

Foreign Competition, Bi-Sourcing and Union Wage Share

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Abstract: Increasing competition due to trade reforms usually redistributes the union wage share in both developed and developing economies depending on the nature of foreign trade, labour market and trade union. A simple theoretical model, using the cournot game between domestic and foreign firms with alternative combinations of different types of labour market and trade union is constructed to see the effects on the wage share. We find that when the foreign firm imports, the competition due to tariff-cuts unambiguously hurts the union wage and its share at a higher rate in the developing countries. Even if the foreign firm produces within the country, the wage and its share unambiguously decline in the presence of decentralised unions and also in the presence of centralised one in a developing economy under certain conditions, but not in a developed economy. It is empirically observed that Indian economy registered a gradual fall in number of industrial disputes, strikes and lockouts as well as the wage share of the workers during 1980-2006, indicating a lowering of union bargaining power with the advent of trade reforms. The panel regression results clearly establish that trade openness, measured in terms import competition, causes expansion of contractual employment and thus depresses the wage share of the unionised sector.

Key words: Trade reform; industrial disputes; unionised sector; wage and distributive share

JEL Classifications: D21; L23

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1. Introduction

Conventional belief suggests that a reduction of trade barriers would promote competitiveness in an economy, and thus essentially raises the demand for labour and the resultant welfare of workers by increasing either wage rate or employment or both. Although this has been the presumption behind the adoption of liberal policies, the effect has been uncertain in the presence of imperfections in both the product market and labour market. If a particular trade policy puts a pressure on the market price of a final good, it affects not only output but also the benefit of the firm. The benefit tends to be lower, if the labour market is rigid enough to accept revised employment and wage. The recent research shows that the trade union in the labour market, by exerting their bargaining power, often restricts the pace of industrialisation and hence it does not help to reduce unemployment rate (such as Blanchard and Giavazzi, 2003). Moreover, Besley and Burgess (2004) studied the effect of labour market rigidity on regional growth in a federal democratic country like India during 1952-1997 and established that the states which have favourable labour laws for workers grew at a slower rate than those have favourable laws for employer. This has mandated the country to bring more flexible labour market policies so that it accelerates the industrialisation and resultant employment. There has been another policy implication of these researches for the developing countries. Only a certain share of working population in these countries is engaged in the unionised sector (i.e., formal or organised sector) where a strong union operates to protect their interests and the rest works outside the firm on flexible contracts, without getting minimum wage and securities. The latter has grown in recent years not only in developing countries but also in developed countries (Schneider and Enste, 2000; Jütting and de Laiglesia, 2009). The economic conditions of those workers are quite often poor and hence in

the process of development the policies are required to lift up the working population from informal to formal sector or non-unionised to unionised sector. If the rigid policies do not help the process, it must be withdrawn for the sake of gainful employment in the formal or unionised sector. As a result, the current policy thrust is given, particularly in developing countries including India, towards bringing more flexibility in the labour laws so that it does not restrict the industrial growth. Given this backdrop the current paper seeks to understand whether the competition has any significant impact on the unionised sector. Since the competition changes the market structure, it could indirectly impact on the union, even without legislative reform. The immediate questions would be: (i) what is the implication of competition on the functioning of union? (ii) is the union better off, both in absolute and relative terms, from that? The present paper would like to explore these issues both theoretically and empirically based on Indian experiences.

We argue that the competition puts downward pressure in the final goods price and reduces the individual market share. This fall in the share of an individual firm leads to a reduction of employment in the union sector and thus has a downward pressure on union wage. The most important and practical question here is that how the firm could cut down the labour force or wage within the current legislative framework in India. There is no doubt that the flexible laws enable a firm to do instantaneous adjustment in the labour requirements and thereby help industrialisation. And, if so, we need to understand who is likely to gain and how much in the process. In the existing system even if the rigid laws do not help instantaneous adjustments, the firm still finds way to do it in the long-run by either not fulfilling the new positions or not hiring against retirements. *Second*, a labour turn-over rate tends to be higher under competition and quickens this process further. While a firm intends to reduce

employment, if the probability of getting employment in another firm, with the entry of new firm after reform, must be higher, this would ease the rigidity in the labour market. *Third*, while the employer wants to rationally allocate resource for optimum benefits, the union workers should not act irrationally and react properly in the presence of credible threat. This would definitely compel them for some adjustments, if alternative of the workers would be starvation, so that the production unit does not shut down. Hence the union makes adjustments with the firm owners accordingly. *Fourth*, even within the existing labour laws in India a firm enjoys relative flexibility depending upon their size. For example, according to Industrial Disputes Acts (1951) in India, a firm needs a prior approval for its retrenchment if it hires workers more than 100. Similarly, Factory Acts (1947) in India is not applicable for a firm how hires less than ten workers (Besley and Burgess, 2004). These relatively small firms easily put pressure on union workers either by firing workers or contracting outside instantaneously. *Fifth*, although the legislative amendment is important factor for the industrial growth, but, it is not just legislation, but enforcement, too, that is crucial to the extent to which firms are deterred by labour legislation (D'Souza, 2008). A field-level study by Maiti (2009) has shown that high level of corruption among the administrative authority enables the firm owners in bypassing these regulations. *Sixth*, the firms also enjoy a legislative right of using flexible labour within the firm on contractual basis following the Contract Labour Regulations Acts (1970). These flexible labourers can be treated as a stock to absorb external shocks. Therefore, in presence of these factors, a firm is able to change employment composition in response to the competition, at least in the long-run. Bargaining power of the union then must shrink if the size of employment shrinks. Moreover, if the firm finds a non-unionized sector to contract out the works, it further puts pressure on union to accept a lower wage and employment. Now, if the competition depresses product price and the firm shifts the burden on the workers, the issue that requires investigation is that who is

better off in both relative and absolute terms. This would depend on the nature of trade union functioning and the accessibility of non-unionised workers.

The study would also like to see the differential impact of competition on union. The distinction between developed and developing country here is made by looking at the existence and non-existence of non-unionised sector. It is understood that a developing economy consists of a large informal or unregistered sector which we define here as non-unionised sector. Mainly the persons who do not find employment in the registered sector come to this sector. Since these employments are largely outside the purview of industrial and labour laws, the workers in this sector cannot build up a formal union for fighting for their rights and better wage. The principal feature of the sector is that the workers work on flexible contracts without any guarantee of employment, social securities and other fringe benefits. We prefer to term the sector which uses workers for production in the registered firms as unionised sector and the rest is the non-unionised sector. Since, the production outside the unionised sector does not face trade union, the wage of the sector must be lower than that in the unionised sector (see Carruch and Oswald, 1981). This gives an incentive to produce outside by either subcontracting or buying from spot markets. We argue that if a firm starts contracting out more to the non-unionised sector under more competition in the post-trade reform period, the workers in the unionised (formal) sector would be worse off, particularly in the developing economy. In order to see this, at first, we develop a theoretical model to show the distributive impact of reform on the unionised sector and then some evidences will be drawn from contemporary experiences on Indian economy.

In theory, there could be two types of countries where a firm produces with or without existence of unionised labour markets in autarky. After reform, we consider a simple

duopoly model of Cournot game between a domestic and foreign firm and examine its implication of trade union wage and its share. The domestic firm can either produce in the unionised sector or contract out to the non-unionised sector (i.e., informal sector). The decision of being produced at the union sector and/or outside is taken simultaneously. On the other hand, the foreign firm can either produce abroad and import those or directly produce at the domestic country. While producing at the domestic country, the implication will be different depending on accessibility of the non-unionised sector by the foreign firm. We find that a rise of competition in the import competing sector, with a decline of tariff rate, the foreign firm captures a share of domestic market and depresses the union wage and its share in the domestic firm at higher rate in a developing economy. Because in the latter case, the domestic firm chooses to produce outside at cheaper cost and thus puts an indirect pressure on the union bargaining. As a result, the wage share of union workers shows a declining trend with a fall in the tariff rate. But when the foreign firm invests and produces in the domestic country (i.e., inward FDI flow), the result would not be straight forward. Although the foreign firm will also generate demand for labour, the rise of foreign competition under these circumstances would depress union wage or not depending on availability of non-union workers and types of union. If more than one firm is engaged in production in the domestic market, labour unions in the respective firms may bargain centrally or de-centrally. We find that in the developed country, the union wage would be lower in the presence of decentralised union but not in the presence of centralised union. On the other hand, in a developing country this is true both in the presence of centralised and decentralised union.

We find empirical support from Indian experience during the period from 1980 to 2006. A sharp decline of wage share in all the major states in India during the period

is observed and we run two-stage panel regression to see the relationship between trade liberalisation and wage share. We use Olley_Pakes (1996) and Levinsohn-Ptrin (2003) methods to investigate the impact of openness on size of non-unionised sector and resultant bargaining power of the union. The regression results reveal that higher the openness higher is the size of non-unionised sector (i.e., contractual employment) and lower is the resultant bargaining power and wage share of the union workers.

So far the existing literature, both theoretical and empirical, deals with the effect of trade reform on either on wage and/or employment. But what the impact on the distributive wage share relative to the value addition has been – is still under-researched. Therefore, the study not only investigates the effect of trade reform on absolute wage but also on the relative distribution of surplus for union sector. This would essentially help us to understand the effect of trade on formal labour market.

The remaining part of the paper is presented in the following structure. In section 2, a brief summary existing literature on the issue is presented. A theoretical model is discussed in section 3 and empirical works were presented in the section 4. The section 5 ends up with concluding remarks.

2. Literature

A rise of foreign competition, in response to trade reform, not only influences in-house production and employment but also penetrates the market price of final output and wage rate of in-house worker, even if they are unionised. The concern about the effects of globalization or trade liberalization on employment and factor prices can be dated back to Stolper and Samuelson (1941). In earlier days, this issue has been addressed in perfectly competitive input markets. However, this is not always the correct reflection of the real world scenario. Often the input markets, and specially the labour markets are imperfectly competitive in presence of labour unions. Moreover, in

the face of foreign competition, how a domestic firm opts for a strategic choice of subcontracting, in order to bypass formal labour market, has been often ignored in the existing literature.

In recent years, a growing interest has been observed to see the effect of trade liberalisation on formal labour market, but the results are inconclusive. Since the labour market in the formal sector functions in a regulatory industrial framework and protective environment in most of the developing countries, trade union often enjoys additional bargaining power over the entrepreneurs and that leads to sluggishness of industrial growth in those economies. It has been an important concern for those countries who want to accelerate industrial growth. Therefore, the labour market flexibility has been a growing demand for the success of accelerating industrial growth (Bertola, 1996; Besley and Burgess, 2004).

The theoretical result of Huizinga (1993) and Sørensen (1993) show that unionized wage is higher under autarky than under free trade. Acemoglu, Aghion and Violante (2001) argue that unions encourage productive training, and such training is incentive compatible for firms only when the wage structure is compressed. Alternatively, collective decision making within a union may reflect the preferences of its median voter, and if this median voter is an unskilled worker, he will try to increase unskilled wages at the expense of skilled wages. It is also possible that union members choose to compress wages because of ideological reasons or for social cohesion purposes. The theoretical works by Naylor (1998 and 1999), Munch and Skaksen (2002), Bastos and Kreickemeier (2009) and Bastos et al. (2009) show the positive effects of trade reform on unionized wage. In two-country trade models, Naylor (1998 and 1999) show that two-way trade liberalization increases unionized wage. Bastos and Kreickemeier (2009) show the effects of two-way trade liberalization in a general

equilibrium model with unionized and non-unionized sectors. Bastos et al. (2009) show that trade liberalization may increase unionized wage by affecting the disagreement utility of the firms if the union is an open shop, where all the workers are not union members.

Empirical works stand entirely on mixed findings across countries of the effect of trade on wage. Rodrik (1997) points out that globalization reduce the bargaining power of the trade unions and create an adverse wage effect. This concern is more prominent in Europe, where the labour market in most countries is strongly unionized.¹ Blanchard (2003) finds that product market deregulation raises the real wage of the workers to the extent that it reduces barriers to enter and thus it reduces unemployment. Moreover, product market deregulation, by decreasing total rents, reduces the incentives for workers to appropriate a proportion of these rents. Keil et al (2007) did a similar kind of study on Belgian firms and they find that the rise in liberalisation has led to the reduction in the union bargaining power and greater distribution of rents in favour of firm owners. On the other hand, Feenstra (2007) finds a substantial improvement in wage earnings in the USA and Canada during 1980s and 1990s following tariff reduction. Cragg and Epalbaum (1996) observe a high growth of skill wage in Mexico in the phase of tariff reduction during 1990s. Aleman-Castilla (2006) shows that Mexican trade opening in the 1990s increased industry wage differentials and widened the formal–informal wage gap.

Other interesting trend that has been observed in recent years, particularly in the developing world, is that a share of output is being delegated more to the informal sector, where the wage rate is determined by the market relatively low, in order to bypass expensive labour in the formal sector. The recent reports, by WTO-ILO (2009) and Jütting and de Laiglesia (2009), also provide an ample evidence of such

¹ As mentioned in OECD (2004), on average, 67% of the workforce in the European nations is covered by union agreements.

experiences. If this is true it would act as a depressing factor on the bargaining power of trade union and resultant wage rate.

3. Model

Trade liberalisation means the adoption of those policies which expose a domestic economy in the global market. Main instruments are – gradual reductions of tariff rates and withdrawal of restrictions on inward flow of foreign capital. In the theoretical excises, we model how these two policies separately affect union wage and its distributive share and then compare those with autarky. The study envisages at least three possible ways by which these reform policies impact on unionised labour market and these are competition effect, bi-sourcing choices and union structures. In order to capture these effects, we assume that types of countries – one with only unionised sector and another with both unionised – are there in the world economy. Mostly in developed countries, the production takes in the formal and registered sector where in support of formal regulations the workers build up a union to bargain their wage. On the other hand, a significant share of production activities in the developing countries takes place outside the formal/registered sector and workers in the sector do not form a union to negotiate their wage. This sector can be defined as non-unionised sector. At first, we take up an autarky case where a single firm produces in the domestic economy and hence enjoys a monopoly power in the output markets respectively of two countries. Then, the completion effect, due to change in a particular trade policy, could be captured by comparing the union wage share with that in autarky. When two firms produce same goods in a country, the trade unions in respective firms can either work centrally and decentrally and the difference of the result capture the effect of union structures. Moreover, since firms in one country

have bi-sourcing option, any difference of results under similar situation arises due to this factor only. Here the firm either produces in the unionised sector or contracts outside and gets rid off union pressure to some extent.

Now, trade liberalisation allows a foreign firm to compete with the domestic market two ways. The foreign firm can either produce abroad or sell in the domestic market, in case when tariff rate is very low, or both produce and sell in the domestic market, in case of inward FDI. We do not derive the condition when the foreign firm prefers importing or producing in the domestic economy. Rather, we are interested to capture the effect of competition, due to the choice of foreign in response to these trade policies, on labour markets. In both cases, the foreign firm competes with the domestic firm and play simple cournot game, but does not access domestic labour market in the former case. In case of inward FDI, the foreign firm can or cannot access non-unionised labour market, and this also has differential impact on trade union.

The principal attempt of trade union is to maximise wage so that the total wage bills are optimised. We assume a simple possible a utility function of union – a product of wage and employment, where outside option is assumed to be zero. In the country only with unionised sector, the workers do not have any alternative option and alternative in the non-unionised section in other country is kept at zero. We further assume that one unit of labour produces one unit of production in the domestic firm and the union determines wage assuming ‘right-to-manage’ the firm.

Since, the foreign competition directly and indirectly affect the price of the output and union bargaining strength, it would not only have an impact on wage in the absolute terms but also have on redistribution of wage share in relative term. When a firm produces also in the non-unionised sector, it cannot be part of the firm. It is defined as

a ratio of union wage bills to the total value addition (excluding the value addition in the non-unionised sector) of the firm. Given these assumptions we construct our theoretical model.

3.1 *Autarky*

3.1.1 *Country with unionised sector*

Suppose a domestic firm produces a good only in the unionised sector and faces a union in the labour market. We consider that q is the output and w is the union wage to be paid to the union workers. The game is structured as follows: at stage 1 the trade union solves the equilibrium wage and at stage 2, the firm chooses q . It is solved by backward induction method. If the firm faces demand as $P = a - q$, and we can write the profit function of the domestic firm:

$$\pi = (a - q - w)q \quad (1)$$

The firm chooses q and then we get,

$$q = \frac{a - w}{2} \quad (2)$$

The equation (2) suggests that q is inversely related to w and $q = 0$ if $w \geq a$.

At stage 2, the trade union solves equilibrium wage. If the ‘right-to-manage’ the firm is the strategy of trade union and one union worker is assumed to be produced one

unit of output, the utility function of union can be written as: $U = wq = w \frac{a - w}{2}$

Therefore, the equilibrium wage would be

$$w^{AS} = \frac{a}{2} \quad (3)$$

Now substituting (3) into (2), we find

$$q^{AS} = \frac{a}{4} \quad (4)$$

The wage share of the unionised sector can be derived as follows:

$$S^{AS} = \frac{2}{3} \quad (5)$$

Therefore, two-third of value addition in the firm is spent for the union workers.

3.1.2 Country with both unionised and non-unionised sector:

Now, in another country a domestic firm produces a good either in the unionised sector or contract outside. Producing outside, the firm can bypass the union and pay them market determined-wage rate. But definitely, the firm incurs an additional cost of transaction for producing outside and such cost is assumed to be increasing with the rise of outside transaction². This includes wage of non-unionised workers and transaction costs for such contracting. In presence of higher labour supply in developing economy, non-unionised wage is assumed to be constant and, for simplicity; it is zero. We further consider that q and k are productions respectively in unionised and non-unionised sector, w is the wage paid to the union workers and ck is the marginal cost of contracting outside. The game is structured as follows: at stage 1 the trade union solves the equilibrium wage rate in the formal sector and at stage 2, the firm will choose q and k simultaneously. It is solved by backward induction method. If the firm faces demand as $P = a - Q$ where $Q = q + k$, we can write the profit function of the domestic firm:

$$\pi = (a - q - k - w)q + (a - q - k - ck)k \quad (6)$$

The firm chooses q and k simultaneously and then we get,

$$q = \frac{ca - (1 + c)w}{2c} \quad \text{and} \quad k = \frac{w}{2c} \quad (7)$$

² Similar specification is also available in Maiti and Marjit (2008)

The equations suggest that q is inversely related to w and $q = 0$ if $w \geq \frac{ca}{1+c}$. On the other hand, k is positively related to w . If $w = 0$, $k = 0$ and the entire production takes place in the unionised sector. If $0 < w < \frac{ca}{1+c}$, both q and k are positive and if $w \geq \frac{ca}{1+c}$, $q = 0$ and then the entire production is contracted out to the non-unionised sector.

At stage 2, the trade union solves equilibrium wage. The utility function of union can be written as: $U = wq = w \frac{ca - (1+c)w}{2c}$

Therefore, the equilibrium wage would be

$$w^{AB} = \frac{ca}{2(1+c)} \quad (9)$$

Since $w^{AB} < \frac{ca}{1+c}$, both q and k are positive. Moreover, w^b is positively related to the c^3 . This is quite intuitive. If transaction cost for contracting out tends to be higher, the union-sector production goes up and the resultant union wage in the firm must rise.

Now substituting (9) into (7), we find The optimum outputs are

$$q^{AB} = \frac{a}{4}, k^{AB} = \frac{a}{4(1+c)} \quad \text{and} \quad Q^{AB} = \frac{a(2+c)}{4(1+c)} \quad (10)$$

If total wage is divided by value addition, we get the wage share

$$S^{AB} = \frac{2c(1+c)}{(2+c)(2+3c)} \quad (11)$$

Lemma 1: In autarky, $q^{AS} = q^{AB}$, $Q^{AS} < Q^{AB}$

³ $\frac{\partial w^{AB}}{\partial c} = \frac{a}{2(1+c)^2} > 0$

Proof: Comparing (4) and (10), it is confirmed that $q^{AS} = q^{AB}$. Since the firm in the second case has an option to avoid the union workers, some amount of output will be produced in the non-unionised sector. If this is positive, i.e., $k^{AB} = \frac{a}{4(1+c)} > 0$,

Q^{AB} will be always higher than Q^{AS} .

Proposition I (Bi-sourcing Effect): $w^{AS} > w^{AB}$ and $S^{AS} > S^{AB}$

As in the second case, the firm substitutes employment from unionised sector to the non-unionised sector, the bargaining power of workers gets declined and union wage falls. A lower union wage gets attracted the firm to raise production in the unionised sector. In the equilibrium, the employment of union sector in the bi-sourcing case is similar to that without non-unionised sector, but at lower wage, i.e., $w^{AS} > w^{AB}$

Since total production the bi-sourcing case is higher, the price must be lower and union wage also gets declined. In total, the distributive share of trade unions in the firm has been lower than that of earlier, i.e., $S^{AS} > S^{AB}$. This is due to bi-sourcing option of the firm.

3.2 Tariff Reduction

2.2.1 Domestic firm with unionised sector

Now suppose that foreign firm starts importing to the domestic economy and competing with the domestic firm in the output market. Two firms, domestic firm and foreign firm, are engaged in cournot game. Both firms produce same good in unionised sector. The foreign firm needs to pay a tariff rate for each unit of sale. For simplicity, we ignore any other cost except tariff rate.

The model can be structured into two stages game. At first stage, the union determines the wage rate and at last stage simultaneously the domestic firm determine the level of

production. The game can be solved by using backward induction method. Suppose the domestic firm produces q_1 and the foreign firm trades q_2 . The demand function is $P = a - Q$ where $Q = q_1 + q_2$. If w is the wage to be paid to the union workers and cost of transacting production in the non-unionised sector is as in previous case. We can write profit function of the domestic firm as follows:

$$\pi_1 = (a - q_1 - q_2 - w)q_1 \quad (12)$$

Similarly, if t is the tariff rate levied on each unit of the commodity to be imported, the profit function of the foreign firm can be written as:

$$\pi_2 = (a - q_1 - q_2 - t)q_2 \quad (13)$$

Now given w , we shall simultaneously solve q_1, q_2 and find.

$$q_1 = \frac{a + t - 2w}{3} \quad \text{and} \quad q_2 = \frac{a + w - 2t}{3} \quad (14)$$

It suggests that union-sector output of domestic firm depends inversely on union wage and positively on tariff rate. On the other hand, exporting by foreign firm depends positively on union wage and inversely on tariff rate.

Now at this stage, trade union negotiates with the firm and solves the union wage. If

the utility function of trade union is $U = wq_1 = w \frac{(a + t - 2w)}{3}$, we solve

$$w^{TS} = \frac{(a + t)}{4} \quad (15)$$

Since $w^{TS} < \frac{(a + t)}{4}$, $q_1 > 0$. Substituting (15) into (14), we get

$$q_1^{TS} = \frac{a + t}{6}, \quad q_2^{TS} = \frac{5a - 7t}{12} \quad \text{and} \quad Q^{TS} = \frac{7a - 5t}{12} \quad (16)$$

The equilibrium union-sector of the domestic firm depends positively on tariff rate.

Now, substituting all values, we can derive the wage share to the total value addition is as follows:

$$S_I^{TS} = \frac{3}{5} \quad (17)$$

In other words, 60% of total value addition is spent on union workers.

Lemma II: If the foreign firm imports, (i) the prohibitive tariff rate is $t^{TS} = \frac{5a}{7}$ when

domestic firm produces only with union workers, and (ii) if $t < t^{TS}$, $q^{TS} < q^{AS}$

Proof: (i) From (16), we derive a condition that the foreign firm stops importing if

$t^{TS} > \frac{5a}{7}$ and therefore, $t^{TS} \left(= \frac{5a}{7} \right)$ is the prohibitive tariff rate. If the tariff rate faced

by the foreign firm is higher than t^{TS} , the foreign firm stops importing and the domestic firm gets monopoly in the domestic market.

(ii) From (16) we derive that if $t < t^{TS}$, the importing by foreign firm will be always profitable (i.e., $q_2^{TS} > 0$) and total market share will be divided between domestic and foreign firms. Following the cournot competition, output of domestic firm will decline, i.e. $q^{TS} < q^{AS}$.

Proposition II (Competition effect due to tariff cut): In developed countries if $t < t^{TS}$,

then (i) $w^{TS} = w^{TS}(t), w^{TS'} > 0$, (ii) $w^{AS} > w^{TS}$ and $S^{AS} > S^{TS}$

Proof: (i) From (16), we get that the union wage positively depends on tariff rate, i.e., $w^{TS'} > 0$. In other words, if tariff rate is reduced the domestic firm faces more and more competition from foreign imports and as a result, production and employment in the domestic firm gradually falls. The lower employment in the union sector also reduces bargaining power of the union workers and resultant union wage.

(ii) Comparing (3) and (15) we can write that $w^{AS} > w^{TS}$ if $t < t^{TS}$. Intuitively, $t < t^{TS}$, the foreign firm imports and union employment and wage are reduced due to competition effect, as is explained in the above section. Moreover, comparing (5) with

(17) we also find that $S^{AS} > S^{TS}$. The market competition can reduce the price and also union wage, the union wage is reduced at higher rate. This is due to the competition effect.

3.2.2 *Domestic firm with both unionised and non-unionised sector:*

Now suppose that foreign firm starts importing to the domestic economy and competing with the domestic firm in the output market. Two firms, domestic firm and foreign firm, are engaged in Cournot game. The domestic firm has two options of production of same good - either in the unionised sector or non-unionised sector. On the other hand, the foreign firm does not produce and but sells their products in the domestic economy. The foreign firm pays a tariff rate for each unit of sale.

The model can be structured into two stages game. At first stage, the union determines the wage and at last stage simultaneously the domestic firm determine the production level in the unionised sector as well as the foreign firm decides the amount to be imported to the domestic country, and accordingly the firms realise their profits. The game can be solved by using backward induction method. Suppose the domestic firm produces q_1 at the unionised sector and at the non-unionised sector k and the foreign firm trades q_2 . The demand function is $P = a - Q$ where $Q = q_1 + q_2 + k$. If w is the wage to be paid to the union workers and cost of transaction in the non-unionised sector is as in previous case. We write profit function of the domestic firm as follows:

$$\pi_1 = (a - q_1 - q_2 - k - w)q_1 + (a - q_1 - q_2 - k - ck)k \quad (18)$$

Similarly, if t is the tariff rate levied on each unit of the commodity to be imported, the profit function of the foreign firm can be written as:

$$\pi_2 = (a - q_1 - q_2 - k - t)q_2 \quad (19)$$

Now given w , we simultaneously solve q_1, q_2 and k from above two equations and find.

$$q_1 = \frac{2c(a+t) - (3+4c)w}{6c}, \quad q_2 = \frac{a+w-2t}{3} \text{ and } k = \frac{w}{2c} \quad (20)$$

It suggests that union-sector output of domestic firm depends inversely on union wage and positively on tariff rate. The production in the non-unionised sector by the domestic firm is positively influenced by union wage and negatively by its cost parameter. Eq. (20) shows that $q_1 > 0$ if $w < \frac{2c(a+t)}{(3+4c)}$. On the other hand, foreign

firm's import depends positively on union wage and inversely on tariff rate. It is important to note that foreign import does not directly depend on cost of contracting out and the production in non-unionised sector does not directly depend on tariff rate.

Now at this stage, trade union negotiates with the firm and solves the union wage. If the utility function of trade union is $U = wq_1$, we solve

$$\max_w w \frac{2c(a+t) - (3+4c)w}{6c}, \text{ then}$$

$$w^{TB} = \frac{c(a+t)}{3+4c} \quad (21)$$

Since $w^{TB} < \frac{2c(a+t)}{(3+4c)}$, $q_1^{TB} > 0$. Substituting (21) into (20), we get

$$q_1^{TB} = \frac{a+t}{6}, \quad q_2^{TB} = \frac{(3+5c)a - (6+7c)t}{3(3+4c)}, \quad k^{TB} = \frac{a+t}{2(3+4c)}, \quad Q^{TB} = \frac{(6+7c)a - (3+5c)t}{3(3+4c)} \quad (22)$$

The equilibrium employment in the unionised sector and non-unionised sector depends positively on tariff rate. Now, substituting all values from previous results, we derive the wage share to the total value addition as follows:

$$S^{TB} = \frac{c(3+4c)}{2(3+5c)(3+2c)} \quad (23)$$

Comparing results we can now write followings:

Lemma III: If the foreign firm imports and compete with the domestic firm who has

bi-sourcing options, (i), the prohibitive tariff rate is $t^{TB} = \frac{(3+5c)a}{(6+7c)}$, and (ii) if $t < t^{TB}$,

$$q_1^{TB} = q_1^{TS}, \quad q_2^{TB} < q_2^{TS} \text{ and } Q^{TB} > Q^{TS}.$$

Proof: From (23), this expression indicates that $q_1^{TB} > 0$ if $t^{TB} = \frac{(3+5c)a}{(6+7c)}$. This is the

prohibitive tariff. If the tariff rate imposed on foreign output is higher than this critical tariff, the domestic firm gets monopoly in the domestic market. Comparing this level with t^{TS} , we find that $t^{TS} > t^{TB}$. The reason is as follows: When the foreign firm starts importing and compete with the domestic firm, the total production in the domestic economy goes up than the earlier case. Because the domestic firm in the case produces in the non-unionised sector and this higher production reduces the final price and the profit of the foreign firm has been relatively lower than that of earlier. As a result, the prohibitive tariff rate in this case is lower.

(ii) Comparing (17) with (23), we get and $q_1^{TB} = q_1^{TS}$, $q_2^{TB} < q_2^{TS}$ $Q^{TB} > Q^{TS}$ if $t < t^{TB}$.

Since the domestic firm has option to produce in the non-unionised sector, the output in the unionised sector would not change and production of the firm in the non-unionised sector will consume a share of foreign firm. As a result, the foreign output would decline.

Proposition III (Competition Effect due to tariff cut and bi-sourcing effect): In the developing country, if $t < t^{TB}$ (i) $w^{TS} = w^{TS}(t)$, $w^{TS'} > 0$, (ii) $w^{AS} > w^{TS} > w^{TB}$ and $S^{AS} > S^{TS} > S^{TB}$.

Proof: (i) From (22), we get that $w^{TS} = w^{TS}(t)$ and taking partial derivative with respect to t it is $w^{TS'} > 0$.

(ii) Comparing (22) with (16) and also with proposition II(ii), we can write that $w^{AS} > w^{TS} > w^{TB}$. And also comparing (24) with (18) and (5), we find that $S^{AS} > S^{TS} > S^{TB}$. The basic intuition is as follows: Following proposition II, if the foreign firm starts importing to the domestic economy, due to a decline in tariff rate, the union wage share of the domestic firm would declines from S^{AS} to S^{TS} . Having bi-sourcing options, the domestic firm has been able to reduce employment in the unionised sector and raises employment in the non-unionised sector. This depresses the union wage and its wage shares in the domestic firm. This is due to a combination effect of competition and firm's bi-sourcing options.

3.3 Inward FDI

2.3.1 Both firms with unionised sector

Now suppose that the foreign firm has decided to produce similar goods in the domestic economy and is engaged in cournot competition with the domestic firm. The both firms face same economic condition in the country. Both firms interact with the trade unions for wage determination. Suppose the domestic and foreign firms respectively produce q_1 and q_2 at the unionised sector. The demand function is $P = a - Q$ where $Q = q_1 + q_2$. Let us assume that w_1, w_2 are the firm-specific wage

rates to be paid by the respective domestic and foreign firms to the union workers. We can write profit functions of the domestic and foreign firms respectively as follows:

$$\pi_1 = (a - q_1 - q_2 - w_1)q_1 \quad (24)$$

$$\pi_2 = (a - q_1 - q_2 - w_2)q_2 \quad (25)$$

Now given w_1 and w_2 , we simultaneously solve q_1, q_2 and k from above two equations.

$$q_1 = \frac{a + w_2 - 2w_1}{3} \quad \text{and} \quad q_2 = \frac{a + w_1 - 2w_2}{3} \quad (26)$$

The expressions (26) suggest that the employment of union workers in both firms is inversely related to its own union wage and positively related to union wage of the rival firm.

If a foreign firm starts competing with the domestic firm the trade unions in the firms may act centrally or decentrally negotiate to solve their wages.

Centralised Union:

The centralised union determines wage rate for both firms, i.e., $w_1 = w_2 = w$. Then the

total employment in both the firms is $Q = \frac{2(a - w)}{3}$. If the utility function of the

centralised trade union is $U = wQ = w \frac{2(a - w)}{3}$, we solve

$$w^{FBUC} = \frac{a}{2} \quad (27)$$

Substituting (27) into (26), we get

$$q_1^{FBUC} = q_2^{FBUC} = \frac{a}{6} \quad \text{and} \quad Q^{FBUC} = \frac{a}{3} \quad (28)$$

The wage share to value addition in the domestic firm can be derived as follows:

$$S_1^{FBUC} = \frac{3}{4} \quad (29)$$

Decentralised Union:

Now, if the trade unions in the respective firms act decentrally we can derive equilibrium wage separately for two firms. The utility functions of trade union in the domestic and foreign firm respectively are written as: $U_1 = w_1 q_1$ and $U_2 = w_2 q_2$. Solving wage simultaneously from these functions, we get equilibrium wages respectively in the domestic and foreign firms are as follows:

$$w_1^{FBUD} = w_2^{FBUD} = \frac{a}{3} \quad (30)$$

Substituting (30) into (26) we find that

$$q_1^{FBUD} = q_2^{FBUD} = \frac{2a}{9} \quad \text{and} \quad Q^{FBUD} = \frac{4a}{9} \quad (31)$$

Now, the wage share to in-house value addition in the domestic firm can be written as follows:

$$S_I^{FBUD} = \frac{3}{5} \quad (32)$$

Lemma IV: $q_i^{FBDC} < q_i^{FBUD} < q^{AS}$ and $Q^{FBUD} > Q^{FBDC} > q^{AS}$

Comparing (31) with (24) and (4) we find that $q_i^{FBDC} < q_i^{FBUD} < q^{AS}$ and $Q^{FBUD} > Q^{FBDC} > q^{AS}$. Because of the competition effect the total output and employment in the economy, irrespective of the form of unions, must be higher than that of autarky, but the individual output would be lower. Moreover, total output and employment in the presence of centralised union would be higher than that in the presence of decentralised unions, but it is opposite in case of individual outputs.

Proposition IV (Effect of competition and Union): (i) $w^{AS} = w^{FBUC} > w^{FBUD}$, (ii)

$$S^{FBUD} < S^{AS} < S^{FBUC}$$

Proof: (i) Comparing (30) with (3) and (27), we get that $w^{AS} = w^{FBUC} > w^{FBUD}$.

Since union workers determine a centralised wage and do not allow the wage to fall.

Hence, we get that $w^{AS} = w^{FBUC}$. When unions determine their firm-specific wages decentrally, the resultant bargaining power of a particular union and wage must be lower than that in case of centralised union, i.e., $w^{FBUC} > w^{FBUD}$.

(ii) Comparing (32) with (5) and (29), we find that $S^{FBUD} < S^{AS} < S^{FBUC}$. In the presence of the centralised union, the union wage is kept at the level of monopoly union. Since after reform because of competition, the market price gets lower the resultant wage share tends to be lower.

On the other hand, in case of decentralised union, the union wage and employment cannot be power to push up the wage to the level in case of centralised union, the resultant wage share gets lower because of competition both in the production market and labour market.

3.3.2 *Only Domestic firm with bi-sourcing*

Now suppose that the foreign firm has decided to produce similar goods in the domestic economy and is engaged in cournot competition with the domestic firm. The both firms face same economic condition in the country, but the foreign firm does not have access to subcontracting. The both firms interact with the trade unions for wage determination and the domestic firm can produce in the non-unionised sector.

Suppose the domestic firm respectively produces q_1 and k in unionised and non-unionised sector and the foreign firm produces q_2 in the unionised sector. The demand function is $P = a - Q$ where $Q = q_1 + q_2 + k$. Let us assume that w_1, w_2 are the firm-specific wages to be paid by the respective firms to the union workers. We can write profit functions of the domestic and foreign firms respectively as follows:

$$\pi_1 = (a - q_1 - q_2 - k - w_1)q_1 + (a - q_1 - q_2 - k - ck)k \quad (33)$$

$$\pi_2 = (a - q_1 - q_2 - k - w_2)q_2 \quad (34)$$

Now given w_1 and w_2 , we simultaneously solve q_1, q_2 and k from above two equations.

$$q_1 = \frac{2c(a + w_2) - (3 + 4c)w_1}{6c}, \quad q_2 = \frac{a + w_1 - 2w_2}{3} \quad \text{and} \quad k = \frac{w_1}{2c} \quad (35)$$

The expressions (22) and (23) suggest that the union employment of both firms is inversely related to its own union wage and positively related to union wage of the rival firm. The employment in the non-unionised sector of domestic firm depends positively on own union wage and does not directly depend on union wage of rival firm.

If a foreign firm starts competing with the domestic firm the trade unions in the firms may act centrally or decentrally negotiate to solve their wages.

Centralised Union:

The centralised union determines wage rate for both firms, i.e., $w_1 = w_2 = w$. Then the total in-house employment in both the firms is $q = \frac{4ca - (3 + 4c)w}{6c}$. If the utility

function of the centralised trade union is $U = w(q_1 + q_2)$, we solve

$$\max_w w \frac{4ca - (3 + 4c)w}{6c}$$

$$w^{FDUC} = \frac{2ca}{3 + 4c} \quad (36)$$

Substituting (36) into (35), we get

$$q_1^{FDUC} = \frac{2ca}{3(3 + 4c)}, \quad q_2^{FDUC} = \frac{a(3 + 2c)}{3(3 + 4c)}, \quad k^{FDUC} = \frac{a}{(3 + 4c)} \quad \text{and} \quad Q^{FDUC} = \frac{2a(3 + 2c)}{3(3 + 4c)} \quad (37)$$

It is noteworthy to mention that, in presence of centralised union, $q_1^{FDUC} < q_2^{FDUC}$ and $q_1^{FDUC} + k^{FDUC} = q_2^{FDUC}$. Since the centralised union determines an equilibrium wage,

both firms accept it, irrespective of their level of employments. As a result, the total

employment, including in the non-unionised sector, by the domestic firm must be exactly equal to that of the foreign firm. As the foreign firm can not access non-unionised sector, the in-house output of the domestic firm must be lower than that of the foreign firm.

The union wage share to value addition of the domestic firm can be derived as follows:

$$S^{FDUC} = \frac{12c^2}{(3+8c)(3+2c)} \quad (38)$$

Decentralised Union:

Now, if the trade unions in the respective firms act decentrally we can derive equilibrium wage separately for two firms. The utility functions of trade union in the domestic and foreign firm respectively are written as: $U_1 = w_1q_1$ and $U_2 = w_2q_2$. Solving wage simultaneously from these functions, we get equilibrium wages respectively in the domestic and foreign firms are as follows:

$$w_1^{FDUD} = \frac{5ca}{3(4+5c)} \text{ and } w_2^{FDUD} = \frac{a(3+5c)}{3(4+5c)} \quad (39)$$

Substituting (39) into (35), we find that

$$q_1^{FDUD} = \frac{5a(3+4c)}{18(4+5c)}, q_2^{FDUD} = \frac{2a(3+5c)}{9(4+5c)}, k^{FDUD} = \frac{5a}{6(4+5c)}, Q^{FDUD} = \frac{a(21+20c)}{9(4+5c)} \quad (40)$$

In the presence of decentralised trade union, the domestic firm captures a relatively larger market share, putting pressure on union wage, by contracting out. So, comparing output of firms, we get $q_1^{FDUD} > q_2^{FDUD}$.

Similarly, the wage share to the total value addition in the firm can be written as follows:

$$S^{FDUD} = \frac{3c(3+4c)}{2(3+5c)(3+2c)} \quad (41)$$

Lemma V: (i) $q^{AB} > q_1^{FDUD} > q_1^{FDUC}$, $k^{AB} < k^{FDUC} < k^{FDUD}$ and $Q_1^{FDUD} > Q_1^{FDUC} > q^{AB}$

Proof: Comparing (40) with (10) and also (37), we find that $q^{AB} > q_1^{FDUD} > q_1^{FDUC}$, $k^{AB} < k^{FDUC} < k^{FDUD}$ and $Q_1^{FDUD} > Q_1^{FDUC} > q^{AB}$. Intuitive explanation is as follows:

When foreign firm enters in the domestic market for production, output produced by an individual firm declines but the total output increases both in the presence of centralised and decentralised unions, due to competition effect. If we compare the cases between the centralised and decentralised unions, individual output in case of former is lower than that of later. Because, the union has also greater bargaining power than that in the former. As a result, the domestic firm wants to produce more in the non-unionised sector to bypass the centralised union in the unionised sector.

Proposition V (Competition, partial bi-sourcing and union effect): (i) $w_2^{FDUD} > w_1^{FDUD}$

(ii) $w^{FBUC} > w^{AB} > w_1^{FDUD}$, (iii) $S^{AB} \begin{matrix} \leq \\ > \end{matrix} S^{FBUC}$, $S^{FBUD} < S^{AB}$ and $S^{FBUD} < S^{FBUC}$

Proof: (i) Comparing two wages in (39), we find that wages in the foreign firm is much higher than that in domestic firm (i.e., $w_2^{FDUD} > w_1^{FDUD}$). Because the domestic firm can bypass trade union to some extent by producing in the non-unionised sector but the foreign firm cannot. As a result, the domestic firm creates a pressure to depress the union wage.

(ii) Comparing also between (9), (36) and (39) we find that $w^{FBUC} > w^{AB} > w_1^{FDUD}$.

Since the centralised union determine in the former case, the union wage must be higher than that of decentralised because the total employment in the former always be higher than that of individual firm in the later case. It implies that the wage of the centralised union, when the foreign starts competing with domestic firm at the domestic economy employing in the unionised sector, is higher than that of autarky.

In other word, since both the firm compete each other, total employment in the unionised sector is increased and as a result the wage gets higher than that of the earlier.

(iii) Comparing (11), (38) and (41) we get that $S^{AB} \begin{matrix} \leq \\ > \end{matrix} S^{FBUC}$, $S^{FBUD} < S^{AB}$ and

$S^{FBUD} < S^{FBUC}$. In other words, although union wage in the presence of centralised union is higher, the union wage share of the domestic firm may not be higher than that of autarky. Because, higher employment in this case would produce higher output and thus depress market price.

On the other hand, the union wage share in the presence of decentralised unions must be lower than that in the presence of centralised union and also that of autarky.

3.4.3 Both firms with bi-sourcing

Now suppose that both firms produce the same goods in the domestic economy and are engaged in cournot competition. The both firms face has same economic condition in the country and can either produce in the unionised or non-unionised sector. The model can be structured into two stages game. At the first stage, the unions determine the firm specific wages and then simultaneously the domestic and foreign firm determine the level of productions and resultant employment in two sectors. Accordingly the firms realise their profits. The games can be solved using backward induction method. Suppose the domestic firm respectively produces q_1 and k_1 in the unionised and non-unionised sector and similarly the foreign firm produces q_2 and k_2 in the unionised and non-unionised sector. The demand function is $P = a - Q$ where $Q = q_1 + q_2 + k_1 + k_2$. Let us assume that w_1, w_2 are the firm-specific union wages to be paid by the respective domestic and foreign firms. Let us also assume that ck_i is the

cost per unit of outsourcing by the i -th firms (where $i=1, 2$), we can write profit functions of the firm as follows:

$$\pi_1 = (a - q_1 - q_2 - k_1 - k_2 - w_1)q_1 + (a - q_1 - q_2 - k_1 - k_2 - ck_1)k_1 \quad (42)$$

$$\pi_2 = (a - q_1 - q_2 - k_1 - k_2 - w_2)q_2 + (a - q_1 - q_2 - k_1 - k_2 - ck_2)k_2 \quad (43)$$

Given w_1 and w_2 , we get

$$q_1 = \frac{2ca + 2cw_2 - (3 + 4c)w_1}{6c}, \quad q_2 = \frac{2ca + 2cw_1 - (3 + 4c)w_2}{6c}, \quad k_1 = \frac{w_1}{2c} \text{ and } k_2 = \frac{w_2}{2c} \quad (44)$$

Similar to the previous case, the expressions (44) suggest that the employment in unionised sector is inversely related to its own union wage and positively related to union wage of the rival firm. The employment in the non-unionised sector depends positively on own union wage and does not directly depend on union wage of rival firm. As is earlier cases, wages can be solved either in centrally or in decentrally by trade unions in the respective firms.

Centralised Union:

At first, we assume that trade union works centrally where $w_1 = w_2 = w$. Total employment is the sum of two individual employment $q = q_1 + q_2$,

$$\text{then } q = \frac{2ca - (3 + 2c)w}{3c}$$

The objective function of central trade union can be written as follows:

$$\begin{aligned} \text{Max}_w w \frac{2ca - (3 + 2c)w}{3c} \\ w^{FBNC} = \frac{ca}{(3 + 2c)} \end{aligned} \quad (45)$$

From the above expression, we can write $w^{FBNC} > 0$ if $c > 0$.

Putting the (45) into (44), we find

$$q_1^{FBNC} = q_2^{FBNC} = \frac{a}{6}, k_1^{FBNC} = k_2^{FBNC} = \frac{a}{2(3+2c)} \text{ and } Q^{FBNC} = \frac{2a(3+c)}{3(3+2c)} \quad (46)$$

The union employment is exactly equal to that of domestic firm in the previous case.

We also find that $q^{FDUD} > q^{FDUC} = q^{FBNC}$.

$$S^{EBNC} = \frac{3c(3+2c)}{2(3+4c)(3+c)} \quad (47)$$

Comparing (45) with (9) we also get $S^{AB} < S^{FBNC}$ if $c > 1/2$.

Decentralised Union:

If we assume that one unit of labour is required to produce one unit of output in both the firms, the utility functions of trade unions are respectively $U_i = w_i q_i$ where $i = 1, 2$.

The firm specific trade unions will solve wage rates from following functions:

$$U_1 = w_1 \frac{2ca + 2cw_2 - (3+4c)w_1}{6c} \text{ and } U_2 = w_2 \frac{2ca + 2cw_1 - (3+4c)w_2}{6c}$$

From above two equations, we get

$$w_1 = \frac{c(a+w_2)}{3+4c} \text{ and } w_2 = \frac{c(a+w_1)}{3+4c} \quad (48)$$

Given same conditions the equilibrium wage rates will be equation. Then, we get

$$w^{FBND} = w_1^{FBND} = w_2^{FBND} = \frac{ca}{3(1+c)} \quad (49)$$

Substituting (53) into (39) – (42), we get

$$q_1^{FBND} = q_2^{FBND} = \frac{(3+4c)a}{18(1+c)}, k_1^{FBND} = k_2^{FBND} = \frac{a}{6(1+c)} \text{ and } k^{FBND} = \frac{a(3+2c)}{9(1+c)} \quad (50)$$

The union wage share respectively to the total value addition in the domestic firm can be written:

$$S^{FBND} = \frac{3c(3+4c)}{2(3+5c)(3+2c)} \quad (51)$$

Lemma VI: (i) $q_1^{FBND} > q_1^{FBNC} > q^{AB}$ (ii) $Q_1^{FBND} < Q_1^{FBNC} < Q^{AB}$

Proposition VI (Competition, Bi-sourcing and Union effect): (i) $w^{AB} > w_1^{FBNC} > w_1^{FBND}$

(ii) $w_1^{FDUC} > w^{AB} > w_1^{FBNC}$ (iii) $w^{AB} > w_1^{FDUD} > w_1^{FBND}$ (iv) $S^{AB} > S^{FBNC}$ if $c < 1/2$ and $S^{AB} > S^{FBND}$

Proof: (i) Comparing (9) with (45) and (48) we get that $w^{AB} > w_1^{FBNC} > w_1^{FBND}$. If the foreign firm enters and both firms can produce in the non-unionised section, the union wage declines even in the presence of centralised union. The centralised union cannot out weight the downward pressure due to competition and bi-sourcing factor. The wage get further declined in the presence of decentralised union because unions compete with each other.

(ii) Comparing (9) with (36) and (45), we get that $w_1^{FDUC} > w^{AB} > w_1^{FBNC}$. In other words, the centralised union can raise the wage than that of autarky if only the domestic firm has a choice of bi-sourcing. But, this is not possible for the centralised union when the form firm can produce in the non-unionised sector.

(iii) Comparing (9) with (39) and (49) we get that $w^{AB} > w_1^{FDUD} > w_1^{FBND}$. In the presence of decentralised union the union wage declines when only the domestic firm has bi-sourcing options and further declines when both firms have bi-sourcing options.

(iv) Comparing (47) with (10) we get that $S^{AB} > S^{FBNC}$ if $c < 1/2$. In other ward, the wage share would decline even in the presence of centralised union when both firms have bi-sourcing option. Again comparing (51) with (10) we get that $S^{AB} > S^{FBND}$. In the presence of decentralised union, the share would always be lower than that of autarky because of competition in production market and union and also bi-sourcing effects.

4. Empirical Section

The theoretical results predict that the competition has direct and indirect impact on union wage and its share. But the impact would obviously depend on the degree of adjustments in the labour market. The study wants to see the example of Indian economy for empirical verification because of its increasing trade flows and existence of dual labour markets. At the outset, we should submit that it is really difficult to prove each every aspect of the theory for Indian context because of lack of requisite information. It would have been always better to use industry level data, but we do not have information on the output or employment in the non-unionised sector at that level. This forces us to run the regression at the state level.

India captures more than 90% workforce in the non-unionised sector (mainly in the informal sector). A significant number research has shown a rising trend of the sector in the Indian economy, but the impact of trade reform on union wage and distributive labour share is rarely discussed in the literature. To do this, we, at first, look at the pace of openness of Indian economy and its direct and indirect impact on formal labour market. Then an econometric model is constructed to establish the relationship.

4.1 Trade Openness of India

India started liberalising her economy vigorously from early 1990s. During the Post-1991 period India shifted from the regime of trade protection to that of liberalisation. Figure 1 depicts how the average tariff rate has changed since 1980. The rate shows an upward rising trend in the early-1980s upto 1985 and then it sharply declines. The tariff rates were very high pre-1991 reaching its highest at 100% in the year 1985 and declined gradually thereafter. A sharp decline in the tariff rates has been observed from 79.2% in 1991 to 12.5% in 2006. Another important indicator of the trade

openness of a country is the FDI inflow into the country. Pre 1991 FDI inflow figures are not at all encouraging. But post 1991 the FDI inflow started increasing while the recent times has seen a huge influx of funds on account of FDI with a slump in 2002 but in started picking up in 2004. It was near to US\$ 0.07 (billions) during 1980-1990 and then start rising and has reached at US\$ 20.3 (billions).

4.2 Dual labour market

The Indian labour market exhibits a duality in its operation. Two parallel sectors- unionised and non-unionised sector – work together in the economy. The unionised sector comprises mainly of the registered enterprises while the latter consists mainly of the unregistered enterprises. The unregistered enterprises can escape the regulations imposed on their registered counterparts. It hires labourers at a much lower rate and gives neither social security nor job security. The outputs produced in the non-unionised/unregistered sector, at 1999-2000 prices, has gone up from Rs. 88740 crores in 1980 to Rs. 393842 crores in 2005. The non-unionised output has increased from Rs 44.5 (lakhs) in 1980 to Rs. 89.7 (lakhs) in 2006 (Figure 2).

On the other hand, the total employment in the industrial sector has not improved much and it has shown several ups and downs in the trend of employment during 1980-2005. Initially the employment has increased from 60.66 lakhs in 1980 to 76.32 lakhs in 1995, and then has gone down to 71.36 lakhs in 2005 2007. The number of union workers has declined from 63 in 1980 to 51 in 2005 (Table 2). This clearly indicates that average firm size in terms of union workers has declined. The employment figures are available in Indian manufacturing sector by types of workers, regular and contract, from 1998 and the figures also shows that contract labours in the sector is rising both in absolute numbers and percentage terms (Maiti, 2009). Another

interesting issue is that real annual wage has increased from Rs. 34226 in 1980 to Rs. 50110 in 1995 and then declined to Rs. 41680. Moreover, other benefits in real terms also have increased from Rs. 8704 in 1980 to Rs. 17457 in 1995 and then declined to Rs. 16149. The share of union wage, measured as percentage of gross value addition (GVA), has drastically come down from 28.0% in 1980 to 10.3% in 2005 (Table 2). The same, measured as a percentage of net value addition, has also declined on similar fashion from 33.6% in 1980 to 12.1% in 2005. It is true in all the major states in India for the same period (Figure 6)

4.3 Forms and Functioning of Labour Market Institution:

As is discussed in the first section, a few possible explanations were given in the literature behind the slow employment growth in the manufacturing sector. One important factor goes against Indian labour legislation. The Industrial Dispute Act, 1947, has played a central role in this regard and has placed labour issues in the hands of state governments, resulting in significant variation in labour regulations and/or their enforcement across Indian states. Most pro-reform policymakers and analysts believe that India's labour laws have made labour markets in the formal (or organised) manufacturing sector rigid in the sense of placing serious constraints on the ability of firms to hire and fire workers (Besley and Burgess, 2004 and Hasan, et al., 2007). Besley and Burgess (2004) has indentified the forms of labour legislation – pro-workers, neutral and pro-employer – looking at the direction its ammendment by the state governments.

Although pro-labour legislation has been considered an essential instrument in providing power to the labour market institution, this may not be reflected on functioning of the union. A rise in liberalisation is likely to have subsequent effect on

the strength of trade unions. We consider namely the number of strikes, to report bargaining strength of labour market institution. Number of strikes show an entirely declining trend for most of the States and it drops from 1459 in 1990 to 210 in 2007 in India as a whole. Two important trends can be noticed from the state-wise figures of strikes in India 1980-2007 (Figure 3) and in all major states (Figure 4). It sharply declines for all the major states and converges between during this period. West Bengal - the state famously known for labour rigid state – also account for a declining trend and actually below most of the above states in recent years. Andhra Pradesh has a kind of unsettling graph but even it shows a decreasing trend after 2002-2003. Number of lockouts is also declining during this period (Figure 3 and Figure 5). Moreover, the share of contract workers in the union sector on flexible basis has increased in all the states during 1999-2005 (Fig 7). It reveals that bargaining power of union is declining over the years.

4.3 Empirical Framework

A standard benchmark model with one production factor labour is widely used in the literature (see Blanchard, 2005). It is built around two crucial equations - first being a wage-setting relation and the second a price-setting relation. At first, Hall (1988) showed that the residual growth must be influenced by imperfect competition in the product market and offer a methodology to incorporate Lerner index in the estimation. In the subsequent year, Abraham et al. (2009) offer a method to estimate the price cost margin without observing prices and marginal costs directly. Here in this study, we employ the similar framework to show how mark-up and bargaining power of the workers can be estimated using production function approach. Let us consider a production function where value added Q_{ijt} of firm i in j -th region and year t is produced using two inputs, namely labor L and capital K :

$$Q_{it} = A_{it}F(L_{ijt}, K_{ijt}) \quad (21)$$

If the production function is homogeneous of degree $1 + \lambda$ for all input factors, the returns to scale would be $1 + \lambda$. It would then exhibit respectively decreasing ($\lambda < 0$), constant ($\lambda = 0$) or increasing ($\lambda > 0$) returns to scale. By taking a total differential of (29) and logarithmic values we get:

$$(q_{ijt} - k_{ijt}) = \varepsilon_{L,ijt}(l_{it} - k_{ijt}) + \lambda_{ijt}k_{ijt} + a_{ijt} \quad (22)$$

We assume that ε_X is elasticity of output with respect to input X and it can be represented in terms of degree of market competition. If $\mu_{ijt} = P_{ijt}/MC_{ijt}$ or mark-up on the top of marginal cost for one unit of production and $s_{X,ijt}$ is the cost share of X input, the input elasticity is underestimated with the cost share by the degree of market imperfection, i.e., $\varepsilon_{X,ijt} = \mu_{X,ijt}s_{X,ijt}$ and $\sum_X \varepsilon_{X,ijt} = 1 + \lambda$. Using this specification, one can easily replace the price information by market power. Then substituting these into (22), we get

$$SR_{ijt} = \beta_{ijt}LER_{ijt} + \frac{\lambda}{\mu_{ijt}}k_{ijt} + (1 - \beta_{ijt})a_{ijt} \quad (23)$$

Where $SR_{ijt} = (q_{it} - k_{it}) - a_{L,ijt}(l_{ijt} - k_{ijt})$. $\beta_{ijt} = (p_{ijt} - MC_{ijt})/P_{ijt} = 1 - (1/\mu_{ijt})$ is the Lerner index. The expression (23) clearly suggests that total factor productivity measured in terms of factor shares (i.e., SR) depends on imperfect competition in the product market (i.e., LER).

Up to this point we have not yet considered imperfection in the labour market. If in the labour market, trade union determines the wage it must be higher than the competitive one. Let us assume that \bar{L} is the total workers available in the economy, w_0 is the alternative wage for workers outside the firm and θ is the bargaining power

of the union, the union wage can be derived from the following Nash bargaining solution,

$$\max_{w,L} \Omega = (L_{ijt} w_{ijt} + (\bar{L} - L_{ijt}) w_{a,ijt} - \bar{L} w_{a,ijt})^{\theta_{ijt}} (P_{ijt} Q_{ijt} - w_{ijt} L_{ijt})^{(1-\theta_{ijt})} \quad (24)$$

Solving (24) with respect to w and L , we can derive

$$\varepsilon_{L,ijt} = \mu_{ijt} a_{L,ijt} + \mu_{ijt} (a_{L,ijt} - 1) \theta_{ijt} / (1 - \theta_{ijt}) \quad (25)$$

Combining (23) and (25), we find that

$$SR_{ijt} = \beta_{ijt} LER_{ijt} + \frac{\lambda}{\mu_{ijt}} k_{ijt} + \frac{\theta_{ijt}}{1 - \theta_{ijt}} BAR_{ijt} + (1 - \beta_{ijt}) a_{ijt} + \omega_{ijt} \quad (26)$$

Where, $BAR_{ijt} = (\alpha_{L,ijt} - 1)(l_{ijt} - k_{ijt})$. The expression (26) is our basic equation to be used in the further analysis and allows us to estimate price cost margins and bargaining power simultaneously without having information on market price and the alternative wage. ω_{ijt} is random disturbance term. We define that the modified total factor productivity will be free from all market imperfections.

4.4 Data Description

Before going to specify the econometric method to be used in the analysis, we need to describe the available database for the study. We gather information of two digit industries for fifteen major states and for seven years from 1998-2005. Further disaggregate information for each variables of our interest are not available till date. Three digit industries are treated as firms in the studies. Altogether total observations in the study are approximately 4536. This information has been collected from Annual Survey of Industries, Government of India. The database includes capital stocks, investments, factor uses, outputs and types of workers. It is noteworthy to mention that a major change of industrial classification took place in 1998 onward. It is really difficult to find perfectly matching the classifications at the three digit level with previous classification. Moreover, some variables like contract workers and

share of entrepreneurs/managers is available at the three-digit level from 1998 onward.

We derive import and export figures from the trade and industrial output data of the World Bank Trade Data-base (World Bank 2006). This data-base provides the data at the ISIC 3 digit level of classification, and we match the data to the NIC 3 digit classification of the Annual Survey of Industries. Thus, our import and export variables vary across industries and over time (but not across states). Import and export figures are first multiplied by the exchange rate and then deflated by WPI to derive at constant price.

4.5 Econometric Method

We initially run pooled and fixed effect panel regressions to estimate the parameters those in (34), but they are often criticised on two specific grounds: (i) selection bias and (ii) endogeneity problem. Second, firms usually observe a part of TFP before hand and hence adjust the factor of production and employment accordingly. This gives rise to the problem of simultaneity as this gives rise to correlation between the residual term and the variable factor inputs, thus violating the basic requirement of Ordinary Least Square method. At first, Olley and Pakes (1996) raised these issues and offered alternative method of estimation. Then Levinshion and Petrin (2003) revised this further. Olley Pakes (1996) developed a consistent semi-parametric estimator to fix the problem where they used firm level investment decision to proxy unobserved productivity shocks. Though Olley-Pakes approach (thereafter OP) has the clear advantage of ease of implementation it also has a potential drawback in the cases where firms report zero investment. Due to the invertibility condition investment proxy is valid only for non- zero investment. Pronounced adjustment costs force most firms in developing countries like India, Turkey, Columbia, Mexico and

Indonesia to report zero investment costs. Levinsohn-Petrin method (thereafter LP) argues that intermediate inputs also adjust to productivity shocks and are more flexible than investment. In addition, the advantage of non-zero level of intermediate inputs also might add to the cause. Firms generally do not report zero level of intermediate input usage. A way out of this problem was suggested by Levinsohn and Petrin (2003). They suggested the use of intermediate inputs as a substitute of investment.

In this study, we apply both methodologies for robustness checking. Since our database includes three digits industry information, we create dummy for those whose profit are negative or zero in order to run OP method. Moreover, we consider gross fixed capital formation in OP regressions. On the other hand, both material and fuel cost as proxies in LP regressions for unobserved factor.

4.1. *Mark-up, Bargaining power and TFP*

At first, *SR*, *LER* and *BAR* described in (26) have been estimated where *SR* is nothing but the usual TFP (i.e., Solow residual). This is usual method of estimating productivity growth – the residual over and above the factor costs. We run the model described in (26) using OP and LP methods and results are reported in Table 2. In both regressions, the coefficient of *LER* after controlling bargaining power has been positive and statistically significant. From this estimated value, we derive the degree of mark-up (μ), i.e., price over marginal cost. It can be seen that the mark-up in Indian manufacturing is, on average, in between 2-3 while it accounts for 2.128 and 3.205 in OP and LP regressions respectively. Two estimates are relatively unbiased and hence we can confer that the price of final goods in Indian organised manufacturing sector tends to be 2 to 3 times higher than their marginal cost of production.

The coefficient of *BAR* indicates the degree of bargaining power of labour union in the organised manufacturing after controlling degree of mark-up and it is negative and statistically significant in all regressions. Then, one would infer that productivity (i.e., Solow residual) declines for a rise in bargaining variable. From the estimated values, we derive the bargaining power of union and it registers almost 0.50 in all regressions. Therefore, we can conclude that the workers in Indian organised manufacturing sector are unionised and almost equally powerful as employer.

In the next table, we attempt to see the effect of casualisation/ informalisation on union bargaining power (Table 4). At first, an interaction term of contract workers with bargaining variable is considered after controlling the reform variables. The columns (2) and (5) suggest that the interaction terms are positive and statistically significant. It indicates that the bargaining power has declined during the study period for the rise of casual employment. We further consider an interaction term of import and contract workers with the bargaining term and the results are same (column (3) and (6)). Often it is argued that the reform in both export and import sector affects the product and labour market differently and after controlling the export and import with lerner and bargaining variables still we find that the interaction term of contract workers with bargaining variable is statistically significant and positive. Therefore, we can confirm that the foreign competition forces the domestic firm to use of more contract workers and that further acts as a depressing factor of union bargaining.

5. Concluding remarks

Within a larger perspective of the debate on labour market reform, this paper attempts to see the effect of foreign competition, due to trade reform, on union wage and its distributive share. First, we construct a theoretical model where a domestic firm

produces a good with or without accessing non-unionised sector in the autarky. This is compared with cases of simple Cournot game between domestic and foreign firms in response to the policies of trade reform under different combination of the types of labour market and union. We find that even in the autarky if a firm accesses non-unionised sector, the union wage and its share must decline. If the foreign firm produces outside and imports to the domestic country, the union wage and its share must fall. On the other hand, if the foreign firm produces and accesses the domestic labour markets, the union wage and share unambiguously decline in the presence of decentralised unions both in the developed and developing countries. But, in the presence of centralised union, the union wage and its share would go up in the developing countries and would fall in the developing economies if both firms have free choice over the types of labour markets and a lower cost of market transaction in the non-unionised sector.

India is the greatest example of dual labour market and is also an excellent laboratory to examine the effect of trade reform on labour market. We argue that even within the existing legislative framework, a firm can adjust labour not instantaneously, but slowly, in India. It registers a gradual fall in the number of strikes, disputes etc. as well as share of union wage. We construct a pooled econometric model to see the relationship. The results clearly reveal that openness causes the expansion of the non-unionised sector output and thus depresses the union wage share even within the existing legislation in India.

Both the theoretical and empirical results reveal that the trade reform directly and indirectly squeezes the bargaining power of the labour market institution. Hence, the labour market institution has been less restrictive on industrial growth in the post-reform period than that was in the previous regime. Moreover, given the current

flexibility, union workers lose their bargaining power in relative terms and before considering full-fledged reform one should think how the interest of workers can be protected. If the legislative reform is made in the labour laws, the industrial growth would be accelerated without fulfilling other commitments of formalisation in the labour market. Moreover, a proper attention needs to be taken up to protect the interest of workers in the non-unionised sector and formalisation.

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Figure 1: Average tariff rate of Indian economy, 1980-2006

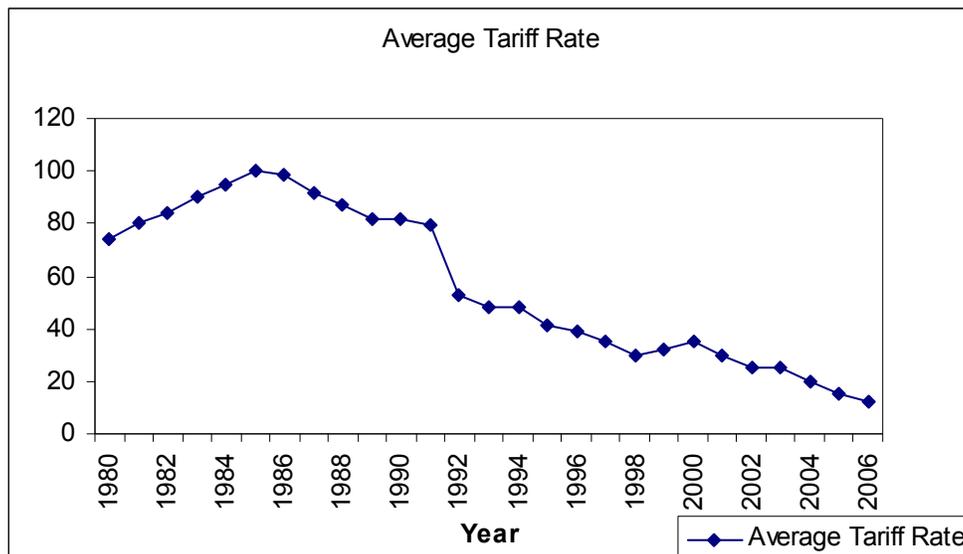


Figure 2:

NSDP in the registered and unregistered sector in India, 1980-2006 (at 1999-2000 prices)

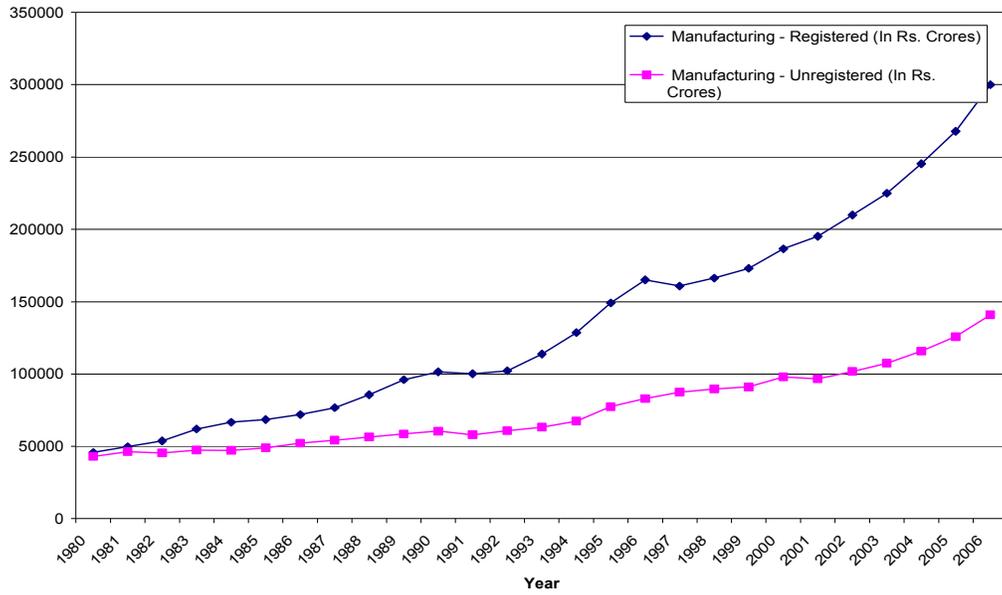


Table 3:

Number of strikes and lockouts in India, 1990-2007

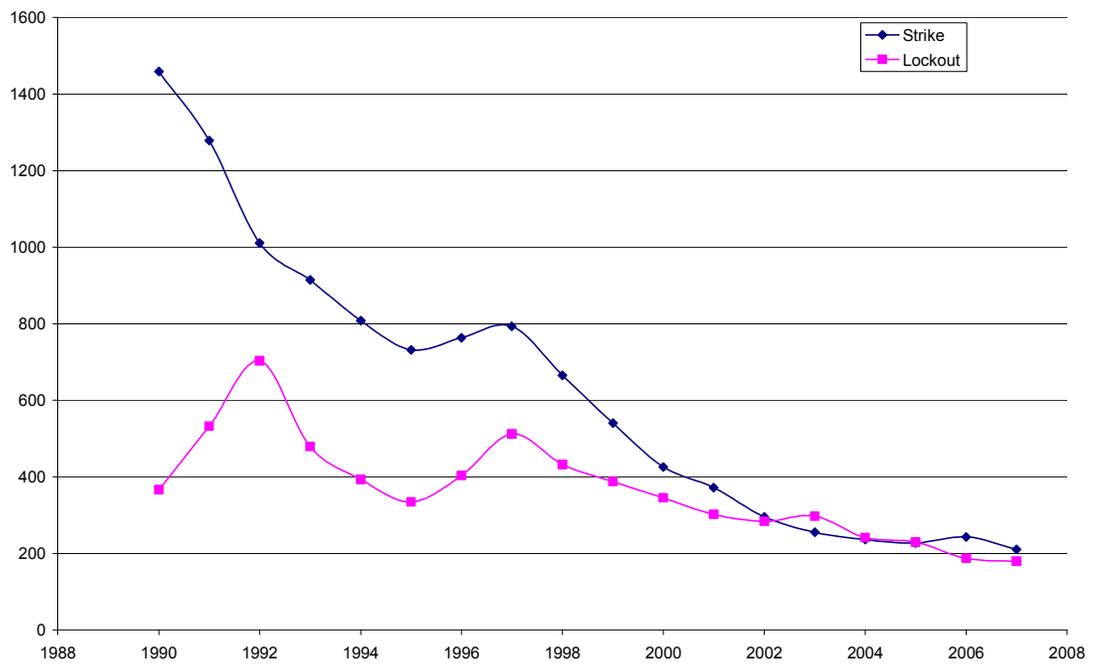


Figure 4: NUMBER OF STRIKES in major states of India during 1997-2006

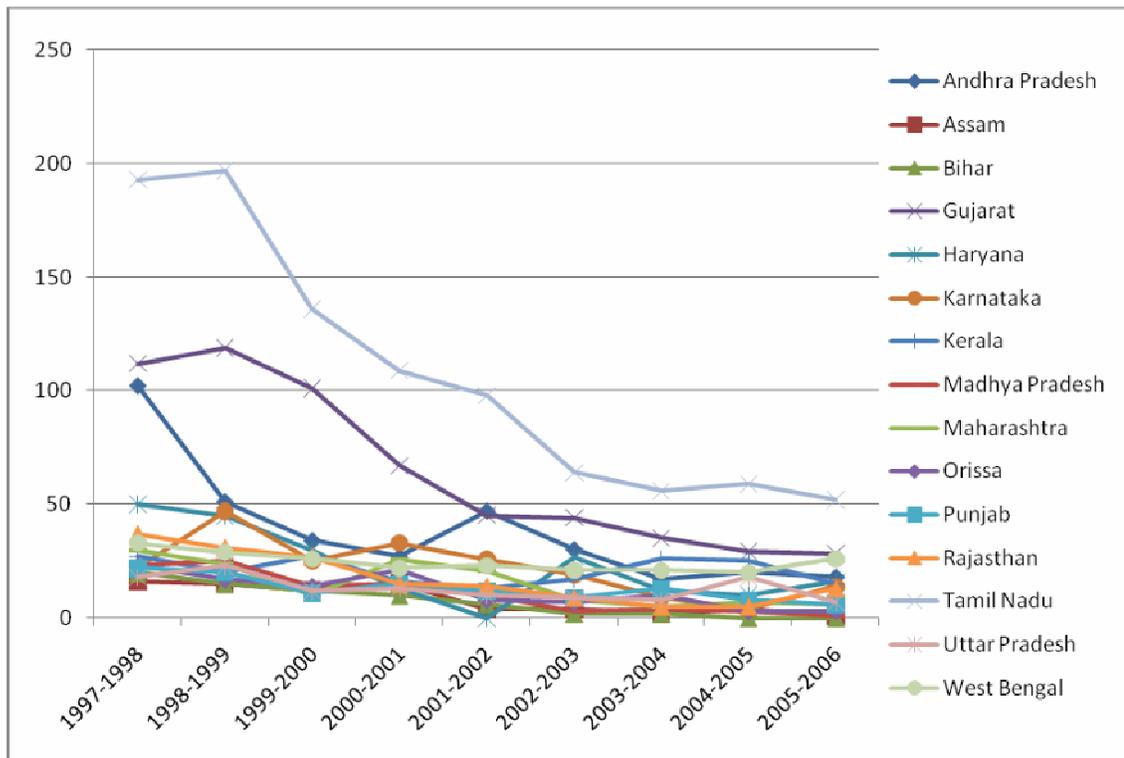


Figure 5: NUMBER OF LOCKOUTS in major states of India during 1997-2006

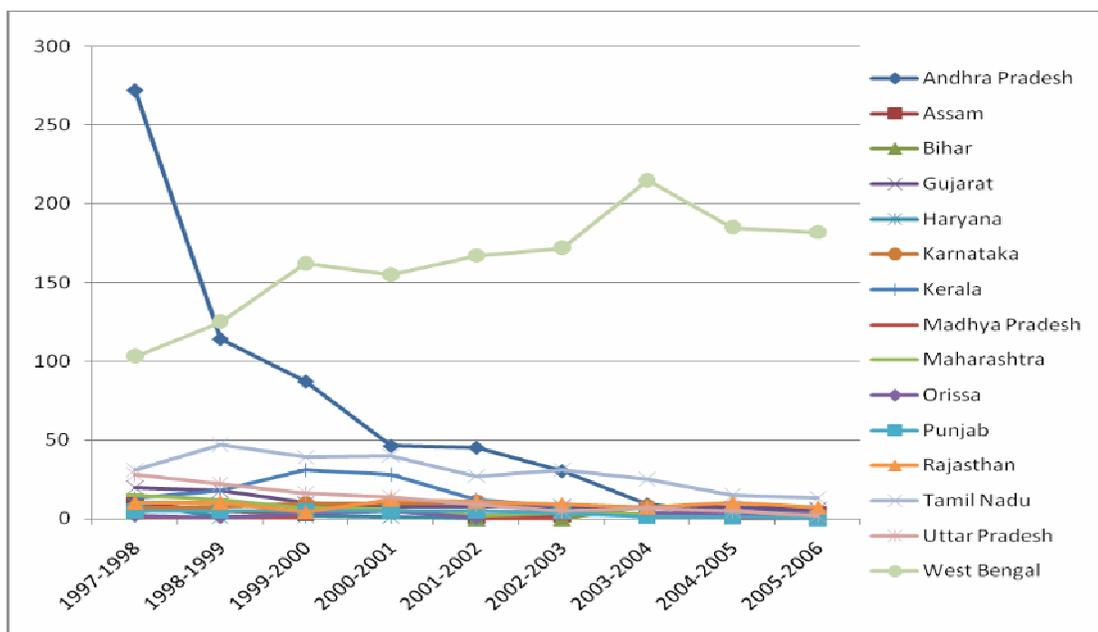


Fig 6: Wage share of workers in major states of India, 1980-2005

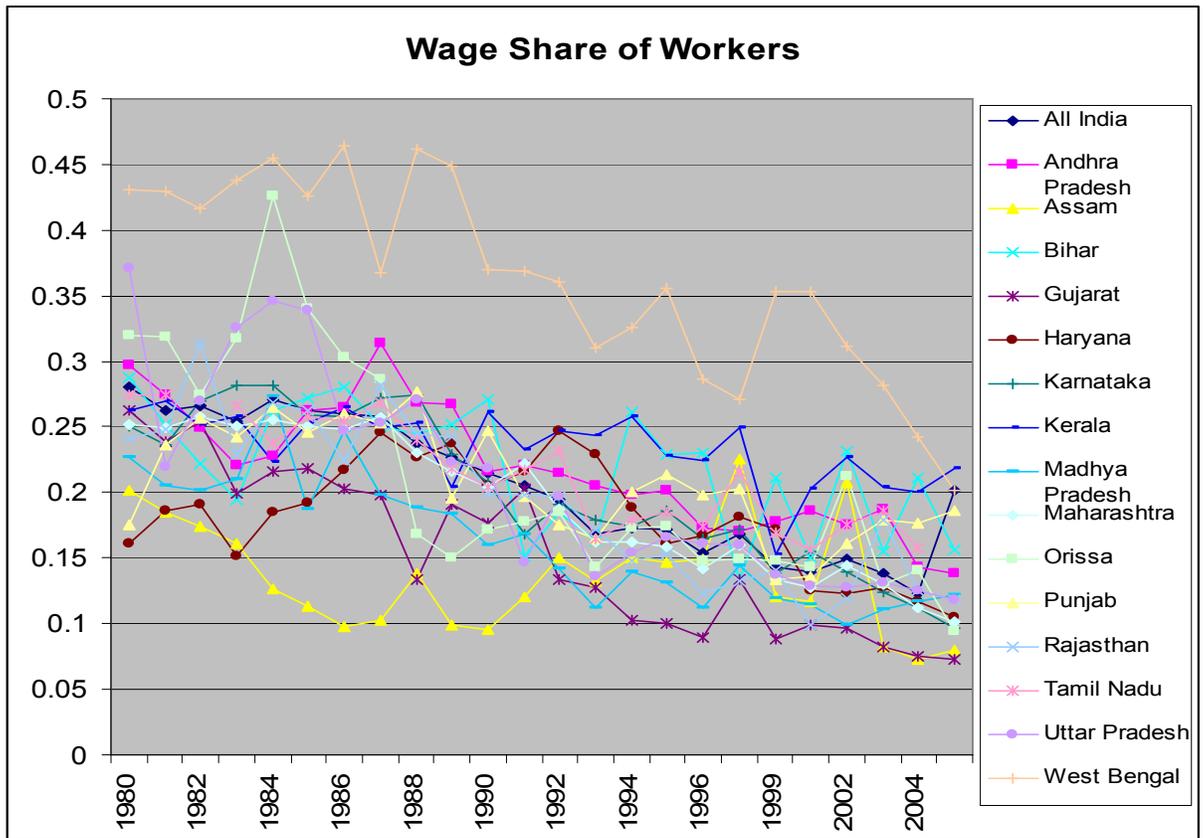


Table 7

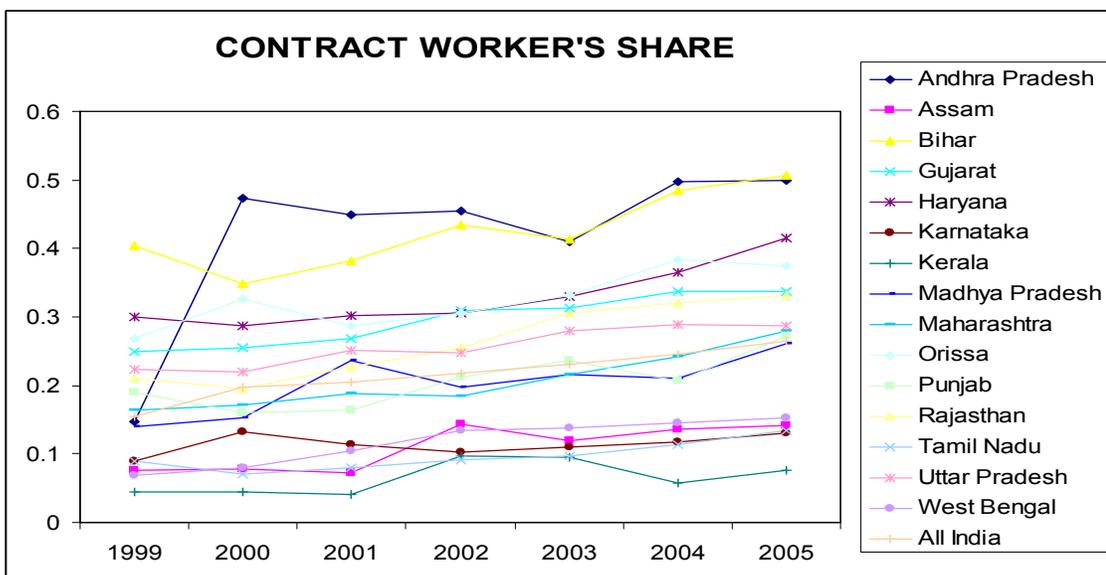


Table 1: Output in the unregistered sector in India during 1980-2006

Year	Total Domestic Product (In Rs. Crores)	Manufacturing Total (In Rs. Crores)	Manufacturing - Unregistered (In Rs. Crores)	Manufacturing as a proportion of GDP	Unregistered Manufacturing Outputs (per factory)
1980	641921	88740	42967	13.8	44.5
1985	815049	117520	49007	14.4	48.5
1990	1083572	161979	60512	14.9	54.9
1995	1396974	226458	77394	16.2	57.5
2000	1864300	284571	98001	15.3	74.7
2005	2616101	393842	125742	15.1	89.7

Source: Handbook of Indian Statistics, Reserve Bank of India and Annual Survey of Industries (CSO, GOI)

Table 2: Employment, wage and workers share in the unionised sector in India during 1980-2006

Year	Number of workers (Lakhs)	Workers Per factory	Share of contract workers (%)	Real Wage Rate (at 1999-2000 prices)	Other Benefit Per Worker (at 1999-2000 prices)	Wage share (% of GVA)	Wage share (% of NVA)
1980	60.66	63	-	34226	8704	28.0	33.6
1985	58.19	58	-	41400	9073	26.3	31.4
1990	63.07	57	-	46380	13267	21.4	25.6
1995	76.32	57	-	50110	18794	17.2	20.1
2000	61.35	47	16	43480	17457	15.5	19.3
2005	71.36	51	26	41680	16149	10.3	12.1
2007	-	-	-	-	-	9.0	10.1

Source: Annual Survey of Industries Data, Central Statistical Organisation, India

Table 3: Mark-up and Bargaining power in Indian Manufacturing during 1998-2005

Variables	OP	LP
Constant	-	
Lerner	0.535***	0.688***
Bargaining	-0.991***	-0.993***
Fixed capital(log)	0.811***	0.705***
Number of observations	4246	4472
Wald- Statistic	-	70.58
Mark-up	2.128	3.205
Bargaining Power	0.50	0.50
Return to Scale	1.725	2.26

Note: *** represents significant at 1%, ** represent significant at 5% and * represent significant at 10%.; OLS – Ordinary Least Square Method, OP – Olley-Pakes Method, and LP – Levinshon- Petrin Method

Table 4: Impact of Openness on Bargaining Power in Indian Manufacturing during 1998-2005

Variable	Olley-Pakes Method			Levinshon- Petrin Method			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lerner		0.760***	0.759***	0.082	0.565***	0.563***	-0.071
Bargaining		-0.962***	-0.965***	-1.014***	-0.971***	-0.973***	-1.018***
Fixed Capital		0.742***	0.732***	0.713***	0.821***	0.823***	0.800***
Export*Bargaining		---	---	-0.009***	---	---	0.009***
Export*Lerner		---	---	0.0339***	---	---	0.035
Import*Bargaining		---	---	0.014***	---	---	0.014***
Import*Lerner		---	---	0.045**	---	---	0.039***
Export		-0.107***	-0.109***		-0.123***	-0.123***	---
Import		0.155***	0.182***		0.156***	0.176***	---
Contract Labours*bar		0.009***		0.009***	0.007***	0.001***	0.007**
Contract Labours*bargaining *Import		---	0.002	---	---	---	---
Wald statistic					34.46	26.21	22.21
Number of observations		4246	4246	4246	3829	3183	3183

Note: *** represents significant at 1%, ** represent significant at 5% and * represent significant at 10%; OP – Olley-Pakes Method, and LP – Levinshon- Petrin Method