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**Wage Differentials between Union and Non-Union Workers: An Econometric
Analysis**

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Paper prepared for presentation in the Far Eastern Meeting of the Econometric Society at
Yonsei University, Seoul, Korea, during July 4-6, 2003.

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Abstract

It is increasingly recognized that institutional factors such as trade unions do play a dominant role in determining the levels of wages, standard of working conditions. This is more pronounced in the industrial sector of developing economies. The role of labor organizations in the labor market has been firmly identified especially in relation to wage bargaining with studies focussing mainly on the advanced industrial economies. In the Indian context, there exist a number of studies on the evolution of the structure; functions and aspects of trade unions; but the empirical analysis of the impact of trade union on wages are rather limited. In this backdrop, this paper attempts to analyze the impact of trade union on wages using a survey covering blue collar male workers employed in manufacturing industries in Chennai district of Tamil Nadu, in southern part of India. We have estimated earnings functions for union and non-union workers separately. The earnings functions are corrected for selectivity bias. Oaxaca, Cotton and Reimer's decomposition method has been used to decompose the gross earnings differential between union and non-union workers into explained and unexplained differentials. The result shows that there exist significant wage differentials between workers in the union and non-union sector. The unexplained portion of the decomposition, which is around 47 percent (reduced to 42 percent after correcting for selectivity bias) can be attributed to unionism.

Key Words: Trade Unions, Wage differentials, decomposition and selectivity bias

JEL Classification: J31, J51, C35

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1.Introduction

It is increasingly recognized that institutional factors such as trade unions do play a dominant role in the process of economic development especially in the industrial sector; this realization is more pronounced in the case of developing economies. The influence of trade union is evident in crucial economic indicators such as employment, levels of wages, standard of working conditions etc., In short, the nexus between labor organizations and labor market has been firmly identified and is gradually getting articulated. As a result, obtaining of wage increase has become an inherent function of trade unions. The effect of trade unions on the wage level using human capital approach has been underscored by a string of research studies in United States, United Kingdom and Canada. In India, there are large numbers of studies on the evolution of the structure; functions and other aspects of trade unions; but the empirical analysis of the impact of trade union on wages are rather limited.

Studies on the labor movement in India show that there was no organized labor force in the early stages of industrialization in India. However, unbearably long hours of work, low wages etc., made the workers use a weapon called 'strike'. As a result, between 1900 and 1914 there were several strikes, but most of them were unsuccessful. In the twenties, soon after World War I, the Indian working class realized the effectiveness of strikes as a means of obtaining concessions such as higher wages and improvement of working conditions. A new sense of confidence and an awareness of injustice perpetuated against them induced them to stand up for their rights and to offer resistance against ill treatment and exploitation. The workers were dissatisfied with their wages, more particularly in view of the steep rise in prices. The unions agitated for rise in wages. The other factors which helped the growth of labor organizations immediately after the war were the deplorable economic conditions, All these factors enabled workers to organize themselves and to play an effective role in getting terms and conditions of labor and wages vastly improved. It is observed that the number of trade unions has been growing steadily. The available data on disputes ever since 1921 show that monetary benefit (wages and bonus) have been the single major issue of various disputes and strikes. Ever since the birth of industrial disputes, the government of India has been taking keen interest in wage problems. In spite of many efforts, India does not have a well-defined, workable and rational wage policy, which is consistent and is in harmony with our economic, social and political goals and national aspirations; disparities in wage levels as between different regions, industries etc., continue to grow. Many studies on inter-industry wage differentials in India unanimously agree that there exist wage

differentials in India (Deshpande, 1998, 2000). While many blame unions for raising wages few have tried to measure the impact of unions on wages controlling for other factors. In this section we attempt to measure the impact of trade union on wages using cross-section data. This paper analyses union wage differentials only and does not get in to the problem of analyzing the impact of wages on unionization, though we are aware that wage differentials also influence unionization.

The organization of the paper as follows: Section 2 deals with the brief review of literature, which contains the situation of unionization and employment in India, wages and working conditions and some empirical studies. Section 3 explains the data source. The Econometric methodology followed in this study is given in Section 4. Section 5 is devoted to empirical results. Section 6 concludes the paper.

2.A Brief Survey of Literature

2.1. Unionization and employment

Declining employment elasticities imply that more output is attained with less employment. This could be due to the fact that employers are investing in more capital-intensive technologies, and that there has been a considerable amount of labour shedding in the private and public-sector enterprises since the mid-1980s. Unions can affect these employment elasticities by resisting technological change that increases the possibility of substituting between capital and labour and by limiting the availability of goods and services that compete with the output of unionized firms. In addition, union bargaining power varies indirectly with labour's share in total costs: unions are more powerful in relatively more capital-intensive firms and industries, as the demand for labour is relatively inelastic compared to labour-intensive sectors. Employers in capital-intensive firms find it much easier to meet union wage demands compared to employers in labour-intensive firms. Finally, it is in the interest of unions to raise the price of other inputs, particularly non-union labour, as this increases the cost of switching from union to non-union labour (see Borjas, 1996, pp. 126-127).

To illustrate the usefulness of the above, consider the following. In the current scenario, labour and unions in the more labour-intensive sectors in India face considerably more uncertain and insecure times than their counterparts in more capital-intensive sectors. Several firms in the textile and jute industries are near closure. On the other hand, the majority of plant-based "independent" unions are located in more capital-intensive industries, and union bargaining power in several public sector sites (such as transportation and banking) is high due to its specific market characteristics defined by state monopoly. In some states, such as in Kerala and West Bengal, progressive unions in conjunction with their state governments have improved the wages and working conditions of agricultural and unorganized workers, thereby curtailing the growth of income inequalities within the workforce as a whole.

Over time, average annual growth rates in GDP have outstripped average annual growth rates in employment (appendix-table 2) and employment elasticities in major sectors have fallen (appendix-table 3). Appendix-Table 1 shows the level of employment in the private and public sectors over the "four phases of unionism". This table clearly shows the following: in the first phase, public sector employment increased sharply and private sector employment increased marginally; during the second phase, public sector employment increased rapidly, whereas private sector employment remained sluggish;

during the third phase, employment growth in both sectors sharply tapered off; and during the first few years of the fourth phase, growth in both sectors remained nearly static.

Appendix-Table 4 presents a sectoral distribution of employment in the formal economy. We note two trends: since the third phase, growth in employment in manufacturing, both in the public and private sectors, has remained virtually stagnant; however, during the third phase, employment increased in public services. We also observe the phenomenal growth in employment in services (especially in the public sector) relative to manufacturing. Finally, except in manufacturing, the public sector continued to be the dominant employer in the organized economy.

Given that the macro data on employment and unionization in India are riddled with problems and contain errors of omission, detailed case studies of specific industries and regions have revealed significantly different trends. The *Friedrich Ebert Stiftung* study (Davala, 1992) is an example. It covers tea plantations and the jute industry in West Bengal, the coal sector, ports and docks, the engineering industries of Andhra Pradesh and West Bengal, the power sector in Andhra Pradesh, and the chemical and pharmaceutical industry in Maharashtra. Although the study shows a fair number of inter-industry and regional variations, there were some striking similarities. The trend everywhere was a downsizing of permanent employment and the proliferation of contract, temporary, and casual jobs. There were very low rates of unionization of contract and casual labour, with the unions being more sensitive to the plight of such workers in the newer industries. In the state of Maharashtra, permanent workers and their unions in the chemical and pharmaceutical industries have realized that their well-being is ultimately tied to their fellow workers in the "reserve army of labour". The study found that unions organize on an industry- and/or region-wide basis in the older industrial sectors, but the enterprise becomes the unit of organization in the newer industries. This pattern corresponds with the prevalent bargaining structure (i.e., industry- and region-wide in the older industries, and plant-level in the newer industries). As Ramaswamy concludes in this study (Davala, 1992, p. 231):

The common thread running through most of these variations is the desire of workers to gain greater control over their unions. This might well be the case in the older industries as well, but the structure of trade unionism does not permit much scope for the expression of these aspirations. In the newer industries, on the other hand, trade union structure itself appears to have been influenced by this fundamental force.

The "market friendly" views of the relationship between unionization and employment in India, especially during the third and fourth phase, was elaborated earlier, but needs to be emphasized in this section as well. The "monopoly effects" of trade unions, together with inflexible labour laws, have enabled employers to move up their demand curves and have practically frozen employment growth in permanent unionized jobs. Due to union wage mark-ups, employers have increased the capital intensity of production, thereby raising productivity. But this route can only lead to jobless growth, clearly a sub-optimal outcome in a labour surplus economy. Those who oppose this view point out that wage increases took place not because of union power but largely because of an intensification of the labour process resulting from a decline in union power. A disaggregated analysis probably comes closest to reality: in the more prosperous sectors,

with low elasticities of labour demand, "selfish" plant-specific unions managed to extract generous wage increases; in the less prosperous sectors, largely in the public sector, "altruistic" unions affiliated to political parties have had little success with centralized bargaining procedures in unstable product markets.

In the buoyant sectors of production, even before 1991, employers have managed to execute viable exit policies through generous Voluntary Retirement Schemes, with the cooperation of enterprise-based unions. In these largely private sector sites, "bringing the union in" has clearly paid dividends in terms of generating "strongly efficient contracts" (that is, when the labour contract leads a unionized firm to hire the competitive level of employment). In the public sector, however, exit schemes (available through the National Renewal Fund) have few individual takers or else they face union resistance at national level. The general secretary of the All India Bank Employees' Association says, "We will resist any attempt to introduce a VRS. As far as we are concerned, job security is more important than wage revision". The practice of "featherbedding" (employing more people than required) in a whole range of public enterprises is no longer financially viable. The union movement as a whole, especially the large centralized and industry-wide public sector unions, may benefit more from unionizing the unorganized than from attempting to preserve unproductive jobs.

2.2 Wages and working conditions

Appendix-Table 5 provides data on the movement of the consumer price index for industrial workers and urban non-manual employees across the four phases of unionism. Appendix-Tables 6 and 7 provide some data on the movement of nominal (a general index for 12 industries) and real wage rates (in organized manufacturing).

Standard neoclassical economic theory would argue that increased global trade raises the earnings of unskilled workers relative to those of skilled workers in a country such as India, which has unlimited supplies of the former. This implies that India's exports are largely unskilled labour-intensive products. Nambiar et al. (1999) found that wage disparity for the period 1980/81 to 1992/93 increased but only marginally. In addition, they found that the disparity rises from less skill-intensive to more skill-intensive sectors. To the extent that the union voice reduces earnings inequality within the unionized workforce, employers, especially in the private sector, have "manufactured consent" with the unions in setting up ingenious pay incentive systems.

Wage determination in the organized economy varies significantly between the private and the public sector (Datta Chaudhuri, 1996; Anant and Sundaram, 1998). In the private corporate sector, where collective bargaining largely takes place at enterprise level, unions that are willing to accept some risk have benefited from a form of gain sharing by agreeing to tie a significant part of the monthly pay to incentives. The incentive structures are designed to generate cooperative behavior at the departmental, plant and firm level. Risk-averse unions, usually more concerned with employment growth than with members' wages have resisted management attempts to impose such systems.

In many of the older sectors, such as tea plantations and jute in Eastern India and textiles in Western India, industry-wide bargaining is the institutional norm. With the

advent of economic liberalization, this bargaining structure will be under pressure to decentralize some of the outcomes as inter-plant and inter-firm differences become wider. Similar decentralizing pressures will be felt increasingly in public sector industries, even though the Bureau of Public Enterprises "sends guidelines for wage settlement to all administrative ministries, setting down norms to be followed in determining basic salaries and the various categories of benefits for different classes of employees" (Datta Chaudhuri, 1996, p. 18). In Coal India, for example, employees in the better-off units feel that their earnings could increase substantially if they were linked more closely to productivity at the unit level. Centralized public sector unions will have to come to terms with these decentralized union "voices".

Salaries and benefits for central government employees in public administration, academic institutions, posts and telegraph, etc., are determined in detail by the Pay Commissions which are periodically set up by the government. As Datta Chaudhuri (1996, p. 18) puts it: "The award of the Pay Commission for the Central Government employees becomes the reference point for wage determination in the rest of the public sector." The Pay Commission is the object of considerable lobbying by various unions and employees' associations prior to and during the deliberations.

The recommendations of the Fifth Central Pay Commission have been implemented and employees in the central and state governments have seen their incomes rise substantially. If it is true that the disparity between the average salary of government employees and per capita income is far higher in India than in most other countries, the public clearly need to see vast improvements in productivity in this sector given the fairly high additional cost involved in delivering the pay recommendations (Joseph, 1997). The All India Federation of College Teachers' Organizations could, for example, take a lead in self-monitoring their constituency so as to impose work norms and discipline. There are already many rules to deal with employees who do not work and/or who are late; applying these rules occasionally will send strong signals to both employees and to the public (Joseph, 1997).

Industrial accident rates in India, both fatal and non-fatal, are extremely high compared to most countries. While it is true that the occupational health and safety monitoring agencies are weak, it is also the case that unions can intervene significantly more in this area than they are presently doing. Often, workers demand higher wages for increased safety measures during contract deliberations. But there are other examples where unions have been closely involved in occupational health and safety matters. One such case is the Occupational Health and Safety Centre that operates out of two union offices in Central Mumbai and was set up largely due to the inefficiencies of the Employees' State Insurance (ESI) Scheme. Among its many achievements, the Centre was able to get the ESI medical board to recognize and compensate mill workers suffering from occupational bysinosis in 1994.

The linking of minimum labour standards and trade agreements, i.e. the "social clause", has generated considerable debate and discussion among trade unions and labour commentators (FES-IIRA, 1996; Hensman, 1996; Bhattacharjee, 1997). There are various economic arguments in favour of the imposition of international labour standards (ILS). To the extent that labour markets in developing countries are beset with imperfect and asymmetric information (for example relating to industrial safety), ILS may level up labour market institutions to correct for market failures of this type. ILS can be used as a

redistributive mechanism if the government feels that the market- determined income distribution profile is skewed towards the more skilled workers in relatively protected environments. Trade unions in India interpret this imposed link as a disguised form of protectionism (for the various trade union views, see FES-IIRA, 1996, and Hensman, 1996). This argument leads to the same outcome as those put forward by the 'comparative advantage' trade theorists that the imposition of ILS will lead to a reduction in the net gains from trade, and therefore individual countries should decide on their own labour standards. But surely one has to question this simple view. Why is it that countries with relatively abundant and cheap labour find it difficult to compete in international markets, except in those sectors that have (relatively) lower labour standards? Clearly, this kind of participation in global trade, where inferior labour standards are the "comparative advantage" is unlikely to lead to social progress. Since it is not enough to wait for sustained economic growth to upgrade domestic labour standards, the unions need to forcefully generate demands, both from above and below, for improvements in working conditions. Hensman (1996) spells out an agenda for trade unionists and NGOs that strongly believe that labour standards in India have to be substantially improved, perhaps even through trade links and other forms of international pressure.

2.3. Empirical Studies

Though the impact of unionism can be studied with reference to any of the wage differentials, our analysis is confined to individual earnings differentials. This calls for an understanding of the factors determining individual earnings. We are using the human capital paradigm in this paper to analyze the impact of unions on wages. From the human capital studies we understand that a person's wage depends, in the absence of institutional impediments to full employment, on (i) his/her personal productivity (human capital view), (ii) the non-pecuniary attributes of his/her job (classical view), (iii) type of employment activity and (iv) discrimination and other factors. It is hard to expect the application of all these factors in any one study. Each of these factors can be used only with particular relevance. Following earlier research, the extended human capital framework is used in the present analysis.

From the theoretical treatment of trade unions in economics, it is quite clear that trade unions attempt to raise wages above the level that would exist in their absence. Reviewing a number of early empirical studies in the US and undertaking much additional analysis, Lewis (1963) concludes that the size of the effect of unionism on the average union-non-union relative wage in the United States has varied greatly and in systematic fashion over time. In recent years several authors have attempted to measure the relative union-nonunion wage differentials using multiple regression analysis mostly on micro-economic data. Parsley (1980) has reviewed the available studies undertaken largely in USA, UK and Canada. Most of these studies fit a single wage equation on pooled data (union and non-union) incorporating unionism as one of the explanatory variables (Weiss, 1966; Ashenfelter 1976; Moore, 1976; Shapiros, 1978; Pencavel 1974, Foster, 1976; Nickell, 1977. For India, see Fonseca, 1964; Johri 1967; Papola, 1971; Sinha and Sawhney 1970, Bhattacharjee, 1987, Bhattacharjee and Datta Choudhary, 1992 and Deshpande, 2000). The important assumption of these studies is that the rewards for the each of the explanatory variables are the same both in union and non-union sectors.

There are few studies in the USA, which consider that both wages and unionization are simultaneously determined (Ashenfelter 1972; Schmidt and Strauss, 1976; and Schmidt, 1978). The authors of these studies view that unionization is also affected by wages; more and more non-union workers join unions after noticing the monetary gains of the unionized workers; thus according to this view unionization is no longer an exogenous factor but endogenous. These considerations suggest that in order to obtain a better estimate the effect of unionism on relative wages it is necessary to incorporate in to the model how unionism is also determined. Few studies (Bloch and Kuskin, 1978; Lee, 1978, Robinson and Tomes, 1984) postulate that the wage structures for union and non-union sectors are different. Bloch and Kuskin have considered separate wage equations for union and non-union sectors and attempted to measure the union-non-union wage differentials. Lee, on the other hand, having fitted separate wage equations for union and non-union sectors has estimated union-non-union wage differentials using the simultaneous equation technique. To sum up, the survey of empirical studies reveals that trade unions increase the wages of their members more than what prevailed in their (union) absence.

3. Source of the Data

In order to analyze the union and non-union wage differentials, data were collected through a sample survey in 1993, covering 522 blue-collar male workers employed in manufacturing industries in Madras district of Tamil Nadu, a state in southern part of India. The sampling procedure adopted was the multi-stage random sampling method. First, Madras district is selected as the study area as it is one of the major districts (and capital) of Tamil Nadu with large number of registered factories. In the second stage, blue-collar male employees in manufacture industries are chosen as they alone face employment death risks in Madras district over the period from 1987 to 1990. Then, these workers are stratified in to 17 groups according to their industrial codes at 2 digit National Industrial classification (NIC) level. Fixing 1 per cent from each stratum, 522 workers are randomly selected for interview on the basis of four workers from each randomly selected factory. The collected data set consists of information on workers personal as well as enterprise characteristics. The definition and measurement of variables are given in appendix-Table-8.

4. Econometric Methodology

In this section, the familiar Oaxaca (1973), Cotton (1988) and Reimer (1985) decomposition technique have been used to decompose the gross mean earnings differentials in to explained and unexplained differences. The empirical procedure for decomposing the wage differentials between union and non-union sectors is as follows:

Oaxaca's Decomposition Approach

The gross earnings differentials is defined as

$$G = \frac{Y_u - Y_n}{Y_n} = \frac{Y_u}{Y_n} - 1 \quad (1)$$

Where Y_u and Y_n represents the earnings of union and non-union workers respectively. In the absence of unionism the earnings differential would reflect pure productivity differences (Q):

$$Q = \frac{Y_u^o}{Y_n^o} - 1 \quad (2)$$

where the superscript denotes the absence of union. The unionism coefficient (D) is then defined as the proportionate difference between G+1 and Q+1:

$$D = (Y_u / Y_n) - (Y_u^o / Y_n^o) / (Y_u^o / Y_n^o) \quad (3)$$

Equations (1) to (3) imply the following logarithmic decomposition of the gross earnings differentials:

$$\ln(G+1) = \ln(D+1) + \ln(Q+1) \quad (4)$$

This decomposition can be applied within the framework of semi-logarithmic earnings equation (Mincer, 1974), which can be estimated by OLS. Thus two separate earnings functions for each sector are obtained.

$$\ln \bar{Y}_u = \sum \hat{\beta}_u \bar{X}_u + \varepsilon_u \quad (\text{Union wage equation}) \quad (5)$$

$$\ln \bar{Y}_n = \sum \hat{\beta}_n \bar{X}_n + \varepsilon_n \quad (\text{Non-union wage equation}) \quad (6)$$

where $\ln \bar{Y}$ denotes the geometric mean of earnings, \bar{X} is the vector of mean values of the regressors, $\hat{\beta}$ is the estimated coefficients and ε is the error term. Within this framework, the gross differential in logarithm is given by:

$$\begin{aligned} \ln(G+1) &= \ln(\bar{Y}_u / \bar{Y}_n) \\ &= \ln(\bar{Y}_u / \bar{Y}_n) \\ &= \sum \hat{\beta}_u \bar{X}_u - \sum \hat{\beta}_n \bar{X}_n \end{aligned} \quad (7)$$

The Oaxaca decomposition simply observes that the last line of equation (7) can be expanded. In other words, this differential is to be adjusted for differences in the values of factors affecting wages, so as to arrive at union and non-union earnings differentials. The adjustment is done in two alternative ways. Since there are two different wage structures, there is no theoretical or empirical guidance for us to know which structure is the actual one prevailing in the labor market. First we assume the real wage structure affecting the labor market is union wage structure (i.e. coefficients of union wage equation) and adjust the gross earnings differential in terms of the coefficient of the union wage equation, and obtain an estimate of union and non-union earnings differential. Second, we assume the real wage structure prevailing in the labor market is non-union

wage structure. (i.e., coefficients of non-union wage equation). According to first adjustment, the hypothetical non-union earnings function would be given as

$$\ln \bar{Y}_n = \sum \hat{\beta}_u \bar{X}_n \quad (8)$$

subtracting equation (8) from (7) we get (Oaxaca method)

$$\ln \bar{Y}_u - \ln \bar{Y}_n = \sum \hat{\beta}_u (\bar{X}_u - \bar{X}_n) + \sum \bar{X}_n (\hat{\beta}_u - \hat{\beta}_n) \quad (9)$$

Alternatively we can also decompose

$$\ln \bar{Y}_u - \ln \bar{Y}_n = \sum \hat{\beta}_n (\bar{X}_u - \bar{X}_n) + \sum \bar{X}_u (\hat{\beta}_u - \hat{\beta}_n) \quad (10)$$

The first term on the RHS reflects the differences in the characteristics (or endowment differences) and the second term in the equation is attributed to unionism.

Selectivity Bias

It is argued that the value of union and non-union wage differential obtained through two separate wage equation is a better estimate when compared to the value obtained through single equation method treating unionism as dummy. Even the estimate measured through the two-equation method suffers from limitations called “selectivity bias”. The individuals decision whether to join a union doe’s influence his wage. If we fit the earnings function without taking in to account the individual’s selectiveness, the wage equations for union and non-union may not be consistently estimated due to the selectivity bias involved; and the union-non-union wage differential calculated subsequently may be biased. Hence, in order to get a better estimate of union-non-union wage differentials, it becomes necessary to incorporate the selectivity variable in both the wage equations besides personal and industrial characteristics and make the equation free from selectivity bias. In order to correct for the selectivity bias, we have followed Lee (1978) and Heckman (1979) two step procedure. In the first step, we have estimated the union status using probit method and “Inverse Mills Ratio (λ)” has been obtained. In the second step, λ has been included as an additional regressor in the earnings equations along with the other independent variables and estimated using OLS method.

Cotton’s Decomposition Approach

Which of the two-equation (9) or (10) is the appropriate one to calculate unionism? (Index number problem). To solve this problem cotton (1988) proposed an alternative decomposition to estimate male-female earnings differentials. We also followed this approach to estimate earnings differentials between union and non-union workers. According to this approach, the unexplained (unionism) component comprise two parts:one representing the amount by which union workers characteristics are over compensated relative to their marginal product (union advantage or the benefit of being a union worker) and the other representing the amount by which non-union characteristics are under compensated (non-union disadvantage or the cost of being a non-union

worker). The true wage lie somewhere between the union and non-union wage structure. Cotton's logarithmic wage differential is given by:

$$\ln \bar{Y}_u - \ln \bar{Y}_n = \sum \beta^* (\bar{X}_u - \bar{X}_n) + \sum \bar{X}_u (\hat{\beta}_u - \beta^*) + \sum \bar{X}_n (\beta^* - \hat{\beta}_n) \quad (11)$$

Where β^* is the reward structure that would have occurred in the absence of unionism. The first element on the RHS of equation (11) is the difference due to differences in characteristics; and the other two elements represent the union advantage and non-union disadvantage. The estimator of β^* used above is defined as:

$$\beta^* = P_u \hat{\beta}_u + \hat{P}_n \hat{\beta}_n \quad (12)$$

Where P_u and P_n are the sample proportions of union and non-union workers and $\hat{\beta}_u$ and $\hat{\beta}_n$ the union and non-union pay structure respectively.

Reimer's Decomposition Approach

In order to separate the effect of selectivity bias, the Oaxaca decomposition can be extended to include selectivity bias, which is suggested by Reimer (1985). This extended methodology has been utilized recently by Idson and Feaster (1990), Hotchkiss (1991), Holtman and Idson (1993) and Terrell (1993). We also follow this methodology in this paper. The extended decomposition can be written as:

$$\ln \bar{Y}_u - \ln \bar{Y}_n = 0.5 \sum (\hat{\beta}_u + \hat{\beta}_n) (\bar{X}_u - \bar{X}_n) + 0.5 \sum (\bar{X}_u + \bar{X}_n) (\hat{\beta}_u - \hat{\beta}_n) + (\hat{C}_u \hat{\lambda}_u - \hat{C}_n \hat{\lambda}_n) \quad (13)$$

The RHS term correspond, respectively, to (a) the portion of the observed wage differential attributable to differences in characteristics of the union and non-union sector workers; (b) differences in the treatment of or returns to these characteristics and (c) selection bias. The intercept difference has not been removed from the coefficient effect reported here. Thus, the coefficient is a mixture of a difference in treatment and other omitted influences captured by the intercepts.

5. Empirical Result

(i) Probit Estimates for Union Status:

Table 1 reports the maximum likelihood Probit estimates for union status and the corresponding marginal effects. Overall the equation fits well. This evident from the Pseudo R-square (0.64) and chi-square value, which is highly significant at 1 percent level. Individuals with more education tend to join unionized factory. The propensity to become a unionist is positively and significantly associated with schooling attainment. The coefficient of age and its square term are significant. This implies that age has inverted U shaped effect for union status. The employees belonging to backward community, having non-labor income, working in the private sector, decision-maker and working in pleasant work sites are less likely to be unionist. As expected, firm size has a positive and significant impact on the union status. The married workers, owning a house, and working as supervisor, turner, machinist and assistant, job security and workers has shift hour are likely to be unionist. The estimate of the probit equation is used to compute the "Inverse Mills Ratio".

Table-1 Probit Estimates for Union Status

Dependent variable: Union Status =-1 if worker is a member of union; 0 other wise

Variables	Coefficients*	Marginal effect	Mean
Constant	-5.4874 (-3.26)	-2.1969	
Age	0.19471 (2.09)	0.0770	34.14
Age square	-0.0023 (-1.93)	-0.0009	1210
Education	0.11822 (4.28)	0.0468	9.981
BC	-0.0902 (-0.68)	-0.0357	0.6456
Married	0.53067 (2.45)	0.2100	0.8123
Work size	0.00174 (2.20)	0.0006	90.96
Income	-0.00007 (-1.49)	-0.00003	348.2
Own house	0.32447 (2.52)	0.1284	0.4330
Private	-0.39427 (-2.02)	-0.1561	0.8697
Super	0.32162 (1.47)	0.1273	0.2701
Turner	0.37621 (1.63)	0.1489	0.0478
Machine	0.17745 (0.96)	0.0703	0.3908
Assistant	0.16078 (0.62)	0.0636	0.1149
Decision	-0.14870 (-0.86)	-0.0588	0.4617
Pleasant	-0.46657 (-3.66)	-0.1847	0.5230
Security	0.46254 (3.41)	0.1831	0.6226
Irregular	0.66447 (5.02)	0.2630	0.4080
Log-likelihood	-278.552		
Pseudo R-square	0.64		
Chi-square	165.24		
N	522	522	522

Note: Figures in Parentheses indicates t-values

(ii) Single Equation Results:

In the first step, we have used single equation method including union status as dummy variable along with other variables in the wage equation (last column of Table-2). Our hypothesis is that unionism raises wages, which has been empirically observed through the positive sign and statistically significant coefficient of the union dummy variable. The coefficient obtained is 0.1718, which is equivalent to $\{(e^{0.1718} - 1) \times 100\}$. This works out to 18.74 percent, it means that workers in the union sector earn 19 percent more compared to the workers in the non-union sector. We have included education and experience in the wage equation considering them as human capital investments, which is presumed to increase the productivity of the workers and consequently earnings; experience coefficient strongly upholds our view. The positive low value of education coefficient (0.03) and high value of experience coefficient (0.05) can be interpreted in another way. Rosen (1969) and Johnson and Youmans (1971) argue that the prevalence of seniority system can attach lower coefficient to education and higher coefficient to experience. Under seniority system wages are based on age and experience rather than

education. This method of analyzing the problem gives rough idea about its magnitude. Further, three major weakness have been found using this single equation method. These are: (a) it assumes that the process of wage determination is the same in both the sector, (b)it is not possible to pinpoint where the differences occur in the wage generating process in the union and non-union sectors and (c) it is not possible to decompose the union-non-union wage differential. These three problems are taken care of when separate wage equations are estimated for union and non-union sectors.

(iii) Determinants of Wages:

The average hourly wage rates (after tax) of union and non-union workers are Rs.5.81 (approximately Rs.6) and Rs.4 respectively (monthly wage rate for union is Rs.1492 and non-union is Rs.1030). The difference of hourly wage rate Rs.2 could be attributed to differences between the two groups of workers in respect of several characteristics that are associated with earnings. The definition and descriptive statistics for the main variables, which are used in the empirical work, are shown in the appendix Table-A1, which reveal that union workers have higher experience and wage rate. To estimate earnings differences attributed to unionism, we estimated the earnings function separately for both union and non-union workers with selectivity corrected and uncorrected, as reported in Table-2. The logarithm of after tax hourly wage rate is used as the dependent variable and the explanatory variables include are education, experience, marital status, work size, occupational dummies and job attributes like decision, security, pleasant, and irregular.

Table 2 Ordinary Least Squares Estimates of Wage Equations for Union and Non-Union Workers

Dependent Variable: Natural Logarithm of After Tax Hourly wage Rate

Variables	Uncorrected		Corrected		Whole Sample
	Union	Non-union	Union	Non-union	
Constant	1.1529	0.5009	1.1253	0.4719	0.7046
Experi.	0.0454 (3.69)	0.0377 (3.61)	0.0459 (3.49)	0.0403 (3.52)	0.0565 (5.89)
Ex.square	-0.0006 (-1.96)	-0.0006 (-2.71)	-0.0006 (-1.86)	-0.0006 (-2.33)	-0.0007 (-3.53)
Education	0.0246 (2.98)	0.0519 (6.09)	0.0255 (2.13)	0.0568 (4.66)	0.0393 (6.73)
BC	0.0438 (1.26)	0.0583 (1.50)	0.0428 (1.19)	0.0534 (1.34)	0.0544 (2.09)
Married	-0.0782 (-1.13)	0.0084 (0.16)	-0.0731 (-0.86)	0.0317 (0.47)	-0.0377 (-0.91)
Work size	0.0002 (3.40)	0.0382 (1.47)	0.0002 (2.49)	0.0004 (1.65)	0.0002 (3.32)
Private	-0.0974 (-2.13)	-0.0472 (-0.67)	-0.1004 (-1.86)	-0.0643 (-0.84)	-0.1117 (-2.97)
Super	-0.0604 (-1.06)	0.1653 (2.59)	-0.0586 (-0.98)	0.1757 (2.64)	0.0431 (1.01)
Turner	-0.1924	-0.0510	-0.1914	-0.0403	-0.1033

	(-2.25)	(-0.52)	(-2.22)	(-0.40)	(-1.65)
Machine	-0.1603 (-2.94)	-0.0099 (-0.19)	-0.1596 (-2.90)	-0.0052 (-0.12)	-0.0721 (-1.99)
Assistant	-0.4692 (-5.33)	-0.2646 (-4.23)	-0.4700 (-5.38)	-0.2570 (-4.02)	-0.3270 (-6.52)
Decision	0.0450 (1.96)	0.0507 (1.78)	0.0442 (1.96)	0.0470 (1.94)	0.0545 (1.69)
Pleasant	-0.0981 (-2.89)	0.0014 (0.03)	-0.1019 (-2.06)	-0.0201 (-0.37)	-0.0562 (-2.23)
Security	0.0412 (1.01)	0.0404 (1.05)	0.0446 (0.86)	0.0599 (1.16)	0.0636 (2.30)
Irregular	0.1056 (3.09)	0.0033 (0.08)	0.1107 (1.88)	0.0299 (0.48)	0.0715 (2.76)
Union	--	--	--	--	0.1718 (6.09)
λ	--		0.0136 (1.985)	0.0778 (1.13)	--
R-square	0.4856	0.5153	0.4958	0.5160	0.5741
F-Value	15.25	16.45	15.18	15.39	42.54
N	274	248	274	248	522

Note: Figures in Parentheses indicate t-values

The parameter estimates are consistent with the expectation based on human capital theory and confirm the plausibility of the human capital model. We expect that the coefficients of education, experience, marital status will be positive in both equations. We also expect that the effect on wages of schooling and experience will be greater in the non-union equation than in the union equation, because we assume that the employers in the non-union sector are more responsive to market forces. Our predictions of signs and magnitudes of coefficients are strongly supported by the regression result reported in the Table-2. The rate of return to education is higher in non-union sector (5.6 percent) compared to union sector (2.5 percent). The occupational dummies are negative and significant in union wage equation. In non-union equation, except the coefficient of supervisor, remaining occupational dummies are negative. This implies that the occupation like supervisor and left out category, namely, fitter/technician tend to earn more income while turner, machinist and assistant workers are paid lower wages. The inclusion of other non-pecuniary job characteristic variables serves two purposes. First, they control a variety of job attributes. Second, they provide additional test of the validity of the theory of compensating differentials. The result show that workers who make decision tend to be paid some what more which is consistent with heavy tasks associated with this attribute. SECURITY is having an unexpected positive sign. However, the higher wages of employees with job security is quite consistent with the greater security associated with upper level blue-collar positions. This variable thus may be capturing the relative ranking of the worker's job rather than any particular job attributes, which is not appropriately compensated. The job with irregular work hours provides higher compensation as expected. The variable PLEASANT has little impact.

In general non-union coefficients appear to be much stronger than union-coefficients. This type wage structure also noticed in the studies of Bloch and Kuskin (1978) and Lee (1978). It appears that unions attempt to flatten out wage equation. The wage equation fits well for the sample of union and non-union workers as indicated by R-square value and highly significant F-value. A chow test was carried out to examine the equality of two sub-sets of coefficients. The calculated F-Value is highly significant at 1 percent level and implies that the process of wage determination is different in both the sectors. This result has given a way to decompose the gross wage differentials in to two parts.

(iv)Decomposition of Union and Non-union Wage Differentials:

The gross wage differential in logarithm terms estimated through wage equation is equivalent to $1.76031-1.38753=0.37278$ in favor of union workers. The percentage gross differential is 45.18 percent (anti log of $0.37278-1$). We have used union coefficients (wage structure) and non-union mean as a weight for the decomposition. Table shows that the endowments and the economic rent are higher in the union sector. The result suggests that the gross differential adjusted to differences when applying union wage structure is approximately (46.93%) 47 percent. This unexplained value is attributed to unionism. The correction for selectivity bias reduces the coefficient of unionism to 42 percent.

Table 3 Decomposition of Wage differentials: Oaxaca's Approach

Components	(in percentge)	
	Uncorrected	Corrected
Explained differentials (Due to endowment differences)	52.32	58.23
Unexplained Differentials (Unionism)	46.93	42.24

Table-4 reports the relative contribution of variables in explaining the union-non-union wage differentials. A positive entry indicates an advantage in favor of union sector and a negative entry indicates an advantage in favor of non-union sector. We have taken selectivity-corrected results for interpretation. First we shall consider the contribution of the endowments to the wage differentials. Of all the superior endowments in the union sector, education, experience, work size, private sector, assistant and job attributes like decision, pleasant, security and irregular are in favor of union sector. Considering the differences in the wage structure between union and non-union, the surplus payment in the union sector appears due to additional rewards associated with acquisition of wage generating skills. This is illustrated by the positive contribution of human capital characteristics such as experience as well as selectivity variable. The positive sign of constant term signifies that the practice prevalent in the union sector of recognizing merit, on-the job performance and the acquisition of wage augmenting skills for wage increment and promotion. In other words, the differences due to constant term indicate that union employees get surplus wage payment.

Table-4 Relative Contribution of Specific Variables to the Decomposition

Variables	Uncorrected			Corrected		
	Endowment Difference	Unionism	Total differentials	Endow. Differ. Differentials	Unionism	Total
Constant	-	174.90	174.90	-	175.27	175.27
Experie.	31.45	26.07	57.52	31.70	18.87	50.65
Exp.squar	-10.51	-1.08	-11.59	-10.70	1.10	-9.60
Edu.	5.14	-69.95	-64.81	5.53	-80.17	-74.84
BC	-0.44	-2.59	-3.03	-0.43	-1.89	-2.32
Married	-4.410	-16.50	-20.61	-3.84	-19.98	-23.81
Worksize	4.11	-2.39	1.71	4.13	-3.35	0.79
Private	2.29	-12.34	-10.07	2.34	-8.86	-6.52
Super.	-1.49	-13.43	-14.93	-1.45	-13.95	-15.40
Turner	-0.74	-1.53	-2.27	-0.74	-1.63	-2.37
Machinist	-1.63	-14.97	-16.60	-1.62	-15.37	-16.99
Assistant	13.05	-9.30	3.76	13.08	-9.68	3.40
Decision	1.07	-1.34	-0.27	1.05	0.37	1.42
Pleasant	4.91	-16.58	-11.67	5.10	-13.61	-8.51
Security	2.67	0.10	2.77	2.85	-2.04	0.84
Irregular	6.57	7.86	14.43	6.89	6.20	13.09
λ	-	-	-	4.43	10.96	15.38
Total	52.32	46.93	100.00	58.23	42.24	100.00

Table-5 shows the estimates based on cotton's decomposition method. The estimated results are provided with and without adjusted for selectivity bias. Skill differences explain 52.53 percent. The union advantage account for 22.32 percent and disadvantage component for non-union sector is 24.40 percent. After correcting for selectivity bias, the first component increased to 72.42 percent, second and third component reduces to 6.09 and 21.96 percent respectively. The disadvantage component for non-union is the difference in the observed non-union wage and the wage they would receive if there were no unionism. Combining union advantage and non-union disadvantage gives us a measure of unionism.

Table 5: Decomposition of Wage Differentials: Cotton's Approach

Components	(in percentage)	
	Uncorrected	Corrected
Due to Skill differences	52.53	72.42
Due to Union Advantage	22.32	6.09
Due to Non-union disadvantage	24.40	21.96

Table 6: Decomposition of Wage Differentials: Reimer's Approach
(in percentage)

Components	Corrected
Due to Characteristics difference	58.15
Due to treatment differences	26.94
Due to selectivity bias	16.62

In order to disentangle the selection effect, Reimer's decomposition approach has been used (Table-6). The wage differentials are decomposed in to differential attributable to difference in characteristics of workers, differences in the treatment of these characteristics and selection bias. This decomposition suggests that the selectivity lower the wage gap between union and non-union workers. When we decompose the wage gap, we find that the differences in constant term rather than differences in coefficients to be the most important determinant of wage differentials between union and non-union sector. It is important to mention here that in any study on the decomposition of earnings equation depends on the specification of the equation. While the argument of the present study may be justified on theoretical grounds, we readily acknowledge the existence of alternative specifications and even approaches. So far we have discussed the analysis of differences in monetary terms to employees in union and non-union sectors. One can look at the other side of the picture and quantify the extent to which individuals with certain characteristics choose to join in the union, which forms the second section as follows.

6. Conclusion

In this paper attempt has been made to analyze the impact of trade unions on wages. We attempt to estimate the union-non-union wage differential through single wage equation treating unionism as a dummy. It gave an estimate of 19 percent, which means that the workers in union sector earn 19 percent more than the workers in the non-union sector. However, drawing some limitations of single equation, separate earnings function has been estimated for union and non-union sectors. The earnings functions are corrected for selectivity bias. The result shows that the parameter estimates are consistent with the expectations based on human capital theory and confirm the plausibility of the human capital model. Further we have used the decomposition technique suggested by Oaxaca, Cotton and Reimer to decompose the gross earnings differentials in to explained and unexplained part. The calculated unexplained part is 47 percent and it is reduced to 42 percent after correction for selectivity bias, which can be attributed to unionism. The hypothetical average wage of union sector in the absence of unionism is calculated which is Rs.1228 and in the same way the hypothetical average wage of non-union sector if it is unionized is calculated, which is Rs.1100. But still average wage of non-union sector was low compared to union sector. On the whole, all these exercises clearly reveal that there is a significant earnings differential between union and non-union sector workers. So far we have discussed the analysis of differences in monetary terms to employees in union

and non-union sectors. One can look at the other side of the picture and quantify the extent to which individuals with certain characteristics choose to join in the union. It is important to test the endogeneity of union choice including expected wage differential in the union choice equation using switching regression framework with appropriate instruments. This alternative framework hopefully allows us to do further research in this direction.

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Appendix Tables:

Table A1. Employment in the organized sector (in 000,000s)				
Four phases of unionization	Year (end of March)	Employment		
		Public sector	Private sector	Total
The first phase (1950 to mid-1960s)	1956	52.34
	1961	70.5	50.40	120.9
	1962	74.17	51.60	125.77
	1963	79.53	54.50	134.03
	1964	84.54	57.80	142.34
	1965	89.57	60.40	149.97
(Data above are not comparable with those which follow)				
The second phase (mid-1960s to 1979)	1966	93.79	68.13	161.92
	1967	96.34	66.84	163.18
	1968	98.02	65.25	163.27
	1969	100.95	65.28	166.23
	1970	103.74	66.85	170.59
	1971	107.31	67.42	174.73
	1972	112.09	67.69	179.78
	1973	119.71	68.49	188.2
	1974	124.80	67.94	192.74
	1975	128.83	68.08	196.91
	1976	133.22	68.44	201.66
	1977	137.66	68.67	206.33
	1978	142.00	70.43	212.43
1979	146.76	72.08	218.84	
The third phase (1980 to 1991)	1980	150.79	72.27	223.06
	1981	154.84	73.95	228.79

	1982	159.46	75.47	234.93
	1983	164.55	75.52	240.07
	1984	168.69	73.45	242.14
	1985	172.69	73.09	245.78
	1986	176.83	73.73	250.56
	1987	180.25	73.64	253.89
	1988	183.20	73.92	257.12
	1989	184.44	74.53	258.97
	1990	187.72	75.82	263.54
	1991	190.58	76.75	267.33
The fourth phase (1992 to 2000)	1992	192.10	78.46	270.56
	1993	193.26	78.51	271.77
	1994	194.45	79.30	273.75
	1995 (June)	194.11	80.65	274.76

Source: (a) For 1956-1969, *Basic Statistics Relating to the Indian Economy, Vol. 1: All India*, Centre for Monitoring Indian Economy (CMIE), October 1980; and (b) For 1970-1994, *India's Social Sectors*, CMIE, February 1996.

Note: Organized sector covers all the enterprises in the public sector and only the non-agricultural establishments in the private sector employing 25 or more workers from 1961 to 1965 and 10 or more workers from 1966 onwards.

Four phases of unionization	Plans	Annual average growth rates	
		GDP	Employment
The first phase (1950 to mid-1960s)	1951-56 (First Five-Year Plan)	3.6	0.39
	1956-61 (Second Five-Year Plan)	4.2	0.85
	1961-66 (Third Five-Year Plan)	2.8	2.03
The second phase (mid-1960s to 1979)	1967-69 (Annual Plans)	3.9	2.21
	1969-74 (Fourth Five-Year Plan)	3.3	1.99
	1974-79 (Fifth Five-Year Plan)	4.8	1.84

1961*	1.80	6.70	8.50	1.29	5.50	6.79	3.69	30.20	33.89	2.24	0.40	2.64	6.03	2.40	8.43	55.45	5.20	60.65
1975*	3.34	8.18	11.52	6.94	1.23	8.17	10.19	41.11	51.30	5.08	0.39	5.47	9.56	1.27	10.83	93.72	15.89	109.61
1976	3.59	8.27	11.86	7.19	1.32	8.51	11.13	41.58	52.71	5.36	0.35	5.71	9.92	0.94	10.86	93.52	15.99	109.51
1977	3.66	8.38	12.04	7.57	1.30	8.87	12.26	41.65	53.91	5.63	0.35	5.98	10.09	0.83	10.92	98.45	16.18	114.63
1978	3.87	8.53	12.40	7.58	1.27	8.85	13.55	43.21	56.76	5.99	0.34	6.33	9.98	0.83	10.81	101.03	16.25	117.28
1979	4.08	8.41	12.49	7.71	1.24	8.95	14.16	44.33	58.49	6.34	0.34	6.68	10.32	0.83	11.15	104.14	16.93	121.07
1980	4.31	8.60	12.91	7.97	1.25	9.22	14.46	44.17	58.63	6.61	0.34	6.95	10.68	0.73	11.41	106.77	17.18	123.95
1981	4.63	8.58	13.21	8.18	1.30	9.48	15.02	45.45	60.47	6.83	0.35	7.18	10.89	0.72	11.61	109.29	17.55	126.84
1983	4.76	8.47	13.23	8.84	1.20	10.04	16.34	45.56	61.90	7.21	0.37	7.58	11.20	0.68	11.88	116.20	18.24	134.44
1984	4.89	8.19	13.08	9.27	1.13	10.40	17.17	44.73	61.91	7.33	0.39	7.72	11.20	0.66	11.86	118.81	18.41	137.22
1985	4.98	8.22	13.20	9.74	1.13	10.87	17.60	44.23	61.83	7.59	0.39	7.98	11.46	0.70	12.16	121.71	18.54	140.25
1986	5.26	8.22	13.48	9.66	1.11	10.77	18.15	44.48	62.63	7.85	0.40	8.25	11.81	0.69	12.50	124.11	18.84	142.95
1987	5.57	8.48	14.05	9.42	0.91	10.33	18.62	44.10	62.72	7.89	0.40	8.29	11.85	0.58	12.43	126.90	19.17	146.07
1988	5.54	8.44	13.98	9.56	0.93	10.49	18.67	43.95	62.62	8.49	0.41	8.90	12.14	0.50	12.64	128.80	19.69	148.49
1989	5.65	8.70	14.35	9.57	0.97	10.54	18.48	43.89	62.37	8.66	0.41	9.07	11.80	0.64	12.44	130.99	20.09	151.08
1990	5.55	8.68	14.23	9.56	0.96	10.52	18.63	43.83	62.46	8.69	0.39	9.08	11.46	0.69	12.15	130.58	20.00	150.58
1991	5.6	8.9	14.5	10.0	1.0	11.0	18.5	44.8	63.3	9.1	0.4	9.5	11.5	0.7	12.2	136	20.9	156.9
1994	5.4	8.8	14.2	10.1	1.0	11.1	17.8	46.3	64.1	9.4	0.4	9.8	11.7	0.5	12.2	140	22.3	162.3

[@] Services include (1) trade and commerce, (2) transport, storage and communications, (3) financing, insurance, real estate, etc. and (4) public administration.

* Data before 1975 are not comparable with data after 1975 because industrial classification changed in April 1975.

Source: Centre for Monitoring Indian Economy.

Table A.5.. Index numbers of consumer prices (1960-61 to 1993-94)

Four phases of unionization	Year	Index		Percentage increase over previous year	
		Industrial workers (Base 1982=100)	Urban non-manual employees (Base 1984-85=100)	Industrial workers	Urban non-manual employees

The first phase (1950 to mid-1960s)	1960-61	20	19	--	--
	1961-62	21	20	4.0	4.0
	1962-63	22	20	3.8	3.8
	1963-64	23	21	4.6	4.6
	1964-65	26	23	14.2	9.7
The second phase (mid-1960s to 1979)	1965-66	28	25	7.8	6.5
	1966-67	32	27	12.9	10.6
	1967-68	35	30	11.5	8.9
	1968-69	35	30	-0.6	1.3
	1969-70	36	31	1.7	3.7
	1970-71	38	33	5.1	4.2
	1971-72	39	34	3.2	3.4
	1972-73	42	36	7.8	6.7
	1973-74	51	42	20.8	15.1
	1974-75	64	51	26.8	22.2
	1975-76	63	52	-1.3	2.6
	1976-77	61	52	-3.8	0.0
	1977-78	66	56	7.6	6.9
1978-79	67	58	2.2	3.4	
The third phase (1980-1991)	1979-80	73	62	8.8	7.8
	1980-81	81	69	11.4	11.8
	1981-82	91	78	11.9	11.9
	1982-83	99	84	8.8	8.0
	1983-84	111	92	12.1	9.7
	1984-85	118	100	6.3	8.7
	1985-86	126	107	6.8	7.0
	1986-87	137	115	8.7	7.5
	1987-88	149	126	8.8	9.6
	1988-89	166	136	11.4	7.9
	1989-90	173	145	4.2	6.6
1990-91	193	161	11.6	11.0	
The fourth phase (1992-2000)	1991-92	219	183	13.5	13.7
	1992-93	240	202	9.6	10.4
	1993-94	258	216	7.5	6.9

Source: *Basic Statistics: India*, August 1994, Centre for Monitoring Indian Economy.

Four phases of unionization	Year	General index for twelve industries
The second phase (mid-1960s to 1979)	1969	150.3

	1971	174.8
	1976	324.5
	1978	350.6
	1979	376.6
The third phase (1980-1991)	1980	421.0
	1981	467.8
	1982	536.2
	1983	588.0
	1984	659.8
	1985	736.3
	1987	887.6
	1990	1159.7
The fourth phase (1992-2000)	1991	1304.9
	1992	1480.7
	1993	1626.3

Note: Index number of wage rates depict movement of relative change experienced in the wage rates over a period of time. These indices have been compiled by the Bureau in selected industries since 1969.

Source: *Indian Labour Yearbook*, Labour Bureau of various years.

Year	Real wage (rupees/year)	Product wage (rupees/year)
1960/61	1197	1197
1961/62	1261	1302
1962/63	1292	1317
1963/64	1363	1356
1964/65	1263	1394
1965/66	1262	1450
1966/67	1264	1467
1967/68	1215	1482
1968/69	1230	1557
1969/70	1345	1596
1970/71	1387	1520
1971/72	1453	1501
1972/73	1436	1494
1973/74	1426	1438
1974/75	1259	1351
1975/76	1426	1589
1976/77	1342	1351

1977/78	1424	1519
1978/79	1627	1773
1979/80	1682	1623
1980/81	1672	1447
1981/82	1632	1585
1982/83	1717	1784
1983/84	1807	1938

Note: Real wage is nominal wage in manufacturing deflated by CPI for industrial workers, and product wage is nominal wage deflated by GDP deflator for manufacturing.
Source: Joshi and Little (1994, pp. 92, 120 & 155).

Appendix Table-A8: Measurement of Variables and its Definition

Variables	Definition
Education	Education (in completed years)
Age	Worker's age in years
BC	Worker's community=1 if he belongs to backward community; 0 otherwise
Married	Marital Status=1 if married; 0 otherwise
Spouse	Employment of spouse=1 if the spouse is employed; 0 otherwise
DC	The number of dependent children, aged 0-16
Union	Union status=1 if worker is a member of union; 0 otherwise
Work Size	Total work force of the firm where he works
Supervisor	If worker is a supervisor=1; 0 other wise
Machinist	If worker is a machinist=1; 0 otherwise
Assistant	If worker is an assistant=1; 0 otherwise
Turner	If worker is turner=1; 0 otherwise
Security	If workers job provides security=1; 0 otherwise
Pleasant	Condition of work site: if workers job has pleasant=1; 0 other wise
Decision	Workers decision on the job: if worker is the decision maker=1; 0 otherwise
Irregular	Irregular work hours: if the worker has shift hour works=1; 0 otherwise
Private	If the worker's employment is in private sector=1; 0 otherwise
Income	Non labor income of the respondent
Asset	The value of the property owned by the respondent including the house
Ind-1	If the industry is manufacture of rubber, plastic, petroleum and coal products=1; 0 otherwise
Ind-2	If the industry is manufacture of machinery, machine tools and parts=1; 0 other wise
Ind-3	If the industry is manufacture of transport equipment and

	parts=1; 0 otherwise
Wage	Natural logarithm of after tax hourly wage rate