary	0.219***	0.188***	0.248***	0.348***	0.331***
	(0.075)	(0.054)	(0.046)	(0.062)	(0.077)
Middle	0.170*	0.187***	0.326***	0.504***	0.539***
	(0.088)	(0.053)	(0.055)	(0.069)	(0.067)
Secondary	0.383***	0.318***	0.361***	0.549***	0.622***
	(0.098)	(0.067)	(0.050)	(0.081)	(0.076)
Higher secondary	0.230*	0.313***	0.490***	0.707***	0.699***
	(0.120)	(0.091)	(0.072)	(0.075)	(0.113)
Other higher studies	0.609***	0.610***	0.629***	0.772***	0.737***
	(0.129)	(0.079)	(0.047)	(0.084)	(0.119)
Experience	0.023***	0.025***	0.029***	0.024***	0.031***
	(0.008)	(0.004)	(0.004)	(0.006)	(0.008)
Experience squared/100	-0.032**	-0.027***	-0.033***	-0.020**	-0.027*
	(0.013)	(0.007)	(0.007)	(0.010)	(0.014)
Clerk, Personal care and Protective services	-0.123	-0.435***	-0.579***	-0.777***	-1.170***
Miner, Shot-firer and Other production worker	0.014	-0.324***	-0.506***	-0.676***	-1.028***
Mining labourer	-0.234	-0.615***	-0.819***	-1.001***	-1.323***
	(0.154)	(0.104)	(0.069)	(0.120)	(0.147)
No job contract	-0.567***	-0.565***	-0.637***	-0.662***	-0.639***
	(0.081)	(0.067)	(0.036)	(0.050)	(0.060)
SC	0.133	0.048	0.025	-0.092	-0.106
	(0.082)	(0.047)	(0.043)	(0.060)	(0.086)
OBC	0.224***	0.244***	0.166***	0.019	-0.009
	(0.077)	(0.047)	(0.038)	(0.050)	(0.064)
Non-ST\SC\OBC	0.295***	0.269***	0.125**	-0.066	-0.131**
	(0.083)	(0.052)	(0.041)	(0.055)	(0.062)
Constant	1.699***	2.370***	2.884***	3.586***	4.300***
	(0.234)	(0.163)	(0.110)	(0.199)	(0.207)
Observations	2903	2903	2903	2903	2903
Pseudo R-squared	0.184	0.291	0.367	0.356	0.339

Notes: ***, ** and * represent significance levels at 1 per cent, 5 per cent and 10 per cent, respectively. Bootstrap standard errors are obtained using 100 replications and are reported in parentheses.

5.2 QR Estimates

Columns [1] - [5] of Table 4 present the results obtained from quantile regression, where we consider five different quantiles (0.1, 0.25, 0.5, 0.75 and 0.9) on the conditional wage distribution. We find a sizeable difference in the real daily wage between the workers in public and private mines across the whole wage distribution (refer to the first row of Table 4). The magnitude of the wage gap ranges between 30 log points and 48 log points over different quantiles, and the gap happens to be largest at =0.25 (48 log points) and follow a declining trend thereafter. The public-private differential in wage at the 10 per cent quantile is 43 log points. That is, holding all other things equal, the 10 per cent quantile of wage for a public mine worker is 43 log points higher than the 10 per cent quantile of wage for a private mine worker.

Unlike the sticky floor and glass ceiling hypotheses proposed in the literature, we notice that, in case of mining industry, the gender wage gap is largest at the median (37 log points) and the least at the top wage quantile (20 log points). As expected, higher levels of education of workers attract higher wages in the mining industry and the impact of education on earnings is particularly remarkable at the top quantile. Workers in the upper tail of the distribution receive higher returns on experience than those at the lower tail. The effect of experience increases with conditional wage quantile. For different occupation groups, the wage gap from the base category follows a declining trend as one moves up the conditional wage distribution. We find that workers who don't have any job contract earn less than those who have job contract throughout the entire earnings distribution. The results show that caste based wage differentiation is significant at the bottom quantiles of the wage distribution, however, the gap appears less clear at the upper tail.

6. Conclusion

In this paper, we seek to address the question: whether the type of ownership of the mines has any impact on workers' wage. Using the data gleaned from three quinquennial rounds (2004 - 05, 2009-10, and 2011 - 12) of the nationally representative household surveys on employment and unemployment situation in India, we present the estimates of wage gap between workers in the public and the

private sector mines from both mean regression and quantile regression. Our empirical results suggest that, on an average, workers in the public sector mines earn around 59 per cent (46 log points) higher wages than their counterparts in the private sector mines. The quantile regression estimates a positive wage gap between the two types of mining worker across the entire conditional wage distribution, and the gap ranges between 30 log points and 48 log points over different quantiles. The wage gaps at lower quantiles are relatively higher than the wage gaps at the higher quantiles.

A recent study shows that the private undertakings in Indian mineral sector has an edge over public sector with respect to Total Factor Productivity or efficiency (Das, 2015). Efficiency and innovation, the two possible positive externalities of privatization of mining industry, are key drivers for economic growth and development. Another research finds that private sector has played a prominent role in boosting mineral output and export in India (Adducci, 2017). The previous two broad observations show that the role of privatization of the mineral sector in the context of economic growth and development may not be undermined.

In the present situation, that is marked by a surge of private agencies in the Indian mineral industry, our paper raises a key policy issue i.e. unequal wages between public-mine workers and private-mine workers. According to the findings of our study, we can argue that there might be some scope for better implementation of existing national labour laws such as Payment of Wages Act, Minimum Wages Act, Equal Remuneration Act, Industrial Disputes Act, Contract Labour (Regulation and Abolition) Act and so on. These laws are directly or indirectly related to the remuneration of the mining workers. So, workers in the private mines need to be made aware of their rights and the mine management should ensure that the workers can effectively exercise their rights. The labour sub-contracting arrangements in private mines should be regularly evaluated for compliance with national rules and laws in order to minimize workers' exploitations. In sum, it is the onus of the government to create a scenario where the efficiency and innovation achieved from private players in mineral sector can be ensured along with the parity in wages between workers in the public and the private mines.

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