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IS DIRECTION OF TRADE RESPONSIBLE FOR WAGE INEQUALITY IN INDIA? AN EMPIRICAL VERIFICATION[1]

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Abstract

The present study analyses the impact of direction of trade on wage inequality in Indian economy and therefore attempts to empirically test the validity of the HO-SS (Heckscher-Ohlin-Stopler-Samuelson) theorem and the model given by Davis (1996). This study employs different specifications of semi log linear multiple regression model for the analysis. To minimize the problem of multicollinearity, principal component analysis has been used. The empirical result of the present study rejects the proposition of both the models. In other words India's trade with developed and developing countries leads to increase in wage inequality.

I. INTRODUCTION

Economic reforms were adopted in developed or developing countries with a predetermined objective that via integration of the domestic country with the rest of the world will result in increase in the growth rate , increase productivity on one side and reduces intra and inter country income inequalities as well as wealth inequalities on the other side. It was thought that Hecksher-Ohlin-Stopler-Samuelson (HO-SS) framework would be bringing egalitarian trend. Over the years, liberalization has benefited all the countries in the form of expansion of market, by increasing the inflow of capital, by creation of jobs by Multi-National Companies/Trans-National Corporations (MNCs/TNCs) and through transfer of knowledge and import of advanced technology. However, it is seen that it has not only widened intra and inter country inequality (See for detailed discussion O' Rourke 2002) but also has created some negative social effect[2]. Thus, it is very important to give balanced view about benefits and the problems of the liberalization. It is also necessary to figure out who is the winner and who is the looser in order to make a balanced policy decisions. So the present study is intended to address this real world economic problem.

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A number of studies have been conducted in the past for developed countries particularly for US, UK and Latin American countries to answer the question, who is responsible for widening wage inequality between skilled and unskilled labors (See for example Haskel and Slaughter (2001, 2003); Tombazos (1999); Haskel and Heden (1999); Berman, Bound and Machin (1998); Autor, Katz and Kruger (1998); Khan and Lim (1998); Sachs and Shatz (1994); Haskel and Szymanski (1993); Bound and Johnson (1992); and Katz and Murphy (1992) among others) ? Though, there is no consensus among researchers, but most of them have found that Skilled Biased Technological Change (SBTC) is mainly guilty and the effect of trade on wage inequality is either negligible or zero; even if the effect of trade on wages is high, it is found that these effects are counter balanced by the effect of SBTC (See, Haskel and Slaughter (2001); Berman, Bound and Machin (1998); Autor, Katz and Kruger (1998); Khan and Lim (1998); and John bound and George Johnson (1992) among others).

Recently, the focus of researchers has shifted towards developing countries and a limited number of researches are available for India and for other developing countries. These studies have applied econometric techniques and have found conflicting results.

India offers interesting case to study the effects of globalization- measured in the form of trade and Foreign Direct Investment (FDI) inflow- on wage inequality due to the following important reasons.

- Since mid 1980s, the Government of India (GOI) implemented a number of far reaching economic policy reforms in the domestic sector as well as external sector. Domestic sector reforms constitute industrial deregulation, introduction of Competition Act (2002), Competition (Amendment) Bill 2007, privatization, disinvestment, financial sector reform etc. and external sector reforms constitute trade policy reforms, exchange rate reforms, and investment reforms (i.e., FDI allowance).
- Although the reforms initiated (marginally) in mid 1980s were endogenous, the major reforms implemented in 1991 were exogenous as these were brought to solve the Balance of Payment (BOP) crisis under International Monetary Fund (IMF) conditionalities.

I.I. India's Experience during 1980s and 2000s

India's experience during last three decades can be analyzed as follows:

- Widening wage inequality between skilled and unskilled labor (but in case of gender wage inequality there is no consensus among researchers). For example study by Dutta and Reilly (2008) finds little evidence that openness is an important determinant of the industry level pay gaps but study by Menon and Rodgers (2008) finds that increasing openness to trade is associated with gender pay gaps.
- Supply of skilled labors (i.e., number of educated peoples inclusive of males and females) as well as demand (i.e., share in employment) for skilled labors

has also increased. For example Bishwanath (2009) found the increased employment elasticity of workers in post reform period that shows that in post reform period demand for skilled labors has increased.

- Wage inequalities among states, among urban and rural areas, across job types, and between older and younger age groups who are not college educated have increased (See for details Mukherjee (2007) for occupational, spatial and across jobs wage inequality and for inter-state disparity see Ghose and Roy (2007), and Aggarwal (2007)).
- The value and volume of trade has increased considerably, but composition and direction of trade has got changed.[3]
- Inflow of FDI has also increased in both absolute and relative terms (i.e. FDI as percentage of Gross Domestic Product (GDP)).[4]
- Percentage expenditure of firms on in-house R&D expenditure has also increased both in absolute and relative terms (i.e., R&D expenditure as percentage of sales).[5]
- Immigration also has increased (particularly illegal). For example Yabuuchi and Chaudhuri (2007) and Chaudhuri (2008) have discussed that developing countries including India are facing the problem of illegal immigration of people (particularly unskilled labor) from neighboring poor countries.
- Bargaining power of unions has decreased because of reduction in the membership of unions (For detailed analysis see Mathur and Mishra (2007)).

I.II. Objective of the Study

The main objective of this study is to identify the factors affecting the wage inequality and to examine whether the direction of India's trade is responsible factor for widening wage inequality.

I.III. Definition

In this study ex-post measurable and objective definitions (like FDI inflow as a ratio GDP, total trade as a ratio of GDP etc.) of globalization has been used and wage inequality has been defined using occupational criteria.

II. LITERATURE REVIEW

This section is organised in to two subsections. First sections discusses about the basic HO-SS model and second section discusses about the alternative explations put forward by the ecnomists recently.

II.I. Basic Theory

Under Hecksher-Ohlin (H-O) model, the Stopler-Samuelson (S-S) theorem was the first theoretical formulation to explain the effects of free trade on income distribution

among productive factors. The basic result of HO-SS model is that, protection increases the relative return to the factor scarce in the country- labor in developing country and capital in developed country or unskilled labor in developing country and skilled labor in developed country. Therefore, when liberal trade is allowed between developed and developing country, prices of unskilled labor intensive (exported) products should increase the wages of unskilled workers and the prices of skilled labor intensive (imported) products should decrease the wages of skilled workers in developing country. So, this implies that wage inequality should be reduced in the developing country due to opening of the home country for trade with developed country. This also implies that prices of skilled factor will increase in developed country via increase in the prices of skilled labor intensive commodity and prices of unskilled factor will fall due to the same reasoning in developed country so opening of developed country for trade will increase wage inequality. However, empirical evidence has turned against this conventional wisdom and has drawn attention to the alternative mechanisms through which the trade openness has affected the wage inequality.

II.II. Alternative Explanations

An extension of the above (HO-SS) model considers capital, unskilled and skilled labor as relevant factors of production. However, in these types of model, capital skill complementary is one underlying assumption. It was originally proposed by Rosen (1968) and Griliches (1969) and has been recently explored by Goldin and Katz (1998), Machin and Reenen (1998) and more recently by Krusell et al. (2000) and Acmoglu (2003). This assumption is based on the argument of Wood (1995) that is trade liberalization results in "defensive innovation". This implies that greater competition from foreign firms in Less Developed Countries (LDCs) will force the domestic firms either to engage in R&D (Research and Development) or to adopt new and advance technologies through import in order to secure their market share in the domestic as well as international market.

Trade liberalization has encouraged the inflow of Foreign Direct Investment (FDI). Thus, the effects of FDI on demand of the skilled labor and on wage inequality are more direct. That is, FDI raises the demand for skilled labor in both developed and developing countries and increases wage inequality since FDI brings new technologies which are skilled biased (Berman, Bound, and Machine 1998). Even if technologies brought by FDI are factor neutral, the transition process of transferring and installing new technologies are skill biased (Pissarides 1997). So in all cases FDI will increase in wage inequality. However, Figni and Gorge (1999) have proposed inverted U hypothesis for FDI's effect on wage inequality.

Davis (1996) has developed a model in which the central hypothesis was that the availabilities of a country's factor of production should not be assessed in relation with the wider international economy rather it should be assessed with a group of countries with similar factor endowments. In this model, trade liberalization can increase the demand for skilled labor in a developing economy as long as among

the countries of its cone, it has relatively high supply of skilled labor. Therefore, a country from a cone where there is greater supply of skilled labor can experience a reduction in wage inequality. The reduction in the prices of products produced in developed country has no effect on the prices of the factors of production in developing country, since they do not produce the same goods.

Model developed by Feenstra and Hanson (1997) shows that the increase in wage inequality in developed and developing country is consistent with FDI flow from developed to developing country. Since, FDI inflow changes the structure of the production; their model assumes the production of a simple final good that requires a continuum of intermediary goods with varying proportions of skilled and unskilled labor. The cost of the production of the final good was assumed to be smaller in developing countries than in the developed countries and assuming that capital returns are higher in developing countries, when trade liberalization takes place in developing countries there will be transfer of capital or FDI from developed to developing countries, this increases the demand of skilled worker in both countries and thereby resulting in wage inequality.

Acemoglu (2002, 2003) has developed a model of endogenous technological change. In this model, increasing supply of skilled labor induces SBTC through the market size effect. That is greater demand for skilled intensive good by consumers or educated labors will increase the profitability of skilled intensive good and thereby encourage SBTC.

Domestic institutions like Job Security Regulations (JSRs) are argued to be important determinants of industry performance like productivity, profits, and employment during liberalization era. However, the impact of these regulations on wage inequality has not been addressed yet adequately. While these regulations can restrict the firms' ability to adjust the skill mix in response to the trade openness.

The study by Chamarbagwala (2006) has investigated the effects of trade liberalization on wage inequality. Since the author used NSSO data therefore in this case wage inequality is defined as the wage gap between the high educated and the low educated workers. This study used the approach developed by Katz and Murphy (1992). This approach is based on the supply and demand framework.

The result of the study supports the argument that domestic and external sector reforms have created more white-collar jobs. That is, reforms have created jobs for those who were ready to upgrade their skills.

Study by Berman, Bound and Griliches (1994) developed a different decomposition approach in this area. Though they also found that within industry component dominates the between industry components in both cases of the employment and the wages. However, they found that for the last period -1979 to 1987 – between industry components plays a major role. Next, the study decomposes within and between industry components into within-between sectoral components. The authors have taken consumption, export, import and defense as sectors. They found that most of acceleration in the proportion of nonproduction workers/skilled

workers wages in the particular industry and acceleration in the share of employment in the particular industry were due to within skill upgrading. Thus the results found to be favoring SBTC hypothesis.

To validate the decomposition findings and give more insights they carried out regression analysis on different specifications and found similar results as they derived from decomposition approach.

Study by Kijima (2006) analyzed the changes in the overall wage inequality distribution of urban in India during 1980s and 1990s. Furthermore, it also identifies the causes of the changing wage distribution in urban India during the period of 1983 to 1999. To analyze the data the author has compiled the data in percentiles and the wage inequality was measured by the wage differential between 90^{th} and 10^{th} percentiles of wage distribution. The author found that this differential started increasing in 1980s but during the reform era of the 1990s it has increased at rapid rate. It was also found that wage inequality grew faster after 1993 than before 1993. This difference was due to wage inequality above median deteriorated more rapidly after 1993. To explain the causes of these differentials the study followed the approach developed by Juhn, Murphy, and Pierce (1993). The author found an interesting result that the factor responsible for wage inequality was different in two periods. The author found that increasing wage inequality between observed skills (such as schooling and working experience) was a major contributor to the increase in wage inequality in 1980s on the other hand the rise in returns to observed skills (particularly tertiary education) increased the wage inequalities in 1990s. Using the given result of the decomposition, the author examined the causes of increased skill premium. The author found that the effect of demand shift was greater than the effects of supply shift. This demand shift for skilled workers was due to SBTC measured by within industry demand shifts. Trade reforms measured by between industry shifts of skilled workers was only a minor contributor to increase in demand for skilled workers.

In this study the author focused on wage distribution of urban male workers by arguing that, since female workers participation in labor force in only 20 percentages so, it will not affect the main result. But if female workers participation in skilled workers is high it will definitely affect the result (Dutta. 2008).

Kumar and Mishra (2008) used this approach to measure the impact of trade reforms. They followed the approach of Goldberg and Pavnick (2004) in order to explain variation in wages and trade policy measures (tariff and other measures) across industry and over time to identify the impact of trade on the wages. They used two stage estimation technique. They found that the coefficient of tariff was negative and statistically significant. The coefficient of trade was not found to be statistically significant implying that it is not an important factor for increasing wage inequality.

Further they carried out sensitivity analysis to check the robustness[6] of the result reported for coefficient of tariff. They found that effect of tariff on wage inequality is robust with inclusion of exchange rate measure.

It is noteworthy that there are other ways through which trade can affect the wage inequality, for example the unionization, the contemporaneous real import and export flows, the minimum wage, and the immigration as mentioned by Pinelopi Koujianou Goldberg and Nina Pavcnik (2005). The effects of these ways on the wage inequality have not been analyzed by this study.

Dutta (2007) followed the almost similar approach. She used the two steps model for the selection and the wage determination. First, she used the Multinomial Logit (MNL) model. Then she followed the two stage regression technique used by Kumar and Mishra (2008) but then she used two regression techniques namely Ordinary Least Squares (OLS) and Weighted Least Squares (WLS). She found that the coefficient of tariff was positive and significant which indicates that wage inequality is increasing.

Further, she carried out the sensitivity analysis to check the robustness of the result reported for the tariff. She found that the coefficients of the tariff was robust with respect to the inclusion of no-exemption tariff measure and the other alternative measures like- the contemporaneous real import and export flows, the import and export shares, and the import penetration and the export intensity.

The interesting thing is that where Kumar and Mishra (2008) finds tariff as a variable which decreases wage inequality Dutta (2007) finds tariff increases wage inequality.

Mullen and Panning (2009) used cost share equation as used by Berman, Bound, and Griliches (1994) in spirit of Feenstra and Hanson (1999). The period of analysis of this study was 1997-2002. The authors modified cost share equation by adding two regressors' namely technical progress and outsourcing. The same cost share equation was used to explain variation in the employment also.

For the estimation in this study the Generalized Least Square (GLS) technique has been used where the industries were weighted by the value added shares of the industries. They have used different models in the sense that each model either include or exclude different variables and/or variable definitions.

They found that output increases the share of unskilled workers, capital skill complimentarity do not exist i.e. more investment in capital do not increase the share of skilled workers while off shoring not only increases the wage inequality but also decreases employment of unskilled workers. Also domestic investment on research and development activities increases wage inequality.

II. METHODOLOGY, DATA AND MODEL DESCRIPTION

The present study employs the model developed by Berman, Bound and Griliches (1994) and later it is used by Machin and Reenen (1997), and Mullen and Panning (2009). This model is derived from translog cost function. The cost function assumed to be quasi fixed as capital is assumed to be fixed and both production and nonproduction workers are treated as variable. Translog variable cost function can be written as:

$$\ln(CV) = \alpha_1 + \alpha_y \ln(Y) + \sum_i \alpha_i \ln(W_i) + \beta \ln(K) + .5_{yy} \ln(Y)^2 + .5 \sum_i \sum_j \gamma_{ij} \ln(W_i) \ln(W_j) + .5\delta \ln(K)^2 + \sum_i \rho Y_i \ln(Y) \ln(W_i) + \sum_i \rho_i \ln(W_i) \ln(K) + \pi \ln(Y) \ln(K) \quad (1)$$

where CV represents variable costs, Y is value added, the W's represent unit costs of the variable factors and K represents capital. Cost minimization implies share equations of the form

$$S_i = \alpha_i + \rho Y_i \ln(Y) + \sum_j \gamma_{ij} \ln(W_j) + \rho_i \ln(K) \quad (2)$$

Given that $\Sigma S_i = 1$ and the symmetry and homogeneity restrictions, only one of the two share equations required to be estimated. Using the restrictions of constant returns to scale assumption the wage bill share equation for unskilled workers can be written as:

$$SUWW = \alpha_1 + \alpha_2 \ln(Y) + \alpha_3 \ln\left(\frac{w^{usk}}{w^{sk}}\right) + \alpha_4 \ln\left(\frac{K}{Y}\right) + \varepsilon \quad (3)$$

The specifications of the models used in the present study are:

$$SUWW_t = \alpha_1 + \alpha_2 \ln\left(\frac{K}{Y}\right)_t + \alpha_2 \ln Y_t + \alpha_3 \ln\left(\frac{w^{usk}}{w^{sk}}\right)_t + \alpha_4 \ln\left(\frac{TT}{GDP}\right)_t + \alpha_5 \ln\left(\frac{FDI}{GDP}\right)_t + \varepsilon_t \quad (4)$$

$$SUWW_t = \alpha_1 + \alpha_2 \ln\left(\frac{K}{Y}\right)_t + \alpha_2 \ln Y_t + \alpha_3 \ln\left(\frac{w^{usk}}{w^{sk}}\right)_t + \alpha_4 \ln\left(\frac{TTDCs}{GDP}\right)_t + \alpha_5 \ln\left(\frac{FDI}{GDP}\right)_t + \varepsilon_t \quad (5)$$

$$SUWW_t = \alpha_1 + \alpha_2 \ln\left(\frac{K}{Y}\right)_t + \alpha_2 \ln Y_t + \alpha_3 \ln\left(\frac{w^{usk}}{w^{sk}}\right)_t + \alpha_4 \ln\left(\frac{TTLDCs}{GDP}\right)_t + \alpha_5 \ln\left(\frac{FDI}{GDP}\right)_t + \varepsilon_t \quad (6)$$

where SUWW is share of unskilled workers to total wages, K/Y denotes capital output ratio and TT/GDP measures ratio of total trade to gross domestic product and finally FDI/GDP measures ratio of foreign direct investment to gross domestic product. Similarly to analyze the impact of direction of trade on wage inequality variable TT/GDP is replaced by variable TTDCs/GDP and TTLDCs/GDP in next two models. Where TTDCs denotes trade with developed countries and TTLDCs denotes trade with developing countries.

This study has used time series data from 1980-81 to 2005-06. Data Sources for the study are EPW-CD Rom (Vol-II), ASI Factory sector, Hand book of statistics (RBI), Indian economy database (Vol-II), WDI, and UNCTAD.

Wage inequality in this study is measured by share of unskilled workers (and unskilled workers are taken as non production workers) in total workers, output has been measured by ratio of net value added to Gross Domestic Product, capital output ratio has been measured by a ratio of Gross Fixed Capital Formation to net value added, openness has been measured by ratio of total merchandise trade to Gross Domestic Product and by ratio of inflow of foreign direct investment to Gross Domestic Product.

However, principal component analysis has been done due to problem of multicollinearity between ratio of total merchandise trade and Gross Domestic Product and ratio of foreign direct investment to Gross Domestic Product, between ratio of total trade with developed countries to Gross Domestic Product and ratio of foreign direct investment to Gross Domestic Product, and between ratio of total trade with developing countries to Gross Domestic Product and ratio of foreign direct investment to Gross Domestic Product. Variance inflation factor (VIF) was ranging from 8.0 to 20.0 in some cases and condition index was ranging from 30.0 to 100.00[7]. By applying principal component analysis and using Eigen value criteria (>1) and scree plot criteria two factors were extracted, namely domestic factors and external factors and to avoid cross loadings between components or factors Varimax rotation with Kaiser Normalization was used.

IV. DATA ANALYSIS AND FINDINGS AND CONCLUSIONS:

Table 1 clearly shows that there may be problem of multicollinearity among ratio of wages of unskilled workers to skilled workers, TT/GDP and FDI/GDP and capital output ratio, and between FDI/GDP and TT/GDP.

Table 1
Correlation Matrix

Correlation	*LRNVATGDP*	*LRGFCFTNVA*	*LRWUWTSW*	*RFDITGDP*	*RTTTGDP*
LRNVATGDP	1.00	0.431	0.471	-0.121	-0.111
LRGFCFTNVA	0.431	1.00	0.659	-0.436	-0.536
LRWUWTSW	0.471	0.659	1.00	-0.781	-0.887
RFDITGDP	-0.121	-0.436	-0.781	1.00	-0.851
RTTTGDP	-0.111	-0.536	-0.887	-0.851	1.00

So, to avoid problem of multicollinearity principal component analysis has been performed and the factors extracted are presented in table2.

Table 2
Total Variance Explained

	Initial Eigenvalues			*Extraction Sums of Squared Loadings*			*Rotation Sums of Squared Loadings*		
Compo-nent	*Total*	*% of Variance*	*Cumula-tive %*	*Total*	*% of Variance*	*Cumula-tive %*	*Total*	*% of Variance*	*Cumula-tive %*
1	3.243	64.856	64.856	3.243	64.856	64.856	2.789	55.774	55.774
2	1.083	21.667	86.522	1.083	21.667	86.522	1.537	30.749	86.522
3	0.466	9.316	95.839						
4	0.171	3.415	99.254						
5	0.037	0.746	100.00						

Extraction Method: Principal Component Analysis.

Table 2 shows that total variance explained by the two factors extracted is 86.168% which is good enough to carry out analysis. Table 3 shows rotated salutation of the components or factors. The values given under the column of components are factor loadings. Factor loadings values indicates that output, capital-output ratio, and ratio of wages of skilled to unskilled workers are coming under component two; this component has been named as domestic factors and ratio of FDI to GDP and ratio of total trade to GDP is coming under factor one; this factor is named as external factors.

Table 3
Rotated Component Matrix

	Component	
	1	*2*
LRNVATGDP	-0.004	0.948
LRGFCFTNVA	-0.518	0.635
LRWUWTSW	-0.847	0.471
RFDITGDP	0.931	-0.052
RTTTGDP	0.968	-0.104

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

One more important thing is that loading of variable output is high domestic factor indicating that output is most important variable which affects wage inequality similarly in external factor loading of ratio of total trade to GDP is high indicating that it is most important variable in external factor. The goodness fit of the model is presented in table 4(1), 4 (2).

Table 4(1)
Model Summary

	Model Summary[b]				
Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	0.969(a)	0.939	0.933	0.07339	1.905

a. Predictors: (Constant), factor score of external factor, factor score of domestic factor
b. Dependent Variable: SUWW

Table 4(2)
ANOVA

ANOVA(b)						
Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	0.055	2	0.028	176.193	0.000(a)
	Residual	0.004	23	0.000		
	Total	0.059	25			

a. Predictors: (Constant), factor score of external factor, factor score of domestic factor

b. Dependent Variable: SUWW

Table 5
Regression Results Coefficients

Regressions Results Coefficients(a)								
Model		*Unstandardized Coefficients*		*Standardized Coefficients*			*Collinearity Statistics*	
		B	*Std. Error*	*Beta*	*t*	*Sig.*	*Tolerance*	*VIF*
1	(Constant)	0.603	0.002		245.951	0.000		
	Factor score of external factor	-0.041	0.002	-0.844	-16.360	0.000	1.000	1.000
	Factor score for internal factor	0.023	0.002	0.475	9.206	0.000	1.000	1.000

a. Dependent Variable: SUWW

The empirical estimate presented in table 5 indicates that the external factors has not only negative impact on share of wages of unskilled workers but also their negative impact is found to be higher(-.041) than the positive impact of domestic factors(.024) on share of unskilled workers.

The table 6 shows the indication of multicollinearity among same set of variables.

Table 6
Correlation Matrix

Correlation	*LRNVATGDP*	*LRGFCFTNVA*	*LRWUWTSW*	*RFDITGDP*	*LRTTDCsTGDP*
LRNVATGDP	1.00	0.431	0.471	-0.121	0.335
LRGFCFTNVA	0.431	1.00	0.659	-0.436	-0.268
LRWUWTSW	0.471	0.659	1.00	-0.781	-0.568
RFDITGDP	-0.121	-0.436	-0.781	1.00	0.745
LRTTDCsTGDP	-0.335	-0.268	-0.568	0.745	1.00

So, to avoid problem of multicollinearity again principal component analysis has been done and following two factors has been extracted namely domestic and external factors respectively. The cumulative variance explained by the two factors is 86.107% and presented in table 7.

Table 7
Total Variance Explained

	Initial Eigenvalues			*Extraction Sums of Squared Loadings*			*Rotation Sums of Squared Loadings*		
Component	*Total*	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	2.832	56.650	56.856	2.832	56.650	56.650	2.430	48.605	48.605
2	1.473	29.457	86.107	1.473	29.457	86.107	1.875	37.502	86.102
3	0.466	9.314	95.421						
4	0.153	3.068	98.489						
5	0.076	1.511	100.00						

Extraction Method: Principal Component Analysis.

Table 8
Rotated Component Matrix

	Component	
	1	*2*
LRNVATGDP	0.191	0.933
LRGFCFTNVA	-0.417	0.710
LRWUWTSW	-0.719	0.633
RFDITGDP	0.890	-0.255
LRTTDCsTGDP	0.954	0.188

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Here, it is clear from table 8 that loading of variable TTLDCs/GDP is comparatively higher than the previous case in factor two which has been named as external factor. Loading of output has fallen marginally and loadings of capital-output ratio and ratio of wages of skilled to unskilled workers has increased marginally in factor two which has been named as domestic factor.

Table 9 presents the goodness of fit of the model 9 (1) and 9 (2).

Table 10 reveals that negative value of external factor (-.035) is higher than the positive value of domestic factor (.031). It can be inferred that increase in wage inequality is due to external factors which are over compensating the positive impact created by the domestic factor on share of unskilled workers.

Table 9(1)
Model Summary

Model Summary[b]

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	0.958(a)	0.918	0.910	0.01450	1.811

a. Predictors: (Constant), factor score of external factor, factor score of domestic factor

b. Dependent Variable: SUWW

Table 9(2)
ANOVA

ANOVA[(b)]

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	0.054	2	0.027	128.047	0.000(a)
	Residual	0.005	23	0.000		
	Total	0.059	25			

a. Predictors: (Constant), factor score of external factor, factor score of domestic factor

b. Dependent Variable: SUWW

Table 10
Regression Results Coefficients

Regressions Results Coefficients(a)

Model		*Unstandardized Coefficients*		*Standardized Coefficients*			*Collinearity Statistics*	
		B	*Std. Error*	*Beta*	*t*	*Sig.*	*Tolerance*	*VIF*
1	(Constant)	0.603	0.003		212.073	0.000		
	Factor score of external factor	-0.035	0.003	-0.716	-11.961	0.000	1.000	1.000
	Factor score for internal factor	0.031	0.003	0.636	10.632	0.000	1.000	1.000

A. Dependent Variable: SUWW

Table 11 gives an indication of the problem of multicollinearity among the variables capital-output ratio and ratio of wages of skilled to unskilled workers, ratio of FDI to GDP and ratio of total trade with less developed countries to gross domestic product.

Table 11
Correlation Matrix

Correlation	*LRNVATGDP*	*LRGFCFTNVA*	*LRWUWTSW*	*RFDITGDP*	*LRTTDCsTGDP*
LRNVATGDP	1.00	0.431	0.471	-0.121	-0.119
LRGFCFTNVA	0.431	1.00	0.659	-0.436	-0.573
LRWUWTSW	0.471	0.659	1.00	-0.781	-0.889
RFDITGDP	-0.121	-0.436	-0.781	1.00	0.876
LRTTLDCsTGDP	-0.119	-0.573	-0.889	0.876	1.00

So, to avoid multicollinearity principal component analysis has been performed and two variables have been extracted. Cumulative variance explained by both factors is 86.852% as presented in table 12.

Table 12
Total Variance Explained

Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*			*Rotation Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumula-tive %*	*Total*	*% of Variance*	*Cumula-tive %*	*Total*	*% of Variance*	*Cumula-tive%*
1	3.258	65.160	65.160	3.258	65.160	65.160	2.798	55.955	55.955
2	1.085	21.693	86.852	1.085	21.693	86.852	1.545	30.898	86.852
3	0.467	9.337	96.189						
4	0.154	3.083	99.272						
5	0.036	1.728	100.00						

Extraction Method: Principal Component Analysis.

The rotated component matrix presented in table 13 shows that loading of trade with less developed countries is comparatively higher than the FDI in external factor (component one) and loading of output variable is comparatively higher than other variables loaded in domestic factor (component two).

Table 13
Rotated Component Matrix

	Component	
	1	*2*
LRNVATGDP	-0.004	0.946
LRGFCFTNVA	-0.512	0.640
LRWUWTSW	-0.843	0.475
RFDITGDP	0.939	-0.052
LRTTLDCsTGDP	0.972	-0.111

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Obtained two factors scores were regressed on the share of wages of unskilled labors.

Goodness fit of the model is presented in table 14 (1) and 14 (2).

Table 14(1)
Model Summary

Model Summary[b]

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	0.967(a)	0.935	0.929	0.01287	1.729

a. Predictors: (Constant), factor score of external factor, factor score of domestic factor
b. Dependent Variable: SUWW

Table 14(2)
ANOVA

ANOVA[(b)]

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	0.055	2	0.027	165.689	0.000(a)
	Residual	0.004	23	0.000		
	Total	0.059	25			

a. Predictors: (Constant), factor score of external factor, factor score of domestic factor
b. Dependent Variable: SUWW

Table 15
Regression Results Coefficients

Regressions Results Coefficients(a)

Model		*Unstandardized Coefficients*		*Standardized Coefficients*			*Collinearity Statistics*	
		B	*Std. Error*	*Beta*	*t*	*Sig.*	*Tolerance*	*VIF*
1	(Constant)	0.603	0.003		238.970	0.000		
	Factor score of external factor	-0.041	0.003	-0.840	-15.807	0.000	1.000	1.000
	Factor score for internal factor	0.023	0.003	0.480	9.029	0.000	1.000	1.000

A. Dependent Variable: SUWW

Table 15 gives a very interesting finding that score of external factor (-.041) in case of third model was found to be having similar impact as was in case one. This indicates that trade with developing countries found to be having larger negative

impact on share of wages of unskilled workers than the trade with developed countries.

V. CONCLUSIONS

This study finds that domestic factors are decreasing the wage inequality while external factors are playing major role in increasing the wage inequality. Though, it is difficult to interpret that in India, capital-skill complimentarity do not exist but it can be said that even if it exists its negative impact on share of unskilled workers is overcompensated by output and by ratio of wages of unskilled to skilled workers because the coefficient of domestic factor in all three cases was found to be positive.

As far as direction of trade is concerned it is found that trade with less developed countries or what we can call trade with developing countries is major variable affecting the wage inequality than the trade with developed countries. This empirical evidence contradicts the model of Davis (1996).

The limitation of this study is that India's trade with all developed countries and all developing countries has not been taken for analysis. Further, this study can be extended in the direction of industry wise and country wise analysis.

Notes

1. This study acknowledges to Prof. A.K.Rao, Prof. J. M.Reddy, Prof. V.N.Reddy for their valuable suggestions and finally Ms. Kavita Joshi for her kind help.

2. Increase in poverty, income and wealth inequality, wage inequality (measured in terms of either education qualification or occupational classification), and gender wage pay gaps etc.
3. Value of India's export and import has increased considerably over the period of planning. Export has increased from $1,269 million in 1950-51 to $ 8, 486 million in 1980-81 and further to $1, 55, 512 million in 2007-08. Import during the same period rose from $ 1,273 million to $15,869 and further to $2, 35, 911 million. India's trade with OECD was 78.0% in 1960-61 of the total trade which came down to 40.1% in 2006-07.
4. FDI inflow has increased from $129 million in 1991-92 to $7, 722 million in 2005-06.
5. Research and Development (R&D) intensity has increased to 0.33 percentage in1996-97 from 0.05 in 1990-91 and the payment for royalty and technical fees has increased from $ 25.1 million in 1985 to $ 200.8 million in 1998 and to $ 350.4 million in 2002 (Rashmi Banga, 2005).
6. Robust estimator is one that is insensitive to violation of any of the assumption made about the way in which the data is generated. Technically speaking when there is presence of outliers, leverage points, and influential observations we use robust estimators to check whether the sign and significance of the coefficients of interest variables are changing are not.
7. Results of multicollinearity are not being given here but it can be obtained from the authors by special request.

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