Trade, Technology, and Institutions: How Do They Affect Wage Inequality? Evidence from Indian Manufacturing

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(*Draft version*)

Abstract

The phenomenon of rising income/wage inequality observed in many developing countries has been one of the major concerns over last two decades of rapid globalization. Rising wage inequality in developing country is paradoxical of what the Heckscher-Ohlin and Stolper-Samuelson models predict. This paper explains the changing pattern of wage inequality in Indian manufacturing sector in the period of its deepening participation in the globalization process through India's economic and trade liberalization over last two decades. Using five different wage inequality measures such as skilled-unskilled wage ratio, Gini Coefficient, 90-50 wage ratio, 90-10 wage ratio, and 50-10 wage ratio, this paper explains how trade, technology, and institutional factors have impacted on these wage inequality measures.

Key Words: Wage inequality, export orientation, import penetration, south-south trade, and skill biased technological change.

JEL Classification: F16, J31

I. Introduction

Over last two decades, many developing countries have adopted major liberalization policies through opening up their markets for international trade, foreign capital flows, and promoting flexible labour market. Empirical evidence support a simultaneous rise in wage inequality along the period of economic liberalization in some developing countries. For example, Mexico experienced a rise in wage inequality in the period 1987 to 1993, Columbia

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in 1986- 1998, Argentina in 1992-1998, India in 1987-1999; these are the periods of major trade liberalizations in these countries respectively (Goldberg and Pavcnik, 2007).

The trade theories, especially the Heckscher-Ohlin (H-O) and Stolper-Samuelson (S-S) theories predict a reduction in wage inequality between skilled and unskilled labour in developing countries once they increasingly open up their markets for international trade. These countries are presumed to be unskilled labour abundant, so they have comparative advantage in unskilled labour intensive goods, and therefore, they specialize on it. International trade leads to an increase in exports and prices of unskilled labour intensive products. As a result, the unskilled labour demand and their wages increase relative to the skilled labour demand and skilled wages respectively. This should lead to a decline in wage inequality between skilled and unskilled labour in the developing country. But the empirical evidence from most developing countries are completely opposite of what these two trade theories predict. It is now a highly debatable topic to explain this seemingly contradictory phenomenon that has been observed in the developing world. So to find out the linkages between trade liberalization and wage inequality, one needs to research on other plausible channels which might have impacted on the rising wage inequality. Section II presents a short review of literature; Section III describes the sources of the data used in this study; Section IV analyzes the estimates of five wage inequality measures; Section V analyzes the estimates of the trade liberalization indicators; In Section VI, we discuss the estimation results of five wage inequality functions. And Section VII gives the summary of this paper.

II. Literature Review

Empirical evidence suggest that the predictions of the H-O and S-S theory have not been observed in the real world. The general equilibrium H-O model is based on extremely restrictive assumptions such as perfect competition, perfect labour and capital mobility, trade in final goods, and fixed technology. These restrictive assumptions are making it extremely unmatched with real world; moreover, it is sometime hard to empirically test these models. On the other hand, the S-S model relates trade-induced changes in relative prices and factor prices. The product prices are sometime endogenously determined for reasons unrelated to trade. For this reasons a direct link between product prices and factor prices - as suggested by general equilibrium trade model - has been empirically elusive. For example in the USA, since 1980s there was no clear decline in the relative prices of the unskilled labour intensive products although there was a rising wage inequality between skill and unskilled labour. Contrary to the factor endowment based trade theories where trade liberalization would

involve labour reallocation from contracting sector to expanding sector, it has been observed that lack of labour relocation/mobility across sectors lead to the market adjustment through changing relative wages and profit margins in developing countries (Revenga, (1997), Hanson and Harrison, (1999), Topalova, (2004)).

Another line of explanation of rising wage inequality focuses on the pattern of trade protection prior to trade liberalization in developing countries. It is seen that the unskilled labour intensive sector in developing countries was more protected, and due to trade liberalization, the unskilled wage was impacted (declined relative the skilled wage) the most by tariff cuts in unskilled labour intensive goods (Hanson and Harrison, 1999; Currie and Harrison, (1997), Attanasio, Goldberg, and Pavcnik (2004)).

Apart from the standard trade theories which are highly stylized vis a vis the real world, it is possible to reconcile the evidence on wage inequality by considering various extension of the original models. One most important aspect of recent trade pattern is that it no longer keeps the technology *fixed*, i.e. technology is not exogenously given for a country. A country's technological orientation in production may change due to diminishing trade protectionism and increasing international trade (Wood, 1997; Robbinson, 1995). The trade liberalization in developing countries provide an opportunity to augment their existing technology with advanced imported technology which becomes cheaply available through trade liberalization and increasing capital inflows (Acemoglu, 2003).

Now the question is how such trade-induced technological change increases wage inequality. It is seen that the trade-induced technological changes is mostly skilled-biased, i.e. trade-induced technological change demands more skilled labour replacing the unskilled labour - this is called skill-biased technological change (SBTC). Due to the SBTC, the skilled wage should increase relative to their unskilled counterpart, and this would lead to an increase in wage inequality. It is well recognized now that most credible explanation of changes in wage inequality would be how trade liberalization changes the SBTC.

Another deviation from the conventional trade theories in recent years is the increasing importance of trade in intermediate products or the 'outsourcing'. Feenstra and Hanson (1997) argue that the rapid expansion of 'outsourcing' or 'global production sharing' explains a part of the observed decrease in demand for unskilled labour in developed countries. The developed countries outsource the unskilled labour intensive segment of production to the developing countries where unskilled labour is comparatively cheap. This leads to a decrease in unskilled labour demand in home country, and an increase in wage inequality. On the other hand, developed countries outsource the segment of production work

which are done by the so called skilled labour in developing countries (for example, the India's IT & ES industry, China's hardware industry), in this case, the increasing demand for the skilled labour in developing countries increase the wage inequalities in these countries.

The conventional North-South trade is the dominating explanation of the economic inequality in the literature. The recent globalization no longer follows the North-South trade only. The South-South trade comprises slightly more than half of the world trade today, moreover, it is increasing. So it is important to see the implication of the South-South trade in the wage inequality particularly for developing countries. As the countries in the South are unskilled labour abundant, the trade in unskilled labour intensive goods within the South does not benefit the unskilled labour, which would have been better off if the South trades with the North. It is observed that an increasing wage inequality in developing countries is more due to the South-South trade liberalization than to the classical trade liberalization with northern countries (Julien, 2007).

Inequality may have occurred through the growth channel, but the evidence on the causal link between trade openness and growth has been controversial and inconclusive to date. This channel is potentially important because trade liberalization is presumed to be expediting economic growth and growth has its effects on distribution. Moreover, in all most every country, the macroeconomic policies are being followed to maximize the growth of the GDP. How does economic growth affect economic inequality? A set of literature say economic growth initially increases economic inequality because of costly restructuring of the economy and thereafter it reduces economic inequality once the restructuring of the economy gets over - the *Kuznets Curve*. But most of the empirical studies reject the Kuznets curve hypothesis (Ravallion, 1995; Deininger, K., & Squire, L. 1998; Majid, 2011). So the effect of economic growth on economic inequality is an empirical question for any country.

III. The Data

The unit of our observation is the manufacturing industry at the 3 digit level of National Industrial Classification in 1998 (NIC 98). The industry data is obtained from Annual survey of Industries (ASI) for the period 1989-2007. The ASI data covers the organized segment of the manufacturing sector. The wage inequality measure, namely, the skilled-unskilled wage ratio has been measured from the ASI data. The wage inequality measures, namely, the Gini coefficient, the ratio of 90 percentile to median, the ratio of 90 percentile to 10 percentile, and the ratio of median to 10 percentile are calculated from the unit level data of the National Sample Survey's (NSS) Employment and Unemployment,

which covers the total manufacturing sector, i.e. the organized and unorganized segments both. Four rounds of the Employment and Unemployment Surveys have been used; they are 50th round (1993-94), 55th round (1999-00), 61st round (2004-05), and the latest is 66th round (2009-10).

We have built a concordance between ISIC Rev. 3 (NIC 98) and SITC Rev. 3 from United Nations Statistical Division (UNSD) database to match the Indian industry data base with the trade data base. After building the concordance between ISIC Rev.3 (i.e. NIC 98) and SITC Rev 3, we used UN's COMTRADE database for getting the trade statistics required for this stdy. While constructing the variable South-South trade we defined the 'South' as non-OECD countries.

IV. Wage Inequality for Indian Manufacturing Labour

Indian manufacturing sector contributes around 16 percent of India's GDP and 11 percent of total employment as of 2009. This sector has significant duality between organized and unorganized sectors within the total manufacturing. Unorganized manufacturing are mostly run by the self-employed entrepreneur with less than twenty wage labor and/or family labour. The unorganized manufacturing accounts for around 81 percent of total manufacturing employment, but have share of only 33 percent of total manufacturing output. In the following section we presented the graphical presentation of the wages and wage inequalities changed over time since 1989. We have taken the all manufacturing industries at the 3 digit NIC 98. We plotted the real wages and inequalities for these manufacturing industries over time.

From Figure 1, we observe a widening gap between per-capita skilled and unskilled wage over the period of 1989-2007. The estimated values (or fitted values) are calculated from the OLS regression of time on the real wages for the skilled and unskilled labour separately for 54 manufacturing industries. Subsequent graphs present the different measures of inequality. Figure 2 presents the wage inequality measured by the skilled-unskilled wage ratio which shows an increasing trend in our data. Figure 3 presents Gini coefficients for different industry groups in various time periods. This graph shows that the wage inequality is highest in high tech industry whereas lowest in medium-low tech industries. We observe that the Gini coefficient decreased for all industry groups in 1999 from the earlier period 1994, and it started increasing in post 1999 period for all industry groups. Interestingly the increase in the Gini coefficient in post 1999 period was high in high tech industry relative to the other industries.

Figure 1. Trends in the Annual Per-Capita Real Wages for Skilled and Unskilled Labour in 55 Manufacturing Product Groups in 1989-2007 (in INR, at 2001 prices)

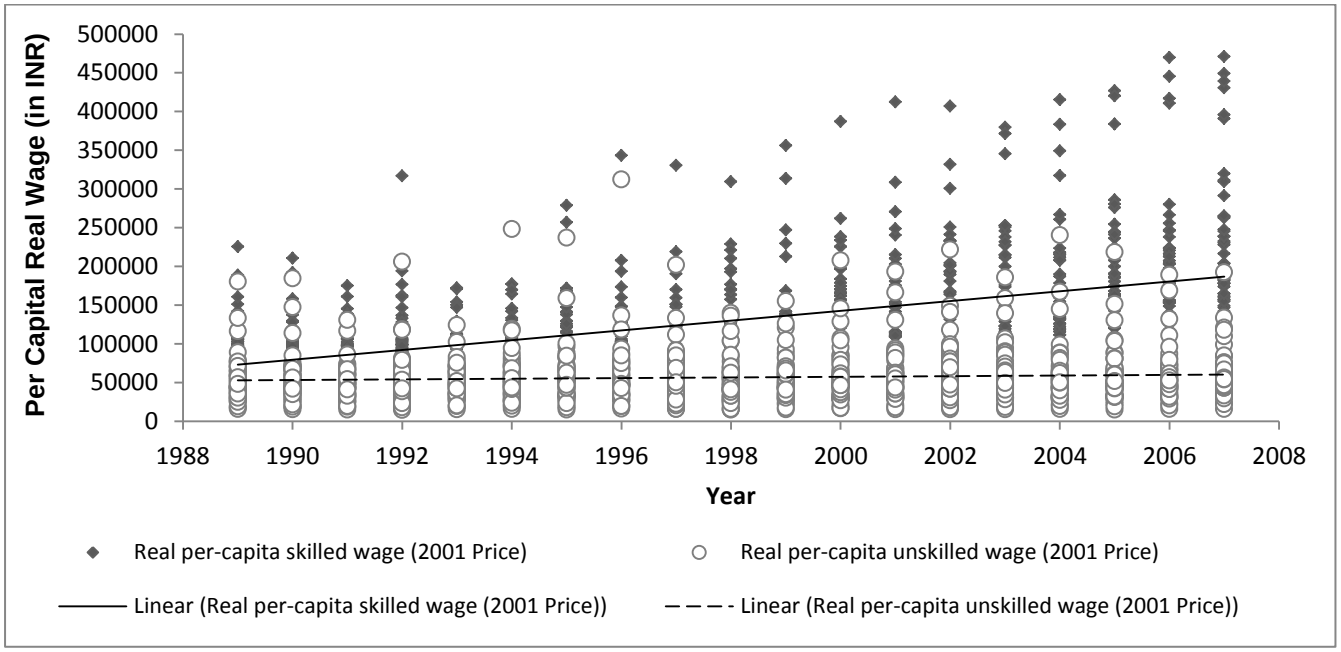

Figure 2: Trend in the Skilled-Unskilled Wage Ratios for 55 Industries in 1989-2007

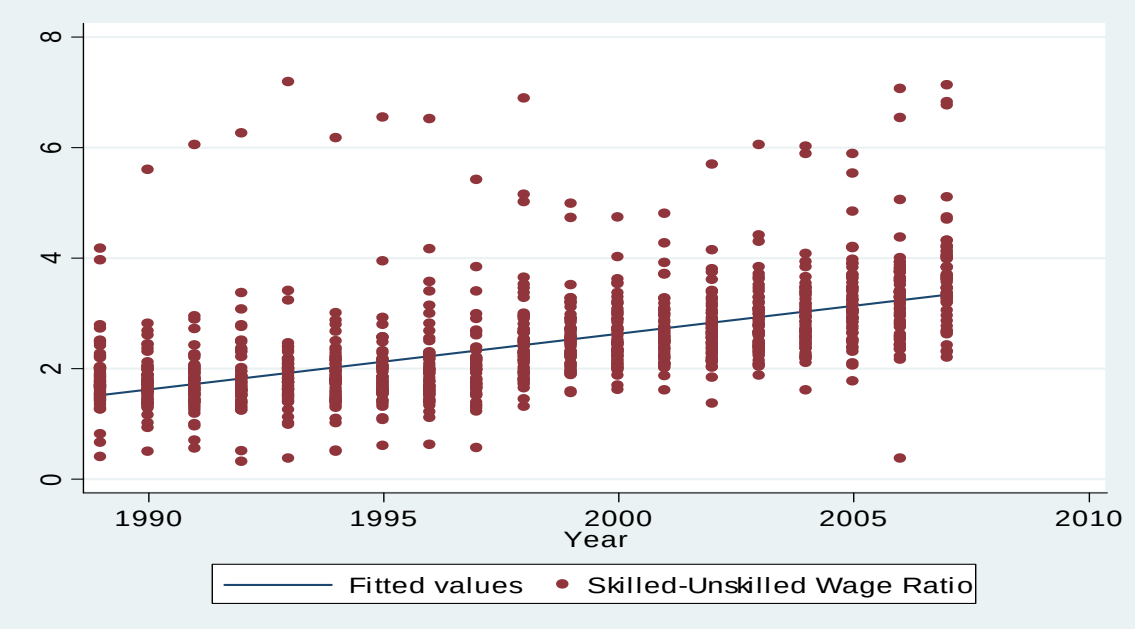

Figure 3: Gini coefficients for various manufacturing industries with different technology sophistications

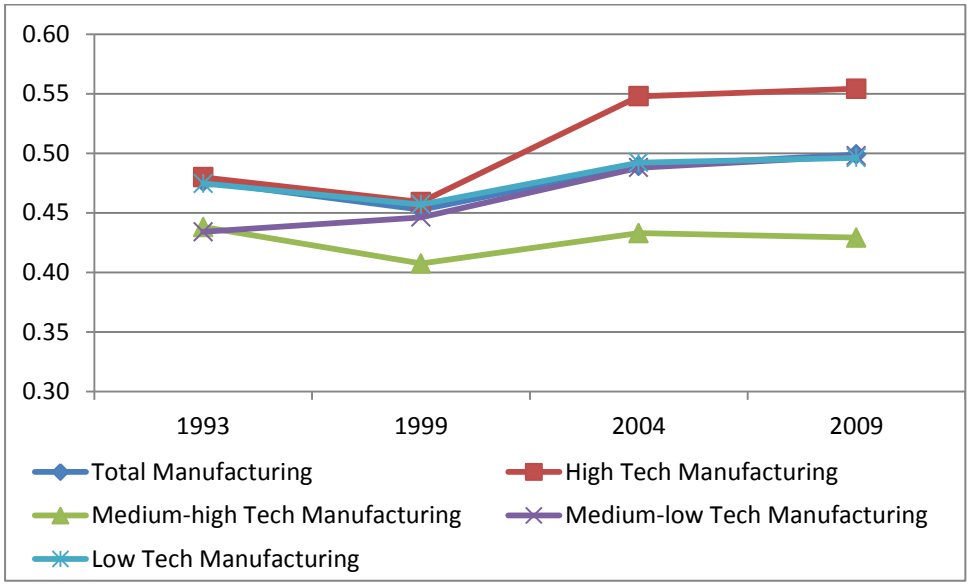

Figure 4: Trend in the Ratios of 90 Percentile to Median income for 36 Industries in 1994-2007

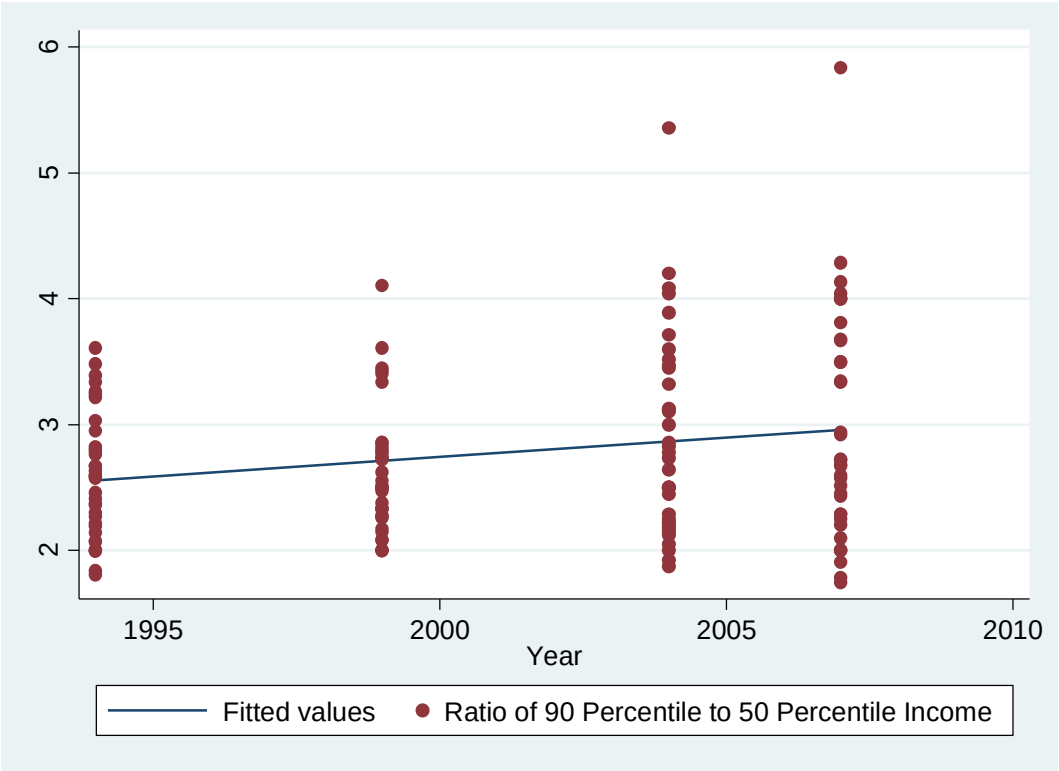

Figure 4 presents the trend of the ratio of 90th percentile to median wage, which shows and increasing trend, this implies that the middle income group (median wage earners) are worsen off relative to high income group (90th percentile).It is interesting to note from the Graph 5 where we plotted the wage inequality measured by the ratio of 90 percentile to 10 percentile wage income shows almost no changes over the period of 1993-2009. This tells us the two extreme poles of the wage distribution do not change relative to each other; so, we see no polarization in the wage distribution *per se*. The Graph 6 which presents the ratio of the median to the 10th percentile income shows a declined trend in this wage inequality measures. If we assume the downward wage rigidity of wages lower wage earners, at least for the 10 percentile wage income groups, there must be a decline in the wages for the median wage earners to support the decline trend of the wage inequality measured by the ratio of median income to 10th percentile income. This argument is supported by the regression analysis in the next section.

Figure 5: Trend in the Ratios of 90 Percentile to 10 Percentile incomes for 36 Industries in 1994-2007