Effects of Foreign Direct Investment and Human capital formation on labour markets in India

Gunja Baranwal*

Dr.P.K.Das

Prof. Sugata Marjit

Corresponding Author

*Research Fellow, Centre for Studies in Social Sciences, Calcutta, R-1, B.P.Township, Calcutta, 700094, India. e-mail: baranwalgunja@gmail.com +91-7890059582

Abstract

Foreign Direct Investment (FDI) and human capital formation's interaction has strong implications for labour demand and supply factors in developing economies. Multi-national Enterprises invest in their employees through provision of training, direct technological diffusion through up-gradation, innovation and imitation. They also tend to affect the scale and composition of labour demand in economy. Indian economy has featured rising wage inequality and demographic dividend simultaneously since the last decade. Using panel data for 5432 firms and period 2000-2013 we attempt to assess the same for Indian manufacturing firms. We apply supply and demand framework of Katz and Murphy, 1992, TeVelde, 2002, to empirically test these effects on relative wage inequality of skilled to unskilled labour force. We observe the positively associated relative wages and employment suggesting the possible shifts in demand side factors. The elasticity of substitution between skilled and unskilled is also traced to be within admissible range. FDI is found out to stirring up wage inequality. While controlling for industry fixed effects we find FDI concentrated industries (Construction, telecom, automobile and chemical) account for increasing wage inequality in manufacturing industries compared to others. The results also suggest skill- biased technological change occurring in this period leading to increase in wage inequality. Furthermore we find that interaction between FDI and human capital raises wage inequality, though human capital itself is negatively associated with wage inequality. Thus the interaction is actually polarising the wages between different skill groups in India. The resulting idea is that patchy spread of investment and human capital will only result in uneven development.

Keywords: Foreign direct investment, Human capital, Labour demand, Labour supply, Wages

JEL codes: F24, J31, J24, J31.

Introduction

Inquiry into the growth drivers of countries has always been a major issue of research. Over the time these drivers have changed. Trade, Foreign Direct Investment (FDI) and human capital have emerged as the new factors causing growth of economies. Free capital mobility among the countries led to advent of Multinational Enterprises (MNE's)[1] in economies, thus providing a substitute to domestic investment. This FDI has the potential to affect the host country's macroeconomic variables like income, investment and employment (Borensztien et.al.1998; Gregario, 2003; Fry, 1993). FDI directly ameliorates production through better technologies, financial capabilities, and provision of state of the art (Luiz and Mello, 1999). It affects level of domestic investment via crowding in and crowding out effect (Agosin and Mayer, 2000).The indirect effects of FDI include spill-over effects (Kokko, 1994).Similarly human capital also has significant long run impacts on an economy's income and employment (Romer, 1986; Lucas, 1988; Barro, 1998, Pissarides,2000; Wilson and Briscoe,2004). Human capital formation takes place through on the job training, schooling, and other knowledge gained through experience and learning by labour force (Becker, 1974; Blundell, 1999). Investments in human capital affect wages (Constantine and Neumark,1994; Liu,2013). This stock of human capital determines the technological absorptive capacity of developing country (Nelson and Phelps, 1966; Benhabib and Spiegel, 1994). Human capital creates positive spillovers to economy(Acemoglou and Angrist,2000; Ciccone and Peri, 2002). FDI also affects the labour market through changes in employment and wage structure of labour force (Baldwin, 1995) ,leads to human capital formation through upgrading the skills of human capital of host countries by provision of formal training, schooling and spill-over effects of layoffs and turn overs of labour force from international firm to domestic firms (Michie,2001; Kapstien,2001; Miyamoto,2003; Ritchie,2002). However in the process, FDI demands specific kind of human capital thus also affects the wages of different levels of human capital (Feenstra and Hanson,1995; Figini and Gorg, 2006; Gorg and Stroble,2002).Thus these may be considered supply side and demand side effects of FDI on human capital formation process. On the supply side, FDI may affect the human capital formation in terms of

[1]We use the terms Foreign Direct Investment and Multinational Enterprises interchangeably henceforth.

skill up-gradation of labour force, thus contribute to supply of human capital. And on the demand side, FDI affects wages of different levels of human capital highly skilled, mid skilled and low skilled due to their demand for specific kind of skilled human capital. Both of these effects are crucial as they have long term consequences on labour force of economy. The significance of either effect is important in determining the overall effect of FDI in a country.

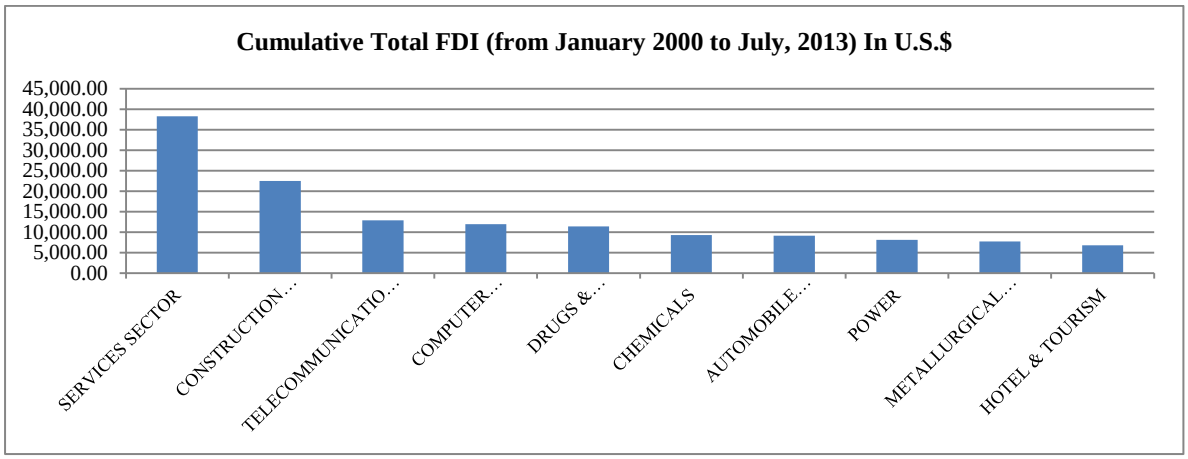
Trends of FDI and Human Capital Formation, Wage inequality in India

India remains the third most attractive destination for FDI, after China and the United States of America, for 2013-15, according to a survey of global companiesconducted by UNCTAD. Foreign Direct Investment in India has increased from $ 1,04,411 in year 2000-2001 to $ 6,96,011 in 2011-2012. The distribution of FDI inflow is concentrated in some sectors. Services, Construction, Communication, Drugs and Pharmaceuticals, Chemicals, Automobile Industry etc. are among the leading sectors which bag major share of FDI inflows. Similarly there is spatial clustering in spread of FDI as some economically advanced regions have accounted for the lion's share of FDI inflows. Top of them are in states of Maharashtra, Delhi, Tamilnadu, Karnataka, Gujarat and Andhra Pradesh. Whereas states like Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, Rajasthan and North- eastern region managed to receive none or only a meagre amount of FDI inflows. In literature there are several determinants responsible for this clustering like availability of quality labour force, size and growth of local markets, physical infrastructure, policy environment, business climate, and presence of agglomeration economies. (Mukherji, 2011;Goldar, 2007 ;Moriss,2007 ; Nunnenkamp and Stracke, 2007). Gross enrolment ratio in tertiary education of the country has increased with compound annual growth rate of 7.8% during 2001-2002 to 2007-2008 (Figure 3).[2]Similar trend is observed in spread of higher education clustered in southern states of Tamilnadu, Karnataka, Andhra Pradesh, Kerala but northern states like Bihar, Orissa, Uttar Pradesh, Madhya Pradesh being laggards. The composition of human capital is concentrated to some special courses with replacement of professional courses with general courses. (Figure 4) Wage inequality both on average and based on skills has also seen an

[2]Human Resource Development report, 2011.

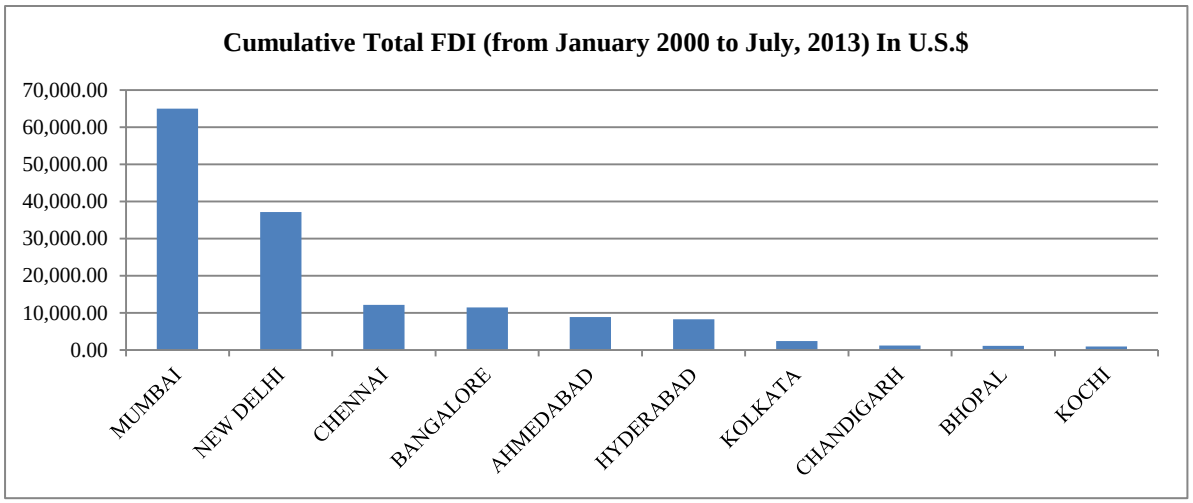
upwards trend since last decade. (Ramaswamy,2008; Chamarbagwala,2007; Mehta and Hasan,2011; Azam,2009 ; Mishra and Kumar,2005).

Figure 1: Sectoral clustering of FDI in India



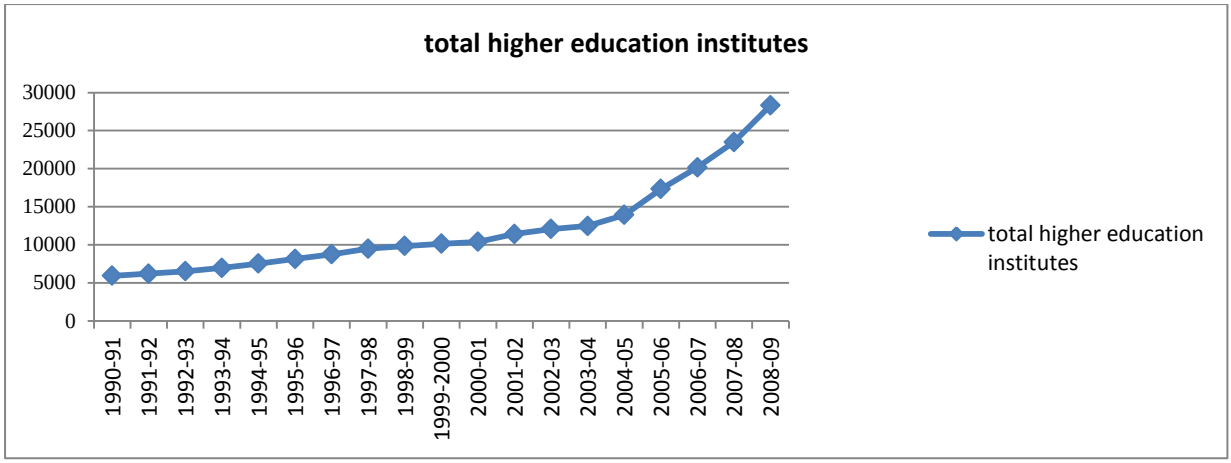
Source: SIA newsletters, DIPP, India

Figure 2: **Spatial clustering of FDI in India**



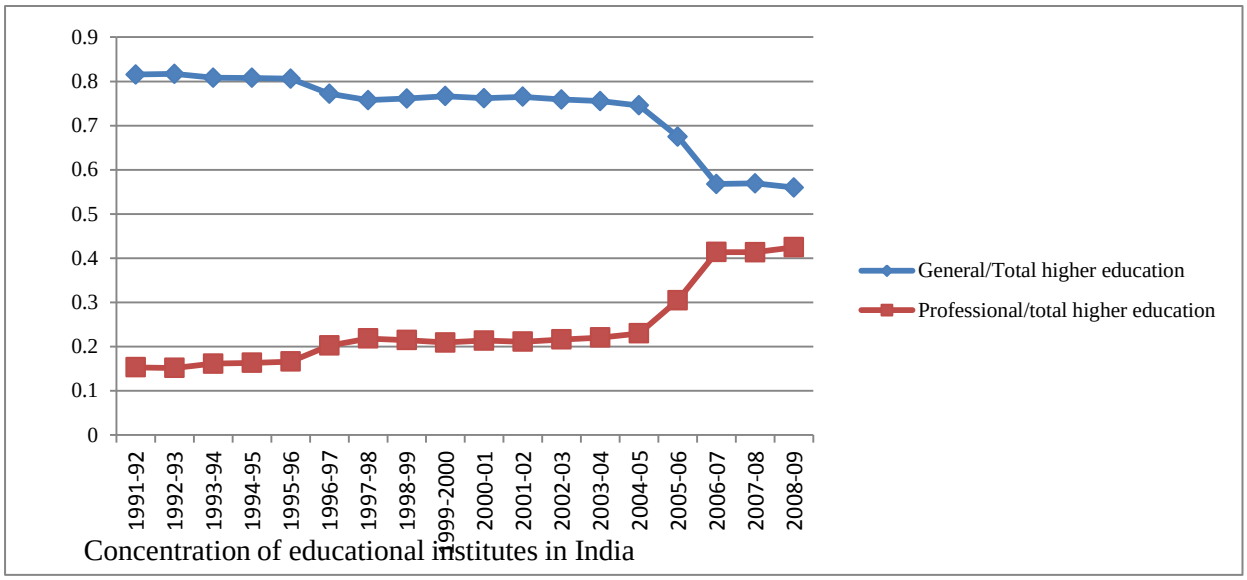
Source: SIA newsletters, DIPP, India

Figure 3: Human capital formation in India over the years



Source: All India Survey on Higher education, ministry of HRD, India.

Figure: 4 Clustering of human capital (higher education) in India



Source: All India Survey on Higher education, ministry of HRD, India

Theoretical Framework

We follow Katz and Murphy(1992) ,Velde and Morrissey (2002) and use the demand and supply framework to analyse the effects of FDI on relative wages. It can be represented by two factor CES production function with low skilled labour (U) and high skilled labour(S) as two inputs.

$$f(U_t, S_t) = \{\lambda(\psi_{Ut}U_t)^{\rho} + (1-\lambda)(\psi_{St}S_t)^{\rho}\}^{\frac{1}{\rho}} \quad \rho < 1 \qquad (1)$$

$$\varphi_{Ut} \equiv ln\psi_{Ut}\ ;\ \varphi_{Ut} = \gamma_{1U}t + \gamma_{2U}FS;\ \varphi_{St} \equiv ln\psi_{St};\ \varphi_{St} = \gamma_{1S}t + \gamma_{2S}FS \qquad (2)$$

Where $\varphi_{Ut} \equiv ln\psi_{Ut}$ and $\varphi_{St} \equiv ln\psi_{St}$ are functions of labour efficiency units, parameter $\rho < 1$. Labour efficiency index can be interpreted as accumulated human capital. The elasticity of substitution between U and S is $\sigma = 1/1-\rho$. The possible changes in technology may come through factors like FDI, skill biased technological change and interaction terms of foreign investment with firm level characteristics. These are some routes through which FDI can affect labour market. Using a demand and supply framework lets us separate the effects of demand side and supply side factors causing wage inequality. Holding supply constant, the effect of demand shiftorsare which cause the changes in wage inequality.These factors are factors like foreign direct investment, international trade, outsourcing, skill biased technological change.

The effect of foreign direct investment on wage inequality is well researched in literature.(Ramaswamy,2008; Banga,2005 ;Mehta and Hasan,2011; Azam,2009 ; Mishra and Kumar,2005; Feenstra and Hanson,1995; Figini and Gorg, 2006; Gorg and Stroble,2002).Thus our labour efficiency indices is a function of a time trend, t, share of foreign promoters in equity FS, (T.Velde, 2000) interaction terms like $FS * train, FS * royal, FS * RnD$ and host of firm level factors as training expenses, royality expenses, research and development expenses , size etc.Kutharia, 2001, empirically test the interaction term of foreign share and research and development indices. In order to assess the human capital formation process and use the maximum possible data available, we also test other interactions of FDI and royality and training expenses of the firms.

Solving for first order condition and keeping marginal productivity equal to factor prices, we derive the formula for relative wages of skilled-unskilled labour.

$$ln\left(\frac{w_{St}}{w_{Ut}}\right) = ln\left(\frac{1-\lambda}{\lambda}\right) - \frac{1}{\sigma} ln\left(\frac{S_t}{U_t}\right) + \frac{\sigma-1}{\sigma}\gamma_1 t + \frac{\sigma-1}{\sigma}\gamma_2 FS_t + \varepsilon_t \quad (3)$$

Where $\gamma_1 = \gamma_{1S} + \gamma_{1U}$ and $\gamma_2 = \gamma_{2S} + \gamma_{2U}$ thus wage inequality depends on a supply term (relative supply of high to low skilled labour, time trend (skill-biased technological change) and FDI (foreign shares). The sign of $\gamma_2$directs the effect of FDI on wage inequality. A positive γ_2 tends to increase wage inequality. The coeffiecient of γ_1 evidents the skill biased technological change.

Data:

The empirical exercise has been conducted using Prowess database published by Centre for Monitoring Indian Economy for the period from 2000-2013 for 13 two digit non-financial public and private limited manufacturing firmstrading on National Stock Exchange and Bombay Stock Exchange , fetching highest FDI. The industries included are Food (785 firms), Metal and Metal products (787 firms), Textile (665 firms), Chemicals (1010 firms), Communication (59 firms), Construction material (244 firms), Construction and real estate (394 firms), Consumer goods (250 firms), Diversified (141 firms), Machinery and Machine tools (533 firms), Mining (50 firms), Miscellaneous Manufacturing (315 firms) and Transport Equipment (303 firms). The earlier sample included 8422 firms in which 2987 firms had to be dropped due to discontinuity and missing data for several years. The result is an unbalanced sample of 5435 firms as our final sample.

Our estimated model (1) is:

$$ln\left(\frac{w_{Sit}}{w_{Uit}}\right) = \alpha_{ij} + \beta_1 ln\left(\frac{S_{it}}{U_{it}}\right) + \beta_2 t + \beta_3 FS + \gamma\ other\text{explanatory variables} + \varepsilon_{it} \quad (4)$$

Where"i"= firm and"t"= year

$$ln\{rlw\}_{it} = \alpha_0 + \beta_1 ln\{rlemp\}_{it} + \beta_2 FS_{it} + \beta_3 OI_{it} + \beta_4 OS_{it} + \beta_5\, train_{it} + \beta_6\, RnD_{it} + \beta_7\, royal_{it} + \beta_8\, K/L_{it} + \beta_9 FS * train_{it} + \beta_{10} FS * K/L_{it} + \beta_{11} FS * roy_{it} + \beta_{12}\, FS * RnD_{it} + \beta_{13} size_{it} + \beta_{14} size^2{}_{it} + \beta_{15} t + \varepsilon_{it} \qquad (5)$$

Paucity of firm level employer-employee data in India poses a strong challenge in testing our hypothesis. This leaves us with the alternative to create relative indices with all possible data available. We set our aforementioned supply and demand framework through demand and supply of labour. Labour demand is proxied by the relative changes in wages and labour supply through relative changes in employment. Thus, our dependent variable is relative price of labour that is the ratio of skilled to unskilled labour in a firm. We derive this indicator by deflating wages and salaries paid by firms in prowess data base to the average wages of rural sector[3]for men over the years at all India level provided by Labour Bureau. This creates our index of relative labour prices that we use for relative labour demand changes. Our main independent variable is relative quantity of labour. We create it by deflating the number of employees in firms from Prowess database by total number of persons engaged in agriculture industry in Two Digit Annual Survey of Industries database.[4]We define it relative quantity of labour in a firm to represent (or proxy) the relative labour supply changes. The coefficient of relative employment represents the inverse of elasticity of substitution between skilled and unskilled workers.

The table below explains all the variables used in model

[3]Rural sector includes activities like ploughing, sowing , weeding ,transplanting, harvesting, winnowing, threshing, picking, herdsmen, well digging, cane crushing, carpenter, blacksmith, cobbler, mason, tractor driver, sweeper and unskilled labourers. Labour Beuroue

[4]We required the micro level skill based data on wages and employment which is explicitly not available in India. Indian Agriculture sector still provides employment to major part of unskilled labour force. Thus, for unskilled labour we use the data of agriculture sector.

Variable Description of Variables	***Signs***
$ln\{rlw\}_{ijt}= \quad ln\left\{\frac{W_{Sijt}}{W_{Uijt}}\right\}$, relative price of labour, ratio of skilled to unskilled labour force in firms	
$ln\{rlemp\}_{ijt} = ln\left\{\frac{E_{Sijt}}{E_{Uijt}}\right\}$, relative quantity of labour, ratio of skilled to unskilled labour in firms	(-)
FS_{ijt}= equity share of foreign promoters in firms	(+)
OI_{ijt} = Total forex earnings+ Total forex spending/ Total Income , Openness Index of firms	(-)
OS_{ijt} =outsourced manufacturing jobs+ outsourced professional jobs/ Total sales of firms, Outsourcing by firms	(+)
K/L_{ijt}= Gross Fixed assets/ number of employees of firms	(+)
$train_{ijt}$ = training expenses by firms on their employees	(-)
$royal_{ijt}$= royality expenses by firms	(-)
RnD_{ijt} = Research and Development expenses by the firms	(+)
Interaction terms	
$FS * train_{ijt}$= Interaction Term1, FS * Training expenses by firms.	(+)
$FS * K/L_{ijt}$= Interaction term2, FS*Capital- Labour ratio of firms	(-)
$FS * roy_{ijt}$= Interaction term 3, FS * Royality expenses by firms	(+)
$FS * RnD$= Interaction term4, FS* Research and Development expenses	(-)
$size_{ijt}$= sales of firms	(+)
$size^2$= $size_{ijt}$*$size_{ijt}$ of firms	(-)

Variables Formation

Demand shift indicators

Foreign Direct Investment : Many studies attempted to find out the impact of FDI on development process of countries. The results are very different for developed and developing countries. We thus try assess the impact of FDI on relative wages of skilled and unskilled labour's price. We measure it by share of foreign equity in annual equaity shares of firms.(Aitken and harrison, ;Almeida,2002;

Arnold and Jevorcik,2009) Many studies use binary measure of private and foreign ownership at the expense of information. But the relation between foreign ownership is better approximated as linear than binary.(Bircan,2011)

Openness Index: Openness is the most researched indicator in literature to explain effect on wage inequality. (Ramaswamy,2008;) Our openness indicator is constituted by the ratio of sum total forexearnings total forex spending by the total income of the firms. Openness may lead to increase in demand for skilled labour force.

Outsourcing: Outsourcing of manufacturing and professional jobs also affects the demand for labour in the economy. (Feenstra and Hanson, 1996;) we create the indicator for outsourcing which is the ratio of sum of outsourced manufacturing jobs and outsourced professional jobs by total sales of firms. Thus it gives us firm level measure of outsourcing .

Skill Biased Technical change: It captures the effect that continuously growing technology has on labour force. The growing use of computers, information and communication technology, electronic machines raises the demand for skilled labour force to work with this technology. (Berman, Somanathan and Tan, 2005; Katz and Murphy,1992; Machin,2001)

Technological changes: All theses demand shifters lead to changes in capital labour ratio in production process of firms. (Hanson and Harrison, 1995;) .Our this indicator is formed by the ratio of gross fixed assets and number of employees.

Human capital Indicators: We use three indicators of human capital which may directly or indirectly lead to skill upgradation. On the job training, Research and development, royalitiespayment

.

On the job training: On the job training provided increases the supply of skilled labour force and therefore should affect the level of wages in economy by increasing the productivity of labour. (Tan and Batra, 1996, Mincer1991, Becker, 1974, Veum, 1995) Our measure of training is annual expenses

financed by firms on training their employees which upgrades the level of skills. It has been normalised by diving it by sales of firms.

Research and Development(RnD): It is an endogenous tool to innovation in new growth theory. Firms invest for accumulation of knowledge capital (Grossman and Helpman,1990;1994; Redding, 1996). This accumulation of knowledge capital increases the productivity and thus sharpens the skills of labour force. We use annual investment by the firms in research and development activities normalised by sales of firms.

Royalities: Imitationisanotherof human capital formation. Along with RnD activities firms also invest in purchasing already patented technologies. It increases the skill level indirectly by imitation of technologies. The indicator of royality payment is expenses by firms on royality payments normalised by sales of the firms.To our best knowledge, we do not find any other study which uses these different ranges of human capital and its effect on wage inequality especially with micro level data.

Interaction terms: In order to separate the role of foreign firms human capital formation from domestic process we use four interaction terms

FDItrain: This indicator looks at the direct effect of foreign firms on skill up gradation of employees by imparting them training. It is product of annual foreign share and training expenses by the firms. It affects the wages directly by increasing productivity of labour force.

FDIRnD: It shows the innovation practices made by the foreign firms in India. Theses foreign innovation practices lead to skill up gradation. It is a product of foreign share and research and development expenses by firms. (Kathuaria,2001;2008)

FDIroyalities: Foreign firm's also spend on purchasing technologies to imitate them. This variable reflects the indirect effect of imitation of technology on wages of labour. Foreign share and royalities payment make up this variable.

FDIkl: Another indicator of technological change brought about by the foreign firms is a product of foreign share and capital labour ratio of the firms. It shows the direct effect of foreign technology on wage inequality.

Size: we take the size of firms in all the specificationsin order to control for the firm specific characteristics. It is the total annual sales of the firms.

Size^2: This term is included to account for the non- linarites' in firm specific indicators. It is a square term of size of firms.

Interpretation:

In this section, we estimate equation (1) for the panel of 13 manufacturing industries and 5435 firms. In order to use all the available information, we estimate unbalanced panel by Fixed effects and Maximum likelihood method. We impose the constant β_1 (the inverse of elasticity of substitution between skilled and unskilled workers) across all firms. After controlling for industry specific fixed effects we also impose similar time trend. The elasticity of substitution is found out to be{–(1/0.40)} = -2.5 in first model. It connotes that one per cent increase in employment of skilled labour lifts wage inequality by 4 per cent. The coefficient of responsiveness of relative wages to relative employment is positive which suggests the possibility of demand side effect in raising wage inequality. The positive effects imply simultaneous changes in relative wages along with the changes in relative employment. The range of elasticity of substitution is -1.63 to -2.85 in different specifications estimated.[5] Other exogenous factor stimulating wage inequality is skill -biased technological change that increases the relative demand for skilledlabour. The coefficient of time trend indicates 0.15 per cent per annum increase in relative wages in Indian manufacturing firms. (Berman et.al, 2010) We also test for other structural factors about this time trend. We include factors

[5]Dasgupta and Goldar, 2005,using NSSO data find negative relation between labour supply and wage rate.

causing changes in relative wages like foreign share, openness index, outsourcing, capital-labour ratio and firm specific factors as training expenses, royalities expenses, expenses on research and development, size and square term of size of the firms. Besides these structural factors we intend to estimate the effects of interaction terms as suggested by the literature. Our interaction terms stand for the possible effects of the interaction of foreign direct investment and human capital formation on relative wages. This interaction is found to have significant effect on labour market. (as earlier stated) It raises the demand for skilled labour thus affects relative wages. The supply side effect is to raise relative supply of relative employment. We use four different interaction terms to test this interaction hypothesis. Our interaction terms include interaction between foreign direct investment and training, royalities, research and development and capital-labour ratio. Foreign direct investment (foreign shares) is found out to be positive and significantly related to wage inequality, though the effect may be small due to the small coefficient but is highly significant. The increase in foreign investment further polarises the wages in Indian manufacturing firms for the period 2000-2013. This can be confirmed by the concentration of foreign investment in some industries and regions in Indian industry in the same time period. The industries fetching maximum amount of foreign investment are Construction materials and construction and real estate, telecom, drugs and pharmacy, automobile industry, chemical industry and metal and metal products.[6] Openness and outsourcing have significant, faint but ambiguous impact on relative wages. Two specifications (column 3 and 4, table 2) result in negative effect of openness on relative wages, thereby decreasing wage inequality. Whereas, in column 4, it becomes positive, when we control for royality payments and its interaction term. Similarly outsourcing has negative but insignificant effect on wage inequality in our fixed effects estimation. The coefficient of capital-labour ratio is positive and significant all

[6]Source: DIPP.

around. One unit increase in capital labour ratio increases wage inequality by 2 units. It reinforces the capital-skill complementarity hypothesis which says that level of technology is complementary to skills. Thus any changes in technology are associated with increases in relative prices of skills. Accounting for the firm specific factors, training expenses of the firms on their employees are negatively but insignificantly related to relative wages. The possible explanation may be that training provision may bridge the gap between demand and supply of skills and thereby reducing the relative wages. The same is the case with expenses on royality payments by firms. The coefficient is found out to be negative and significant for all the specifications (column 5). Size of the firm is positively and significantly related to relative wages which is quite obvious. The second order term square of size is negative suggesting that after a level firms size tend to be reducing wage inequality. We are also interested in coefficients of interaction terms. The first and the most significant is the interaction of foreign direct investment and training expenses. Expenses by Multinational Enterprises on training of employees are also a form of human capital formation(Becker, 1974) which directly affects the human capital base and thus composition of labour force.This term serves to test our hypotheses of the effect of this interaction on wage inequality. Regression results display a positive and significant relationship between the interaction term and wage inequality conforming to the fact foreign direct investment and human capital formation interaction increased wage inequality in Indian firms over the years. This may have been happened due to strong demand side effect of this interaction and clustering of foreign investment in some sectors. Though the coefficient of interest is small but is significant in all the models (column 1-6). The coefficient of interaction term of foreign direct investment and royalities payment is also significant and positive. One unit increase in fdi and royality payments interaction is related to 6 unit increase in wage inequality. Whereas the interaction terms of FDI and capital- labour ratio is negative and significant. It shows

possible technology spill overs of foreign investment which upgrade the level of technology and eliminate the wage inequality.The interaction of FDI and research and development is also negative but insignificant in all the models tested.[7] Thus research and development seems to have insignificant effect on wage inequality.

We also estimate equation (5) by Maximum likelihood method to check for any inconsistency in results. The results we find are very much in coherence with our earlier findings. Demand side effect is exposed due to the significant and positively related relative wages and relative employment. (Column 1-6 in table 3) though the elasticity on substitution ranging from -2.12 to -1.78. Foreign share again contributes to wage inequality significantly. Capital labour ratio has positive and significant impact on wage inequality. Openness has negative and significant effect on wage inequality contrasting to other results.[8]In interaction terms training and royality have positive significant effect on wage inequality. Whereas research and development and capital labour ratio has negative effect on wage inequality.

We estimated the industry specific effects with the industry dummies to find industry wide differences in wage inequality. In Food, Metal, Mis. Manufacturing and textile industries, we find negative and significant coefficients. Diversified, machinery, mining, transport equipment, chemical, construction material and construction and real estate are found to have positive and significant relationship with wage inequality. It confirms our prior analysis of concentration of wage inequality in FDI concentrated sectors like chemicals, automobile, construction and communication compared to the FDI deprived sectors.

Conclusion

[7]Kutaria,2001 also find the same results for non-scientific group of industries.

[8] Hasan,et.al.2007; Ramaswamy, 2008, find positive effect of trade openness on wage inequality.

We find that relative demand for labour shifting for Indian manufacturing industrieswhich bag the largest share of FDI in favour of skilled labour thus increasing wage inequality. The possible demand shifters are foreign direct investment, skill-biased technological change, capital-skill complementarity and the interaction of foreign direct investment and human capital formation since the last decade.The interaction between FDI and human capital formation also increases wage inequality. This calls for appropriate policies to even out the spread of FDI. Suitable policies are also required to increase the spread of human capital in the country.

Table.1: Summary Statistics

	Observations	Mean	Std.Deviation	Min	Max
Foreignshare	5617	26.72	26.06	0	97.45
lnrlempt	8001	-4.86	1.59	-11.60	1.15
Openness	30340	1710.07	27354.83	-830.16	2600001
Outsourcing	22818	454.71	6902.33	-2.75	510022
Kl	9487	4.83	27.61	0	939.20
Training	46800	.0128327	.2086268	-2.125	32
Royality	9915	-.0113205	25.87387	-784.857	2202.5
RnD	13626	-.5414741	62.19423	-5370.78	1251.69
Fditrain	5110	1559.20	4752.30	0	73536.05
Fdirnd	2509	-9.01	495.49	-22742.85	5744.80
Fdiroy	1548	-4.55	129.72	-4644.45	192.66
fdikl	2342	140.37	715.36	0	15557.49
Size	63785	5216.94	50288.01	-0.2	3500000

Table2. Fixed Effects Estimation (2000-2013): Dependent Variable relative wages

	1	2	3	4	5	6
lnrlemp	**0.40***** (0.01)	**0.38***** (0.01)	**0.40***** (0.02)	**0.41***** (0.02)	**0.37***** (0.02)	**0.35***** (0.03)
foreignshare	**1.41E-03*** (8.86E-04)	1.15E-03 (1.03E-03)	**1.27E-03*** **(**8.89E-04**)**	9.17E-04 (1.19E-03)	1.10E-03 (1.32E-03)	5.96E-04 (1.74E-03)
Train	-0.63 (1.00)	-0.25 (0.76)	0.52 (0.98)	-0.50 (1.12)	-0.02 (2.13)	-2.84 (3.41)
kl	-	-	**1.61E-03***** (5.87E-04)	**0.02***** (2.21E-03)	**0.01*** **(**9.62E-03**)**	**0.02*** (0.01)
openness	-	-	**-4.48E-06***** (9.6E-07)	**-5.74E-06***** (1.57E-06)	**3.91E-05***** (8.35E-06)	-
outsourcing	-	-3.3E-05 **(**3.61E-05**)**	-	-	-	-

rnds	-	-	-	1.29 (1.69)	-	1.29 (3.63)
roys	-	-	-	-	**-9.63***** (2.79)	-3.92 (3.29)
fditrain	**6.58E-06***** (2.61E-06)	**4.84E-06*** (3.86E-06)	**1.05E-05***** (2.31E-06	**1.02E-05***** (2.13E-06)	**2.87E-06** (2.63E-06)	**6.71E-06***** (2.47E-06)
fdiroy	-	-	-	-	**0.11**** (0.05)	0.06 (0.05)
fdirnd	-	-	-	-0.01 (0.02)	-	-0.05 (0.09)
fdikl	-	-	**3.44E-05*** **(**2.45E-05**)**	**-2.32E-04**** (1.17E-04)	-2.29E-04 (1.93E-04)	**-2.73E-04*** (2.07E-04)
size	**3.24E-06***** (8.96E-07)	**4.83E-06*** (2.17E-06)	-	-	-	-
$Size^2$	**-4.78E-12***** (2.02E-12)	**-1.07E-11**** (6.73E-12)	-	-	-	-
Timedummy	**0.15***** (0.01)	**0.14***** (0.01)	**0.18***** (0.01)	**0.12***** (0.02)	**0.17***** (0.01)	**0.14***** **(0.02)**
Constant	**2.72***** (0.89)	**2.74***** (0.98)	**2.81***** (0.12)	**3.17***** (0.11)	**3.02***** (0.15)	**3.09***** (0.18)
Observations	1940	1077	1734	1077	655	479

Note: Hausman test is asymptotically χ^2distributed with standard errors in brackets. *significant at 0.1 level, **at 0.05 level, ***at 0.01 level.

.

Table 3. Maximum Likelihood Method (2000-2013): Dependent Variable relative wages

	1	2	3	4	5	6
lnrlemp	**0.53***** (0.01)	**0.56***** (0.02)	**0.47** *** (0.01)	**0.55***** (0.02)	**0.53***** (0.03)	**0.52***** (0.03)
foreignshare	**2.49E-03***** (8.02E-04)	**1.67E-03**** (7.97E-04)	**2.19E-03**** (9.53E-04)	**1.67E-03*** (1.06E-03)	**1.90E-03**** (1.19E-03)	2.25E-03* (1.60E-03)
train	**-0.89** **(1.00)**	-0.49 (0.99)	**-0.62** **(0.77)**	-1.00 (1.08)	-2.38 (2.08)	**-6.05**** (3.31)
kl	-	**2.35E-03***** (5.89E-04)	-	**0.02***** (2.21E-03)	**0.02***** (8.54E-03)	**0.05***** (0.01)
openness	-	**-4.75E-06***** (9.60E-07)	-	**-4.53E-06***** (1.52E-06)	**2.41E-05***** (4.81E-06)	-
outsourcing	-	-	**4.40E-05***** **(**1.64E-05**)**	-	-	-
Rnd	-	-	-	0.89 (0.14)	-	0.13 (3.56)
royality	-	-	-	-	**-6.80***** (2.49)	-0.61 (3.08)
fditrain	**7.09E-06***** (2.53E-06)	**1.06E-05***** (2.33E-06)	1.55E-06 (3.54E-06)	**8.84E-06***** (2.13E-06)	**4.93E-06**** (2.46E-06)	**6.03E-06***** (2.49E-06)
fdiroy	-	-	-	-	**0.06*** (0.04)	-5.17E-03 (0.05)
fdirnd	-	-	-	-0.02	-	-0.05

				(0.02)		(0.09)
fdikl	-	1.91E-05 (2.43E-05)	-	**-2.55E-04**** (1.15E-04)	**-4.81E-04***** (1.72E-04)	**-6.16E-04***** (1.82E-04)
size	**2.61E-06***** **(5.11E-07)**		**2.95E-06***** (9.27E-07)	-	-	-
Size^2	**-6.50E-13*** (4.87E-13)		-7.98E-13 (6.44E-13)	-	-	-
Timedummy	**0.13***** (0.01)	**0.16***** (0.01)	**0.13***** (0.01)	**0.12***** (0.01)	**0.15***** (0.01)	**0.12***** (0.02)
Constant	**3.20***** (0.09)	**3.48***** (0.11)	**2.99***** (0.11)	**3.69***** (0.12)	**3.60***** (0.16)	**3.66***** (0.19)
Log Likeihood	-801.20813	-623.93395	-139.31046	-170.31048	-74.945651	-29.16603
Observations	1940	1737	917	1077	655	479

Note: Standard errors in brackets.*significant at 0.1 level, **at 0.05 level, ***at 0.01 level.

Table.4 Industry effects:

Explanatory vars	**Random effects**	**Maximum likelihood**
lnrlemp	**0.61***** (0.01)	**0.54***** (0.01)
foreignshare	**3.18E-03***** (7.91E-04)	**2.46E-03***** (8.00E-04)
train	**-1.22** (1.08)	**-0.85** (1.01)
fditrain	**6.41E-06** ** (2.72E-06)	**6.91E-06***** (2.53E-06)
Size	**3.22E-06***** (5.13E-07)	**2.61E-06***** (5.10E-07)
Size^2	**-1.07E-12***** (4.26E-13)	**-6.57E-13*** (4.74E-13)
Time dummy	**0.12***** (0.01)	**0.13***** (0.01)
dindustry1(Diversified)	0.11 (0.21)	0.13 (0.26)
dindustry2(Food)	**-0.37**** (0.17)	**-0.36*** (0.22)
dindustry3(Machinery)	0.14 (0.16)	0.14 (0.20)
dindustry4(Metal)	-0.18 (0.17)	-0.19 (0.22)
dindustry5(Mining)	0.15 (0.34)	0.18 (0.42)
dindustry6(Mis.manufacturing)	**-0.40**** (0.21)	**-0.44*** (0.26)
dindustry7(Textile)	**-0.45****	**-0.39***

	(0.19)	(0.24)
dindustry8(Transportequipment)	**0.27*** (0.17)	**0.31*** (0.22)
dindustry9(Chemical)	0.03 (0.15)	0.02 (0.19)
dindustry10(Communication)	0.21 (0.28)	0.27 (0.35)
dindustry11(Constructionmaterial)	**0.27*** (0.18)	0.30 (0.23)
dindustry12(Constructionrealestate)	**0.37**** (0.21)	**0.37*** (0.26)
constant	**3.60***** (0.16)	**3.24***** (0.20)
Log Likelihood		-784.68105
Observations	1940	1940

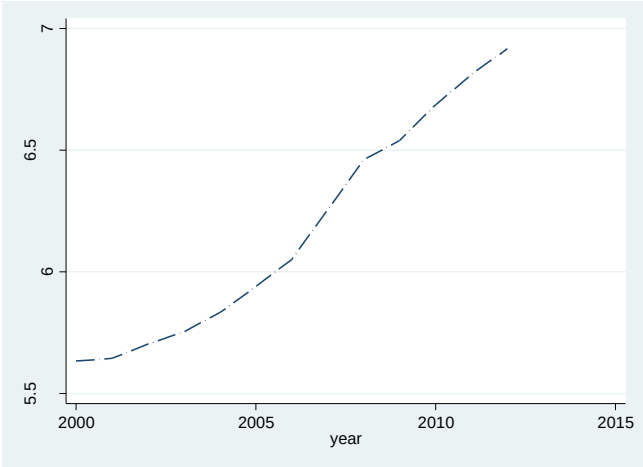
Notes: Standard errors in brackets. *significant at 0.1 level, **at 0.05 level, ***at 0.01 level.

Table.5 Log of average wages and relative wages and relative employment in India (2000-2013)

year	lnavgw	lnrlw	lnavgempt	lnrlemp
2000	5.633537	-1.32368	9.148622403	-3.98884
2001	5.644569	-1.35769	8.44394033	-4.48699
2002	5.70323	-1.43101	8.072060422	-4.95483
2003	5.75351	-1.40809	8.030412816	-4.82489
2004	5.832383	-1.35053	8.04972299	-4.9743
2005	5.940369	-1.27484	7.975233218	-5.05859
2006	6.051558	-1.17463	8.105729226	-5.10618
2007	6.255222	-1.08021	7.956674746	-5.05071
2008	6.460725	-1.08319	7.951325853	-4.55122
2009	6.540412	-1.09617	8.094620784	-4.78121
2010	6.687014	-1.10927	8.055765166	-4.95071

2011	6.811634	-1.05882	8.206443905	-4.79692
2012	6.917817	-1.07254	8.192883925	-

Figure.5 Log of relative wages 2000-2013

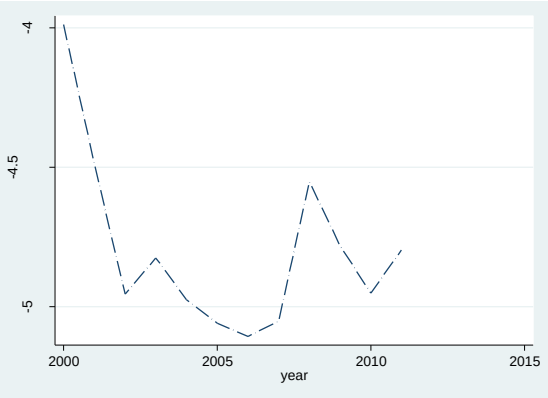


Source: Author's own calculation.

Figure.6 Log of average wages 2000-2013

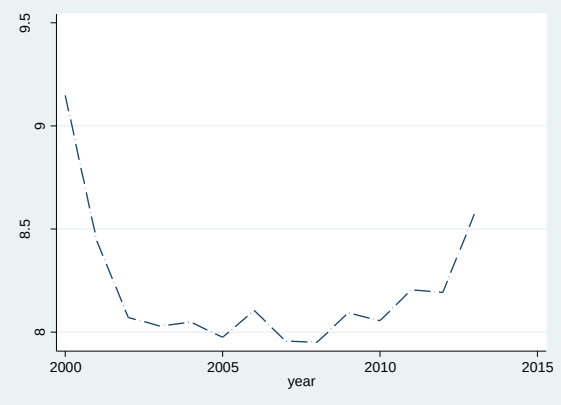
Source: Author's own calculation.

Figure.7 Log of relative wages 2000-2013.



Source: Author's own calculation.

Figure.8 Log of relative employment 2000-2013



Source: Author's own calculation.

References:

Acemoglu D. and Angrist J., (2001), "How large are Human-Capital Externalities?Evidence from Compulsory-Schooling Laws."NBER Chapters, *NBER Macroeconomics Annual*, Vol.15, pp.9-74, *Chicago University press.*

Agosin, M. R. and Mayer, R. (2000), "Foreign Investment in Developing Countries: Does it Crowd in Domestic Investment?" Discussion Paper No. 146, United Nations Conference on Trade and Development (UNCTAD), Palais des Nations, Geneva, Switzerland.

Aitken and Harrison, (

Azam M., (2010),"India's Increasing Skill Premium: Role of Demand and Supply," *The B.E. Journal of Economic Analysis & Policy*, De Gruyter, vol. 10(1), pp.1-28.

Barro Robert J., (2013), "Education and Economic Growth," *Annals of Economics and Finance*, Society for AEF, vol. 14(2), pages 301-328.

Baldwin, E.R. , 1994,"Effects of Trade and Foreign Direct Investment on Employment and Relative Wages", OECD Economic Studies No. 23.

Becker, Gary, (1993), *"Human Capital: A Theoretical and Empirical Analysis, with special reference tto education", Chicago University Press*.

Benhabib, J. and Spiegel, Mark M.,(1994),"The role of human capital in economic development evidence from aggregate cross-country data", *Journal of Monetary Economics*, Elsevier, vol. 34(2), pages 143-173.

Borensztein E, Gregorio J, Lee W., (1998), "How does foreign direct investment affect economic growth?"*Journal of International Economics* 45(1):115–35.

Blundell, R., Dearden, L.,Meghir, C. and Sianesi, B.,(1999), "Human Capital Investment: The Returns from Education and Training to the Individual, the Firm and the Economy", Fiscal Studies, 20(1), pp. 1–23. doi: 10.1111/j.1475-5890.1999.tb00001.x.

Chamarbagwala, R.,(2006), "Economic Liberalization and Wage Inequality in India," *World Development*, Elsevier, vol. 34(12), pp. 1997-2015.

Constantine, J. and Neumark, D., (1996), "Training and the Growth of Wage Inequality. Industrial Relations", *AJournal of Economy and Society*, 35: 491–510. doi: 10.1111/j.1468-232X.1996.tb00418.x.

Ciccone, A. and Peri, G., (2002), "Identifying Human Capital Externalities: Theory with an Application to US Cities", IZA Discussion paper series, No. 488.

Dasgupta, P.andGoldar, B.,(2005), " Female Labour Supply in Rural India, An Econometric Analysis, Working Paper No.265, Institute of Economic Growth, New Delhi.

De Mello, L. R., (1999), "Foreign Direct Investment-Led Growth: Evidence from Time Series and Panel Data," *Oxford Economic Papers*, 51, 1999, pp. 133-51.

Gorg H. and Strobl E. (2002) "Relative wages, openness and skill biased technological change", IZA Discussion paper series, No. 596.

GoldarB.andBangaR. ,(2007) ,"Impact of Trade Liberalization on Foreign Direct Investment in Indian Industries", Working Papers No. 3607, Asia-Pacific Research and Training Network on Trade (ARTNeT), an initiative of UNESCAP and IDRC, Canada.

Gregario, D. J. (2003), "The role of Foreign Direct Investment and Natural Resources in Economic Development", Working papers No. 196, Central bank of Chile.

Feenstra, R. C. and Hanson, G. H., (1997), "Foreign direct investment and relative wages: Evidence from Mexico's maquiladoras," *Journal of International Economics*, Elsevier, vol. 42(3-4), pp. 371-393.

FiginiP.andGörgH., (1999), "Multinational companies and wage inequality in the host country: The case of Ireland," *Review of World Economics (WeltwirtschaftlichesArchiv)*, Springer, vol. 135(4), pp. 594-612.

Fry, J. M.,(1993), "Foreign Direct Investment in a Macroeconomic Framework: Finance, Efficiency, Incentives and Distortions", Policy Research Working paper series 1141, International Economic Department, The World Bank.

Harnermesh S. D., (1993), "*Labour Demand*", Princeton, *Princeton University Press*.

Hasan R., Mitra,D. and Ramaswamy, K.V. , 2007, "Trade Reforms, Labor Regulations, and Labor-Demand Elasticities: Empirical Evidence from India", *Review of Economics and Statistics*,Vol., 89(3), pp.466-481.

Katz, Lawrence F & Murphy, Kevin M, (1992),"Changes in Relative Wages, 1963-1987: Supply and Demand Factors ", *The Quarterly Journal of Economics*,MIT Press, vol. 107(1), pp. 35-78, February.

KapstienB.E. ,(2001), "Virtuous Circles? Human Capital Formation, Economic Development, and the Multinational Enterprise", Paper presented to the OECD Conference on FDI, Human Capital, and Education in Developing Countries Technical meeting, Paris.

Kathuria,V.,(2001), "Foreign firms, technology transfer and knowledge spillovers to Indian manufacturing firms: a stochastic frontier analysis", *Applied Economics*, 33(5), pp. 625-642.

Kokko, A.(1994). "Technology, Market Characteristics and Spillovers," *Journal of Development Economics*, 43(2), pp. 279-93.

Liu, Q. and Qiu, L. D. (2014), "Labor Training and Foreign Direct Investment", *Review of International Economics*, 22(1), pp.151–166. doi: 10.1111/roie.12102.

Lucas, E.RobertJr,(1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, Vol. 22 (1), pp. 3-42.

Mehta A.andHasan R.,(2011), "Effetcs of Trade and Services Liberalisation on Wage Inequality in India",AsianDevelopmentBank Working Paper Series No.268.http://dx.doi.org/10.2139/ssrn.1920004

Mincer, J., 1991, "Human Capital, Technology, and the Wage Structure: What do the time series show?", NBER Working Paper No. 3581.

Miyamoto, K., (2003), "Human Capital Formation and Foreign Direct Investment in Developing Countries", Working Paper No. 211, OECD Development Centre.

Kumar U. and Mishra P., 2008. "Trade Liberalization and Wage Inequality: Evidence from India," *Review of Development Economics*, Wiley Blackwell, vol. 12(2), pp. 291-311.

Morris, S., (2007), "A Study of the Regional Determinants of Foreign Direct Investments in India and the Case of Gujarat", Indian Institute of Management (Ahmedabad), Working Paper No. 2004/03/07.

Mukherjee A.,(2011), “Regional Inequality in Foreign Direct Investment Flows to India: The Problem and the Prospects”, Reserve Bank of India Occasional Papers, Vol. 32(2).

Nelson R.R. and Phelps,E.S., (1966), “Investment in Humans, Technological Diffusion, and Economic Growth”, *American Economic Review*, Vol. 56(1/2), pp. 69-75.

Nunnenkamp, P. and Rudi S., (2007)“Foreign Direct Investment in Post Reform India: Likely to Work Wonder for Regional Development?” Kiel Working Paper No. 1375.

Pissarides, A.C., (2000), “Human Capital and Growth: A synthesis Report”, OECD Development Centre Working paper No. 168, OECD publishing.

Ramaswamy K.V., (2008), "Wage Inequality in Indian Manufacturing - Is it Trade, Technology or Labour Regulations?," Labor Economics Working Papers 22361, East Asian Bureau of Economic Research.

Ritchie,K.B., (2002), “Foreign Direct Investment and Intellectual capital formation in South-East Asia” OECD Development Centre, Working Paper No. 194.

Romer, M. P,(1986), “Increasing Returns and Long-Run Growth”, *The Journal of Political Economy*, Vol. 94, No. 5.pp. 1002-1037.

Tan Hong W. and BatraGeeta, 1996, “Enterprise Training in Developing Countries:Overview of Incidence, Determinants, and Productivity Outcomes”, Private Sector Development Department, Occasional Paper No. 9, World Bank.

VeldeDirkTe and Morrissey Oliver,(2004), “ Foreign Direct Investment, skills and wage inequality in East Asia”,*Journal of the Asia Pacific Economy* , Vol. 9, Iss. 3.

Veum, R.J., 1995, “Training, Wages and the Human Capital Model”, Bureau of Labour Statistics, Department of labour, U.S. Working paper No.262.

Wilson A. R. and G. B., (2004), “The impact of Human Capital on Economic Growth: a review” in Descy, P.; Tessaring, M. (eds) “Impact of education and training”, Third report on vocational training research in Europe, EUR-OP, (Cedefop Reference series, 54).