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# Impact of Trade on Labour Productivity and Wage Inequality in India

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**Abstract:** The paper empirically estimates the impact of trade on labour productivity and wage inequality between skilled (white collar) and unskilled (blue collar) labour in Indian manufacturing. Analysis is undertaken using dynamic panel data estimations (GMM) for 58 manufacturing industries for the period 1998-99 to 2004-05. The results show that export intensity of industries has positively impacted productivity of unskilled labour while import competition has led to higher productivity of both skilled and unskilled labour. However, trade has led to increase in wage inequalities between skilled and unskilled labour implying that it has increased the wages of skilled labour more than the unskilled labour.

**JEL Codes:** F16, F23, J31.

**Key Words:** Trade and Wage Inequality; labour productivity; wage inequality between skilled and unskilled labour; Wage Inequality; Indian manufacturing and labour productivity; Indian manufacturing and wage inequality; Labour productivity of unskilled labour.

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# **Impact of Trade on Labour Productivity and Wage Inequality in India**

## **1. Introduction**

A number of developing countries over last two decades have embarked on a program of trade liberalization in an attempt to integrate with the rest of the world. The proponents of liberal trade regimes argue that one of the main beneficiaries of greater trade openness are the workers in these countries. It is felt that, given abundant labour supplies, trade liberalization encourages the producers to relocate output in favour of labor intensive goods. The resulting increase in the demand for labour leads to a combination of an increase in employment and/or wages. This argument is supported by the experiences of the newly industrialized countries of East Asia which were the early liberalizers.<sup>3</sup> At the same time, the opponents feel that as the developing countries liberalize their policies, one of the critical issues that have to be addressed is the social cost of liberalization, in particular, the impact on the labour markets through its negative effect on wages and employment. In fact recent experiences of trade liberalization have not been, associated with large improvements in prospects of typical worker (Robbins, 1996 and Wood, 1997).

Several factors can be cited for these divergences between expectation of liberal trade regimes and actual experiences. For example, if trade liberalization causes a flow of new technologies from abroad, then it will lead to an increase in demand for small number of workers with relatively high skill. It is also possible that available results may not be complete in different

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<sup>3</sup> Although this paper intends mainly to explore the link between international trade and labour market outcomes, the impact of trade reforms cannot be ignored. For, trade liberalisation itself impacts international trade. Further, this study pertains to post reform period, therefore, the policy of trade liberalisation needs to be considered.

ways. For instance, the short term impacts may be adverse for labour because the reallocation of resources to new industries takes time and available data may not be sufficient to trace out the effects of trade fully. In the same way the sample countries that have been examined may not be appropriate (Hasan, 2001). Large number studies which found limited benefits from trade have focused on the experience of Latin American countries. Still other empirical literature on the impact of trade on labour market has mainly been focused on developed countries. It is mainly concerned with how trade liberalization has affected trade in U.S labour market (Freeman and Katz, 1995 and Krugman and Lawrence, 1994).

It is also argued by some that trade does have the power to benefit labour at large, but this is constrained by the nature of labour market regulation (Edwards and Edwards, 1994). This is especially true for Indian economy, where a large unorganized sector co-exists with the organized sector and many regulations apply only to the organized sector. Some of these regulations such as stringent rules relating to firing of workers, closing of enterprises and minimum wage legislation are considered to be constraining for the employers leading to rigidities in labour market (Banga, 2005). Thus, where labour market regulations come in the way of adjustment to changes in the demand and supply conditions of labour, the potential for trade liberalization to benefit workers will remain limited.

It is against this background that the present study makes an attempt to contribute to the existing literature by estimating the impact of trade on the labour market of organized Indian manufacturing sector in the post-reform period. This has been necessitated by the fact that despite considerable debate concerning the possible impact of reforms, very few systematic work

exists on effects of international trade on Indian labour market, especially for the post 1997 years. This paper attempts to fill the gap by capturing the differential effects of trade on skilled and unskilled labour in terms of wages and labour productivity. The next section provides a theoretical framework underlying this analysis. It is illustrative and guiding rather than comprehensive. This section also provides a carefully selected survey of existing literature on the subject in order to justify the undertaking of this study. The next section explains the methodology and the data used. Section 4 presents the results. Section 5 concludes the study.

## **2. Theoretical Framework and Review of Literature**

### **2.1 Theoretical Framework**

There are mainly two theoretical approaches or analytical framework for understanding the channels through which international trade might impact on labour market. The first is neoclassical Hecksher-Oklin (H-O) model which provides predictions about the impact of trade between countries with different resource endowments as is the case of trade between developed and developing countries. The second approach is subsumed into what is called “new trade theories” which describes trade between countries with similar resource endowment as in the case of trade between developed countries.

The H-O model predicts that comparative advantage arises from the differences in relative endowments of factors of production. Nations will therefore specialize in the production of goods that employs more of their relatively abundant factor. For instance, developed countries which have relatively more abundant capital would export capital-intensive goods and services and import labour-intensive goods and services from developing countries where labour is

relatively more abundant. Such prediction is reflected by actual pattern of trade between developed and developing countries (OECD, 1994). Thus, under the assumption of two factors and two goods version of the model, the movement from autarky to trade is associated in both countries with an increase in the relative price of good which uses the relatively abundant factor more intensively. Assuming each country produces both the two goods, the relative price of the two goods will increase in the labour abundant country making the firms there to change to production towards labour intensive good. The opposite will happen in the capital abundant country. Such a change will lead to increase in demand for labour in the labour-abundant country. Under the model's assumption of full-employment, this will entail an increase in wages. If this assumption is relaxed, then the increase in the demand for labour may translate into higher employment as well as an increase in wages. The precise magnitude would depend upon the labour market conditions.

However, in predicting the effect of trade on labour on the basis of H-O model, several caveat needs to be kept in mind. For, this model relies on a series of other restrictive assumption: Constant returns to scale in production, competitive labour and goods market, full mobility of factors within each country, and an inelastic supply of labour. Especially, the last assumption may not hold true in many developing countries. Thus trade may result in higher employment but not increase in wages. Further, H-O model can best be interpreted as a long-run rather than a short-run prediction. In the short-run, even labour may be regarded as immobile as they may have to acquire skill, undergo training and search for jobs before they move to the expanding labour-intensive sector. In such a scenario, international trade will be counter productive in the sense that it will serve to reduce the real return to labour. At another level, unionization of the

labour force, minimum wages legislation and other government mandated labour regulation may also dilute the benefits of trade and impede the frictionless clearing of labour market and contribute to the stickiness of wages.

Nevertheless, caveats such as mentioned above do not deny the potential of international trade to benefit labour – at the most, they may postpone such benefits. Indeed, it is argued by some that labour market intervention can even facilitate adjustment by protecting the well-being of workers. The resolution of these debates is essentially an empirical issue. This study can therefore be viewed as an attempt in this direction.

New trade theories were developed to explain trade between countries with similar factor endowment such as the trade that takes place between the developed economies. The gains from trade occur because production cost falls as the scale of output increases translating in lower prices. Although, society as a whole benefits from the lower prices and higher consumption possibilities, the displacement of resources may invariably create losers in a situation where more recent waves of technological change appear to have favoured skilled workers more than the unskilled workers. These theories also assert that the relationship between labour skills and structure of commodity trade. It is felt that the quantity of labour, measured by the levels of skill and technical education embodied in human beings varies significantly across nations. Similarly skill requirements differ among different traded commodities. This being so, countries which is abundant in skilled labour, export goods which require large amounts of highly skilled labour. Whereas, the exports of countries with lack of skilled labour displayed low need for skilled labour and a high requirements of unskilled labour (Keesing, 1966).

Here it is pertinent to note that foreign direct investment (FDI) and international trade are mutually related components. In fact a large part of international trade is the outcome of FDI flows.<sup>4</sup> There is a voluminous body of literature concerning the relationship between FDI and trade flows. Theories predict FDI and trade are substitutes. However, empirical works have achieved different results. A two way positive feedbacks between FDI and trade are found not only in country level research (Brainard, 1997, Noyi and Aizennan ,2005) but also in industry level research (Head and Ries, 2001, Faciane, 2005). Consequently, the impact of trade on labour market can also be traced through FDI's impact. Economic theory suggests that FDI has a positive effect on wages in the industries of the host country. It is argued that foreign firms pay higher wages to domestic labour in comparison to local firms, not entirely due to productivity of labour. One explanation has been provided by the "efficiency wage hypothesis". This hypothesis states that if work effort depends directly on the wage level, it will be profitable for a profit maximizing firm to pay above the market level. So far as productivity is concerned it is propounded that foreign firms are associated with higher labour productivity as compared to local firms. Theoretically, the reasoning is based on the argument that foreign firms adopt new techniques based on the latest R&D and will therefore have higher labour productivity than domestic firms. Besides, FDI may also cause higher productivity in local firms through spillover effects.

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<sup>4</sup> As is well documented the MNC's are the driving force behind FDI. These firms have large internal market, access to which is available only to affiliate. They also control large markets in unrelated parties having exclusive brand names and distribution channels spread over several national location. They can, thus, influence granting trade privileges not only in home markets but also elsewhere. As per one estimate MNC accounted for more than 50 percent of the total manufactured exports from developing countries (Mallery, 2005).



It is in the context of the above theoretical framework that a review of earlier studies will be now attempted, so as to provide a justification for the present study. Since the study attempts to analyze the impact of trade on labour markets, the survey of literature is undertaken accordingly.

## **2.2 Review of Literature**

### **a. Trade and Labour Productivity**

In the analysis of the potential link between trade and economic growth, one of the directions in which research has proceeded it to investigate the microeconomic link between countries trade and their firm's productivity. It asks whether firm's higher productivity growth is by becoming exporters or being forced to improve as a result of more intense competition with foreign rivals.

The impact of trade on labour productivity requires to be analysed with care for it is possible that higher labour productivity may lead to higher trade. Frankel and Romer's (1999) pioneering work on the casual effect of trade on average productivity across nations was based on the perception that trade is partly determined by the location characteristics of countries that are unrelated to productivity. They had examined this idea empirically for a large set of countries in 1985 and concluded that trade has positive effect on average labour productivity. Other studies have also examined the link between trade and labour productivity. Kraay (1997) found that controlling for past firm's performance and unobserved firm's characteristics, past exports are a significant indicators of an enterprises current performance. The estimated co-efficient indicate that a ten percentage point increase in a firm's export to output ratio in a given year causes a thirteen percent increase in labour productivity.<sup>5</sup>

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<sup>5</sup> Cited in Banga (2005a)

Sometimes trade exposes firms to the latest available technology. Exposure to international markets may provide a network for sources of new knowledge and new technique. These may have positive effect on labour productivity. Bloch and McDonald (2000) have analysed this issue. They found that the labour productivity in the manufacturing firms in Australia had increased with increased exposure to exports. Alcalá and Ciccone (2001) had undertaken a study to ascertain the effect of trade on average labour productivity across countries. Their findings show that the casual effect of trade on labour productivity is large, highly significant and very robust. They have examined the channels through which trade affects average labour productivity and found that trade works through total factor productivity. They also found that average labour productivity is influenced in a statistically significantly way by the size of a country's work force once international trade is taken into account.

A study by Douglas (2003) on the impact of USA-Canada FTA on Canadian manufacturing suggests that tariff reductions helped boost labour productivity by a compounded rate of 0.6 percent p.a in manufacturing as a whole and by 2.1 percent p.a in the most affected (i.e high-tariff) industries. These productivity effects were achieved by a mix of plant turnover and rising technical efficiency within plants. By increasing productivity the FTA also helped to increase the annual earnings of workers. Another study by Doyle and Zarzoso (2005) used the real openness measure as a determinant of labour productivity in a cross country setting over 1980-2000 periods. This study suggests that a 1 percent point increase in real openness increases labour productivity only by 0.55 percent. This differs in the findings of earlier studies mentioned above.<sup>6</sup>

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<sup>6</sup> Real openness is national imports plus exports (in US\$) divided by national GDP in PPP US \$.

Banga (2005a) has found that exports have raised labour productivity in Indian manufacturing industries. Higher competitive pressures have driven firms to improve their productivity. With regards to import's impact it was found that import intensity of an industry to have a strong negative effect indicating that higher the extent of import freedom higher will be the labour productivity.

The survey of literature attempted above regarding the effect of trade on different labour outcomes generally provide conflicting views about the impacts. That is, these studies are ambiguous in their conclusions. Further, these studies have viewed the different impacts in isolation and in different time period. Moreover, very few studies have been undertaken for India in the recent past to explore the linkages between trade and labour market. Consequently, this research represents one of the first attempts at analyzing econometrically the link between trade and different labour market outcomes in India.

### **2.3. Trade and Wage Inequalities**

Very few studies have been conducted to examine the relationship between trade and wage inequalities. One of the first attempts of trade based hypothesis to explain increased differentials between skilled and unskilled worker was made by Bhagwati and Dehejia (1994). The authors argued that increased economic integration have increased the volatility of comparative advantage. This has, in turn, led to increased labour turnover reducing the relative wages of less skilled, either because they have skill that are less transferable than those possessed by skilled

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workers or because they are less likely than high-skilled individuals to invest in skill improvement during jobless spells . Some empirical support for this hypothesis for Canada was found by Zalkiwal (2000).

Durevall and Munshi (2006) have explored the relationship between trade liberalization and skilled-unskilled wage inequalities in Bangladesh cotton Textile industry. Their major finding is that opening up to international trade has affected unskilled and skilled wages in the same way; there is no reduction or increase in wage inequality. Moreover, trade opening seems to have increased real wages across the board, possibly because of trade-induced increases in productivity. However, Mishra and Kumar (2005) in their study for India, in contrast have found a strong, negative and robust relationship between changes in trade policy and changes in industry premiums over time. As per their study trade liberalization has led to decreased wage inequalities between skilled and unskilled workers in India. According to them as tariff reduction were relatively large in sectors with higher proportion of unskilled workers and these sectors experience an increase in relative wages, these unskilled workers experience an increase in income relative to skilled workers. Thus, the findings in this paper suggest that trade liberalization has led to decreased wage inequalities in India.

Similarly Banga (2005a) found that higher export intensity of an industry is associated with lower wage inequalities. Higher exports in an industry have reduced wage inequality because most of the exports take place from low skill and labour intensive industry, as a result higher exports by raising the demand of these labour increases their return so as to subsequently reduce

the wage gap. However, as technological progress is skilled biased, a higher extent of technology acquisition is found to be associated with higher wage inequalities.

### 3. Methodology and Data

#### 3.1 Methodology

##### *Labour Productivity Equation*

Impact of trade on labour productivity has been estimated in the framework of a production function. A Constant Elasticity of Substitution (CES) production function has been chosen for the purpose. The CES production function, unlike the Cobb-Douglas production function, allows for non-unit value of elasticity of substitution between the inputs. Further, the production function is assumed to be of the type of constant returns to scale (CRS), i.e.,  $\mu = 1$ .

$$Q = \chi [s(K)^{-\rho} + (1-s)(Le^{\lambda t})^{-\rho}]^{-1/\rho}$$

Kmenta (1967) has shown that labour productivity can be estimated by an approximation of CES production function by expanding  $\ln Q$  in Taylor's series around  $\rho = 0$ , i.e.,

$$\ln(Q) = \ln(\chi) + e^{\lambda t} \ln(K/L) + \ln(L) + [\rho e^{\lambda t} (1-s)/2][\ln(K/L)]^2$$

$$\ln(Q) - \ln(L) = \ln(\chi) + e^{\lambda t} \ln(K/L) + [\rho e^{\lambda t} (1-s)/2][\ln(K/L)]^2$$

Labour productivity is therefore found to be a function of:

$$(Q/L)_{it} = F[(K/L)_{it}, (K/L)_{it}^2, Q_{it}, Trade_{it}, Tech_{it}]$$

### ***Wage Inequality Equation***

To analyse the effect of trade on the market for skills, we use demand and supply framework.<sup>7</sup> Following Katz and Murphy (1992), we take two-factor CES production function with low-skilled labour (U) and skilled labour (S) as follows:

$$F(U_t, S_t) = [\chi(\delta_{ut}U_t)^\rho + (1 - \chi)(\delta_{st}S_t)^\rho]^{1/\rho}$$

where,  $\delta_{ut}$  and  $\delta_{st}$  are functions of labour efficiency units and the parameter  $\rho < 1$ .

The labour efficiency index can be interpreted as accumulated human capital or the skill-specific technology level. Elasticity of substitution between U and S is  $\sigma = 1 / (1 - \rho)$ . In neo-classical theory, technological change happens exogenously. However, trade can also shift the pattern of technological change. We let the labour efficiency indices (skill-specific technological progress) depend on trade-intensity (TRDI) [export-intensity (EXPI) and import intensity (IMPI)] and technology (TECH).

Using the first-order condition that factor productivity equals the real factor price, the wage of skilled labour ( $W_{SK}$ ) relative to un-skilled workers ( $W_{USK}$ ) can be represented as:

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<sup>7</sup> FDI can have a composite effect on market for skills. Traditional trade theory (the Heckscher-Ohlin model) suggests that FDI in developing countries with abundant low-skilled workers is located in low-skill sectors<sup>14</sup>. New trade models also based on Heckscher-Ohlin foundations consider cases where transnational corporations (TNCs) transfer activities abroad, which are less-skilled compared to the home average but more skilled compared to the host-country average (Feenstra and Hanson, 1995). In addition, new trade models have been developed where TNCs locate abroad because of firm-specific assets (Markusen and Venables, 1997) and foreign firms may have different skill intensities from domestic firms, pushing up the demand on an average for skill labour.

$$\ln(W_{SK} / W_{USK}) = \ln[(1 - \chi) / \chi] - \frac{1}{\sigma} \ln(S_t / U_t) + (\sigma - 1 / \sigma)\lambda_{1t} + (\sigma - 1 / \sigma)\lambda_3 TRDI + (\sigma - 1 / \sigma)\lambda_4 Tech$$

### 3.2 Data Sources and Construction of Variables

For the manufacturing sector, no single source of data exists for the Indian economy that provides data required by this study. The study therefore draws data from two different sources, i.e., The *Annual Survey of industries* (ASI), which is published by the Central Statistical Organisation, Government of India and DGCI&S for trade data. ASI provides a reasonably comprehensive and reliable disaggregated estimates for the manufacturing industries. It covers all the production units registered under the Factories Act, 1948<sup>8</sup>, ‘large ones’ on a census basis (with definition of ‘large’ changing over time) and the remaining on a sample basis. DGCI&S provides data at eight digit level on HS 2002 codes. A concordance matrix is constructed to arrive at trade data at ASI three-digit industry level NIC codes.

There are considerable problems in obtaining good quality time series data on wages by skill level. For our purpose, we use the available information on wage contained in the ASI database. This source provides the average number of full time production-process ‘workers’ and ‘employees’ (which includes in addition to ‘workers’, non-production workers like supervisors, clerks etc.) employed per day after taking account of reported multiple shift working. Wages of production workers is taken as wages of unskilled workers.

The data on employment, wages, and capital formation are extracted from Annual Survey of industries (ASI). ASI, published by the Central Statistical Organization (CSO), Government of

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<sup>8</sup> The Factories Act, it may be noted, applies to those units employing 10 or more workers and using power / 20 or more workers not using power.

India, provides a reasonably comprehensive and reliable disaggregated estimates for the manufacturing industries, covering all production units registered under the Factories Act, 1948, 'large ones' on a census basis (with definition of 'large' changing over time) and the remaining on a sample basis. Data is drawn for 58 industries at three-digit level of industrial classification (National Industrial Classification, 1998) for a period between 1998-99 to 2004-05

For the purpose of estimating the regression equations, a set of variables have been constructed using various data series. The wage series of both skilled and unskilled labour have been deflated with WPI index to reflect the wage rates in real terms. Gross Value Added (GVA) of industries is deflated with respective WPI series to reflect the values at constant (1993) prices. To capture the technological level across industries, a ratio of capital formation to the labour is arrived at. Exports and imports intensities have been calculated by dividing the share of each of them in total output produced.

## **4. Empirical Findings**

### **4.1 Trade and Labour Productivity**

Table 1 presents the results of the dynamic panel-data estimation of labour productivity equations. Since wages and employment in Indian industries are characterized by downward rigidities, we use Generalized Method of Moments (GMM-IV) two-step estimators, following Arellano and Bond (1991). Estimates are done for aggregate as well as disaggregate level of skilled and unskilled labour. Equation (1) presents the results for labour productivity, irrespective of the skills of labour. Equation (2) presents results with respect to skilled labour and equation (3) presents results with respect to unskilled labour. Each of the equations is estimated separately



for export intensity and import intensity as independent variables. In view of high degree of correlation between  $(K/L)$  and  $(K/L)^2$ , the second term was dropped from the model estimated.

A note of caution is that skilled labour imply 'white collar workers' while unskilled labour imply 'blue collar workers'. For aggregate labour, as reported in equation (1), the relationship between both export intensity and import intensity are found to be statistically significant at 5% level. This implies that both export intensity and import intensity of the industries lead to higher labour productivity. This supports the view that competition, whether in international market or domestic market will raise labour productivity.

Trade has, however, differently impacted the productivity of skilled and unskilled labour. When the relationship between trade and labour productivity is decomposed into skilled and unskilled labour, it is found that while in case of former (as reported in equation 2) the relationship is statistically not significant whereas in case of later, i.e., unskilled labour, the impact is positive and significant. **This means that industries with higher export intensity, productivity of unskilled labour is higher**, but impact of export intensity on productivity of skilled labour is inconclusive.

**Import intensity, on the other hand, improves labour productivity of both skilled as well as unskilled labour.** Domestic competition may therefore raise productivity levels of labour more than competition in international markets.

**Table :1 Estimates of the Determinants of Labour Productivity**

	<b>(1)</b>		<b>(2)</b>		<b>(3)</b>	
<b>Variables / Stats</b>	<b>Skilled + Unskilled</b>		<b>Skilled</b>		<b>Unskilled</b>	
<b>Constant</b>	-6.78 (-43.64)*	-6.70 (-28.35)*	-2.75 (-13.65)*	-2.66 (-11.15)*	-6.85 (-43.11)*	-6.83 (-30.63)*
<b>Log (LPTY)-1</b>	-0.25 (-4.52)*	-0.31 (-3.70)*	0.23 (1.78)	0.035 (0.24)	-0.26 (-4.84)*	-0.35 (-4.29)*
<b>Log (GVA)</b>	0.50 (25.98)*	0.48 (22.01)*	0.35 (13.32)*	0.33 (11.32)*	0.52 (23.34)*	0.50 (21.31)*
<b>Log (exports/output)</b>	0.0138 (2.32)*	-	-0.0011 (-0.13)	-	0.0121 (2.08)*	-
<b>Log (imports/output)</b>	-	0.025 (3.26)*	-	0.019 (1.77)*	-	0.02 (2.96)*
<b>log (K/L)</b>	0.03495 (2.84)*	0.039 (3.22)*	0.066 (4.32)*	0.051 (3.26)*	0.026 (2.32)*	0.034 (2.91)*
<b>Wald Chi Sq</b>	1373.2	623.1	187.2	204.4	1411.4	648.5

Note: (i) Estimations are done using Arellano-Bond dynamic panel-data technique. (ii) \* signifies statistical significance at 5% level. (iii) Due to high degree of correlation between K/L and  $(K/L)^2$ ,  $(K/L)^2$  was dropped from estimation.

Higher capital intensity improves labour productivity is an expected result. Productivity of both skilled and unskilled labour is positively related with the capital labour ratio. However, the impact in case of skilled labour is much larger than that in case of unskilled labour. Modernization of industry, reflected in terms of rise in capital labour ratio, hence, increases the productivity of skilled labour more than that of unskilled labour.

The results control for the size of the industries. Larger the size of the industry higher is the labour productivity. The relationship between labour productivity and output (GVA) is found to be statistically significant in all the cases.

#### 4.2 Trade on Wage Inequality

Table 2 presents the results of the dynamic panel-data estimation of wage inequality equations. Since wages and employment in Indian industries are characterized by downward wage rigidities, we use Generalised Method of Moments (GMM-IV) two-step estimators, following Arellano and Bond (1991). Two specifications have been tested, one controls for technology differences across industries by using K/L ratio while other equation is estimated dropping k/l ratio. The results are reported in Equations (1) to (4).

**Table:2 Estimates of the Determinants of Wage Inequality**

**Dependent Variable: Wage rate of Skilled Labour-Wage rate of Unskilled Labour**

<b>Variables / Stats</b>	(1)	(2)	(3)	(4)
<b>Constant</b>	-4.28 (-7.04)*	-5.02 (-7.75)*	-5.09 (-10.03)*	-5.43 (-9.15)*
<b>Log (Wd)</b>	0.35 (20.39)*	0.38 (22.42)*	0.29 (22.06)*	0.34 (30.21)*
<b>Log (GVA)</b>	0.11 (1.41)	0.22 (3.48)*	0.12 (1.88)	0.21 (3.40)*
<b>Log (unsk/Sk)</b>	-0.21 (-2.22)*	-0.28 (-2.19)*	-0.38 (-4.54)*	-0.40 (-3.77)*
<b>Log</b>	0.02	0.03	-	-

(exports-output)	(3.55)*	(4.06)*		
Log (imports-output)	-	-	0.017 (2.32)*	0.036 (5.15)*
log (K/I)	0.085 (4.02)*	-	0.099 (5.61)*	-
Wald Chi Sq	3460.7	2087.0	2616.0	2708.5

Note: (i) Estimations are done using Arellano-Bond dynamic panel-data technique. (ii) \* signifies statistical significance at 5% level.

Wage inequality is defined as the difference between wage rate of skilled and unskilled labour. Higher the wage inequality, lower is the wage rate of unskilled labour as compared to skilled labour. It is interesting to note that the lagged wage- inequality has a significant positive relationship with wage inequality in the current period, which indicates that industries with higher wage differential continue to have larger wage inequalities.

Keeping other factors constant, results indicate a positive relationship between exports and imports with wage inequality. **With the increase in share of import and export intensity, the wage differential between skill and unskilled worker has tendency to widen.** This is in line with other studies including Bhagwati and Dehejia (1994). Banga and Sharma (2008) using the same methodology show that exports has led to higher wages of unskilled labour in the same period. This indicates that though the real wage rate of unskilled workers have increased due to exports, the rise in wage rate of skilled workers has been higher than that of unskilled workers. Buoyancy in economic activities as witnessed in last few years has fast augmented the demand

for skilled labour. But as industries have become more labour intensive, the demand for unskilled labour has not increased in the same proportion.

The fact that increase in trade in India is positively related with the widening wage inequality is also reinforced by the direct relationship between scale of output and wage inequality across the sectors. The GVA as a determinant of the output is found to be directly related with the inequality in the wage rate, though this relationship is not powerfully supported by the statistical significance in all the equations estimated. But since the relations are statistically significant in one of the two equations in each export and import, it can be argued that scale of output has tendency to widen the inequality.

Employment differential between unskilled to skilled labour reflects that as proportion of unskilled labour to skilled labour rises, the wage inequality lowers. This indicates that in industries which employ more unskilled labour as a proportion of skilled labour, the wage inequality between skilled and unskilled labour is lower. High tech industries are found to have larger wage inequality, which is on the expected lines as they would hire more expensive skilled labour. The impact of exports and imports on wage inequality is also tested by dropping  $k/l$  ratio, we find the results still hold indicating the robustness of the arrived result.

## **5. Conclusion**

This paper takes a step forward in examining the linkages between international trade and labour market outcomes in India. The theory predicts that with greater openness to trade and resulting expansion of trade, India's labour-intensive manufacturing sector will benefit in terms of improvement in productivity. It is also forecasted that the abundant factor (unskilled labour) should benefit more from the movement towards free trade. This will result in the reduction in the wage differential between the unskilled and skilled labour. In the light of this, the present paper examines whether such a predictions holds true for India also, by considering the case of organized manufacturing sector for the post-1997 period.

The data for exports and imports at the industry level for India is not available. Using the concordance matrix between six digit HS 2002 codes at product level with three-digit National Industrial Classification (NIC) the trade data is constructed at the three digit industry level. This is an important contribution to the existing literature as it enables estimation of impact of export and import competition on industry characteristics.

The impact of trade on labour productivity has been estimated on the basis of a constant elasticity of substitution (CES) production function, which allows for non-unit value of elasticity of substitution between the inputs. For analyzing the effect of trade on the market of skill, the two-factor CES production function with low skilled and skilled labour has been considered. The necessary data is culled from Annual Survey of industries, published by the Central Statistical

Organization, Government of India. Data is drawn for 54 industries at three-digit level of industrial classification for the period 1998-99 to 2004-05.

Focusing on the registered manufacturing industry it is found that trade is positively related with labour productivity. Higher is the export intensity and import intensity of an industry, higher is the labour productivity. But, although, trade has benefited labour in general and unskilled labour in particular, it has in no way reduced the differences in the wage earnings between the two classes of labour. In fact trade has led to higher wage inequality. This suggests that higher skills enable higher gains from trade.

But it needs to be noted here that though the organized Indian manufacturing sector provides employment to a small fraction of the total labour force but given the backward and forward linkages between organized and unorganized sectors in India, effects of trade on labour markets in the organized sector may percolate to the large unorganized sector. It is therefore important to have policy interventions, especially in export-intensive industries, in order to reduce wage inequality between skilled and unskilled labour.

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