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**Trade liberalization and wage distribution when skilled intermediate input is used in import competing sector that uses a common type of capital\***

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Abstract

The presence of informal sector is a pervasive and persistent feature of most developing countries of the world. The phenomenon related to informal labor markets has become a great concern for our policy makers. This paper presents a simple theoretical model of a small open economy comprising of three formal and a single informal sector. Labour is the common factor of production which is segregated as skilled and unskilled ones. In accordance with the traditional specification it is assumed that skilled labours are used in the formal and informal labours are used in the informal sector. The distinguishing feature of the present paper is that the import competing formal sector uses both skilled and unskilled labours. Moreover, these two types of labour work in separate sectors using a common type of capital under the same economic structure. In such backdrop we tried to study the impact of trade liberalization on absolute and relative wage(s). It has been found that irrespective of factor intensity ranking both types of workers gain owing to tariff cut whereas under reasonable condition wage disparity between the two types of labour is reduced.

JEL classification: D5; J31

Keywords: informality; skilled- unskilled labour; wage gap

## **I. Introduction**

A Balance of Payments crisis in 1991 pushed India to near bankruptcy. The Indian rupee devalued and economic reforms were forced upon India. Trade reform allowed domestic providers of goods and service to compete freely in world markets and foreign providers to compete more freely in domestic market. Policies that make an economy open to trade and investment with the rest of the world are needed for sustained economic growth. Integration with the world economy has been proven to be a powerful means for countries to promote economic growth, development and poverty reduction. There is considerable evidence that more outward oriented countries tend consistently to grow faster than those countries that are inward looking (Bhagwati 1986; Srinivasan and Bhagwati, 1997; Frankel and Romer 1999). The primary goal of economic liberalization is the free flow of capital between nations and efficient allocation of resources. This is usually done by reducing protectionist policies such as tariffs, trade laws and other trade barriers commonly termed as 'Liberalization policies'. Thus, liberalization policy has exposed the entire domestic sector to the throat cutting competition of free market.

The informal sector is no exception. In spite of the fact that there are some definitional differences across developed and developing countries, the existence of such sector is undeniable. However, the informal sector<sup>1</sup> is huge and largely undocumented in most developing economies. It provides the means of livelihood to millions of people around the world, particularly in the developing countries. A substantial proportion of employment and output generation are concentrated in the informal sector (Schneider et al., 2010). According to the statistics compiled by WIEGO, informal employment as per cent of total Non-agricultural Employment over 2004-2010 is about 82% in South Asia, 66% in sub-Saharan

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<sup>1</sup> The First Indian Commission on Labor (1966-69) defined unorganized sector workforce as- "Those workers who have not been able to organize themselves in pursuit of their common interest due to certain constraints like casual nature of employment, ignorance and illiteracy, small and scattered size of establishments".

Africa, 65% in East and Southeast Asia, 51% in Latin America, 45% in Middle East and North Africa and 10% in Eastern Europe and Central Asia ( Statistical report, WIEGO. 2010). The share of persons employed in the informal economy is 68.8% in case of India. Informal workers are absorbed by different sectors of the economy. In case of transportation it is 84.5%, for construction sector 97.6%, 97.2% in trade, 87.15% in manufacturing, 59.9% in services other than trade or transportation and 83.6% in all non-agricultural activities (ILO, 2012). Informal employment includes own-account workers working in their own informal enterprise, producing goods for his own or family consumption or members of informal producers' cooperatives, domestic workers employed by households, casual day labour and temporary or part-time work for formal firms. People working as small farmers, street vendors, hawkers, micro-entrepreneurs, cobbler, rag-pickers, porters, labourers, artisans all belong to the informal sector. Traditionally, it is assumed that workers in the informal sector are younger, have less education and earn less than the formal labours (Thomas, 1992, Maloney 1999). Sometimes, workers or firms voluntarily select into the informal sector given their preferences and skills or, in order to avoid taxes or regulatory legislation (De Soto 1989, Maloney 1999, Cunningham and Maloney 2001). In general, informal wage is a market determined competitive wage whereas formal wage is a negotiated one. Thus, formal workers enjoy a higher wage premium than their informal counterparts. In case of self employment, however, wage of informal workers may exceed those of formal workers (Maloney 1998, 1999). This difference in wage may be attributed to the existence of trade union in formal sector, difference in skill level of the workers, immigration of workers and their nature, mobility of factors between the two types of sectors, liberalization policy adopted by the domestic economy etc as studied by different scholars (Marjit and Kar 2005; Marjit 2003, Marjit and Acharyya 2006, Marjit and Maiti, 2006, Mandal and Chaudhuri 2011 etc.). In most of the less developing countries, the public sector which employs a large number of workforces is

confronted with the pressure to increase wages of the existing workforce which, reduces its potential for hiring new workers with its budget constraints. This leads to widening wage differentials between the formal and residual (informal) sectors with a declining proportion of the urban labor force employed in the formal sector (Mazumdar, 1983). Labour segmentation theory suggests that there may be a wage differential between the primary and secondary (formal and informal) sectors even if both the sectors have equal potential (Fields 1975, Dickens and Lang 1985, Agenor and Montiel 1996). The higher wage of primary workers cannot be explained simply in terms of their higher skill and efficiency since many secondary workers are capable of performing well, given the opportunity to do so. Nevertheless, the wages of two sectors are interdependent. An increase in formal wage results into an increase in the wage of informal sector through reduction in rate of return to capital (Carruth and Oswald, 1981 and Leamer 1998)<sup>2</sup>. But, if the economy enjoys some monopoly power in world market, a rise in the formal wage reduces the informal wage (Carruth and Oswald, 1981).

International mobility of labor has significantly increased with the adoption of liberalization policies by the countries and it plays an important role in the determination of wage inequality between skilled and unskilled workers. Unskilled emigration of workers worsens the wage-gap, if and only if the distributive share of the intersectorally mobile factor (capital) of the skilled sector is greater than that of the unskilled sector. Similarly a skilled emigration improves wage inequality under similar condition. However, the result is completely reversed if the relative distributive shares of capital are opposite. skill emigration can reduce wage inequality, although absolute wages increase with emigration (Marjit and Kar, 2005). Emigration of skilled labor must reduce the wage rate of unskilled workers under certain

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<sup>2</sup> A rise in union or minimum wages in the formal sector cannot be passed along in higher prices. Thus, profits fall, leading to a migration of capital, rather than labor, out of the formal sector. Capital moves to informal sector driving up wages and employment in that sector.

factor intensity assumption. Emigration can lead to a drastic change in the degree of wage inequality depending on which sectors survive in the post-emigration scenario (Marjit and Kar, 2009). Basically, international migration of labour and its effect on wage inequality depends on the relative capital intensities of sectors that use either skilled or unskilled labour (Yabuuchi and Chaudhuri, 2007). There may be deterioration in wage inequality following an inflow of foreign unskilled labor (Beladi, Chaudhuri and Yabuuchi, 2008).

As we have mentioned before, associated illegality with the undocumented nature of informal sector makes it vulnerable to corruption and / or extortion (Mandal, Marjit & Beladi, 2014). Recent literature on corruption and development focuses on such dimension quite extensively. Corruption as an institutional factor affects the development process of an economy. In the context of pervasive and cumbersome regulations in developing countries, corruption may actually improve efficiency and help growth. In the second best world, where there are pre-existing policy induced distortions, additional distortions in the form of black-marketing, smuggling, etc., may actually improve welfare even when some resources have to be spent in such activities (Bardhan, 1997). On the other side, the corrupt officials may actually cause administrative delays in order to attract more bribes (Gunnar Myrdal, 1968). It is an important determinant of the costs and benefits of informality and greater corruption is likely to be associated with a larger informal sector. Its effect on the wage inequality between the sectors depends on the loose accrued by the sectors (Mandal and Marjit, 2010). Size of corruptive sector may increase if the unskilled labor using formal sector is capital intensive compared to its informal counterpart (Mandal, 2011).

According to the conventional wisdom, trade liberalization was expected to lower the wage inequality between skilled and unskilled labors through an increase in price of exportables. The experience of East Asia in 1960s and 1970s shows that greater openness to trade tends to narrow the wage gap between skilled and unskilled workers in developing countries. But the

experience of Latin America in the late 1980s and early 1990s was completely the opposite. The increase in wage inequality is explained in terms of increase in import competition from low-wage countries that shifted resources towards industries that use skilled labor relatively intensively (Leamer 1993, 1994; Wood, 1994; Hanson and Harrison 1999). Another explanation for the rising wage inequality in Mexico is the inflow of foreign direct investment which is positively correlated with the relative demand for skilled labor and accounts for a large proportion of the increase in the skilled labor share of total wages (Feenstra and Hanson, 1997). Increase in wage inequality between the skilled and unskilled workers may also be explained in terms of trade in intermediate inputs. Trade in intermediate inputs will shift demand away from low-skilled activities, while raising relative demand and wages of the high skilled workers (Feenstra and Hanson 2001). Experience of Brazil shows that there is no or little relationship between trade and informality but in case of Columbia liberal trade policies has led to the expansion of informal sector (Goldberg and Pavcnik 2003). Moreover, informal employment has expanded substantially in the post-reform period in India (Dev, 2000). Informal output and informal employment shows improvement as a result of trade liberalization in the import competing sector (Kar and marjit, 2009). Informal real wage in India has experienced a rising trend, despite the fact that, in the post-reform era fierce import competition pushed many erstwhile protected industries out of business and released significant amounts of capital and labour into unorganized manufacturing and service sectors (Marjit and Kar, 2009). An empirical study shows that the urban informal wage has increased substantially for workers hired under Non-Directory Manufacturing enterprises in India over the period of 1984-85 and 2000-01 (Marjit and Kar, 2004). Trade liberalization leading to an increase in the import of low-skill manufacturing product intensifies wage inequality but an inflow of foreign capital may enhance wage equity between the skilled and unskilled labour (Chaudhuri and Yabuuchi, 2007). An improvement in the terms of trade for the domestic economy may result



into a fall of relative wage of unskilled labour (Marjit, Beladi and Chakrabarti, 2004). Wage of informal workers improves following a contraction of formal sector and consequent expansion of informal sector due to trade reform (Marjit, 2003; Marjit and Maiti, 2006; Marjit, Kar and Beladi, 2007b). Sometimes, the degree of capital mobility determines the wage movement of informal workers (Marjit and Kar, 2007). Immigration of unskilled workers and trade reform both leads to a reduction in informal wage but informal output expands (Mandal and Chaudhuri, 2011).

In this backdrop we develop a theoretical model *a la* Jones (1965, 1971) having both formal and informal sectors. The basic results we derive in this paper are: irrespective of factor intensity ranking both skilled and unskilled wage increase consequent upon trade liberalization, whereas relative wage disparity crucially hinges on factor intensity ranking. Therefore, the results indicate the role of factor intensity assumption in determining which kind of labor is going to loose much.

The present paper is divided into a number of sections. Section I has the introduction and background literature. Section II comprises the general structure of the model and its solutions. Section III discusses the findings and finally section IV includes the conclusion. Mathematical calculations are given in the appendix.

## **I. The Model and its Solution**

Consider a small open economy with three formal sectors (H, X and Z) and an informal sector Y. Commodity H is produced in the formal sector using skilled labor (s) and capital (k). Hence it is an intermediate input which is again used to produce X. X which represents the formal import competing commodity also requires capital (k) and labor (L) for its production and is itself protected by an import tariff (t). This artificially raises the price of X. X may be some electronic good as video games, camera or mobile phones. In our model, Commodity X is produced using both the unskilled and skilled labor either directly or

indirectly as it uses H as input. However, note that L gets an unionized wage ( $\bar{w}$ ) here. The intermediate commodity H may be a software development firm designing gaming software that is used in mobile phones. Z is an exportable commodity produced using skilled labour and land as factors. This may be a firm manufacturing organic chemicals. Sector Y is the only informal sector in our model using unskilled labor (L) and Land (T) as inputs. This may be street vendors selling vegetables. The other three sectors H, X and Z are informal sectors as these sectors use skilled labor that enjoys higher wage premium and are operated under government laws. Note that two types of labor (skilled and unskilled) work in separate sectors (Z and Y) using a common type of physical capital (land). Wage in the formal sector is set fixed by prior negotiations with the labour unions. Formal wage ( $\bar{w}$ ) is higher than the informal wage ( $w$ ) because labour laws allow various benefits to formal workers but not to the informal workers. Again, wage of skilled labor ( $w_s$ ) is higher than that of formal wage ( $\bar{w}$ ). Thus  $w_s > \bar{w} > w$ . Capital is perfectly mobile between the two formal sector X and H.

All the factors of production are fully employed. Workers who do not find a job in the formal segment must move to the informal segment to survive and there is no open unemployment in the economy. Labour is heterogeneous and skilled workers receive a higher premium. The production functions are neo-classical types with constant returns to scale (CRS), diminishing marginal productivity for factor inputs and operate in perfectly competitive market. To build the system of equations (following Jones (1965), (1971), we use the following notations:

$\bar{w}$	Formal negotiated wage
$w_s$	Wage of skilled labour
$w$	Informal wage

R	Return to land
t	Exogenously imposed import tariff rate
$P_h$	Price of intermediate good
X	Output of formal importable
Y	Output of informal sector
Z	Output of formal exportable sector
H	Output of intermediate commodity
$(P_h, P_x, P_y, P_z)$	Exogenous commodity prices (small country assumption guarantees this)
$\bar{S}$	Total supply of skilled labour
$\bar{L}$	Total supply of unskilled labour
$\bar{T}$	Total supply of land
$\bar{K}$	Total supply of capital
$a_{ij}$	Input coefficients
$\theta_{ij}$	Relative share of the $i^{\text{th}}$ input in the total value of the $j^{\text{th}}$ commodity,
$\lambda_{ij}$	Relative share of the $i^{\text{th}}$ input in $j^{\text{th}}$ commodity.
	Where $i = S, L, T, K$ and $j = H, X, Y, Z$
‘^’	represents percentage changes for particular variables

The general equilibrium structure of the model is given by the following equations comprising of the competitive price equations from (1) to (4) as well as factor endowments and full employment conditions for each input through equations (5) to (8).

$$P_h = w_s a_{sh} + r a_{kh} \dots\dots\dots (1)$$

$$P_x(1 + t) = \bar{w} a_{lx} + r a_{kx} + P_h a_{hx} \dots\dots\dots (2)$$

$$P_y = w_{ly} + R a_{Ty} \dots\dots\dots (3)$$

$$P_z = w_s a_{sz} + R a_T \dots\dots\dots (4)$$

$$a_{sz}Z + a_{sh}H = \bar{S} \quad (5)$$

$$a_{lx}X + a_{ly}Y = \bar{L} \quad (6)$$

$$a_{kh}H + a_{kx}X = \bar{K} \quad (7)$$

$$a_{Ty}Y + a_{Tz}Z = T \quad (8)$$

The commodity prices are given from rest of the world. We intend to check the effects of tariff cut on endogenously determined factor prices and the wage gap between the skilled and unskilled workers who are employed in formal and informal sectors.

The four price variables of the model  $W_s$ ,  $w$ ,  $r$  and  $R$  are determined from the four price equations with exogenously given commodity prices  $P_h, P_x, P_y$  and  $P_z$  in the following way. Given the formal wage of unskilled or informal worker  $\bar{w}$  and the exogenous price of commodity H ( $P_h$ ), the rate of return to capital ( $r$ ) is obtained from equation (2) in terms of tariff rate  $t$ . Substituting the value of  $r$  in equation (1) we determine  $w_s$ . Using this value we obtain  $R$  from equation (4) and further we obtain  $w$  from equation (3).

Differentiating equations (1) to (4) and using the zero profit and envelope theorem we get the following mathematical results. These results will help us later in exploring the effects of trade liberalization. Detailed calculations are given in the appendix.

$$\hat{r} = \alpha \frac{\hat{t}}{\theta_{kx}} < 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (9) \text{ where } \alpha = \frac{t}{1+t}$$

$$\widehat{w}_s = (-)\alpha \frac{\hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} > 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (10)$$

$$\widehat{R} = \alpha \frac{\hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} \frac{\theta_{sz}}{\theta_{Tz}} < 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (11)$$

$$\widehat{w} = (-)\alpha \frac{\hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} \frac{\theta_{sz}}{\theta_{Tz}} \frac{\theta_{Ty}}{\theta_{Ly}} > 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (12)$$

Wage gap between two kinds of labour is given by

$$\widehat{w}_s - \widehat{w} = \frac{\alpha \hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} \frac{\theta_{Ty} - \theta_{Tz}}{\theta_{Tz} \theta_{Ly}} \quad \dots\dots\dots (13)$$

## II.A Tariff cut and Wage Rates

Following trade liberalization, protectionary trade policies are gradually becoming an issue of past. So, we strive to check various effects of tariff reduction. From equation (9) to (13) we find that as the tariff rate imposed on the import competing sector decreases the rate of return to capital ( $r$ ) falls, wage of skilled labour ( $w_s$ ) goes up and rate of return to land ( $R$ ) decreases. However, at the same time wage of unskilled labour ( $w$ ) increases due to reduction in tariff rate. Thus, we may say that both the skilled and unskilled labour gain following tariff cut when capital is allowed to move between the two formal sectors of the economy where one sectors supplies an intermediate input for the second one.

**Proposition I:** *A tariff cut in the formal sector increases  $w_s$  and  $w$  irrespective of factor intensities.*

**Explanation:** From equation (10) and (12) it is found that  $\widehat{w}_s > 0$  and  $\widehat{w} > 0$  as  $\hat{t} < 0$ . A reduction in tariff rate reduces the domestic price of commodity X. This, in turn, must reduce the return to the factors that are used in its production. X being a formal sector hires labour at a fixed unionized wage ( $\bar{w}$ ) and the price of the intermediate input H is given exogenously. Thus, the effect of reduction in the domestic price of X directly falls on the rate of return to capital. Hence, rate of return to capita (r) falls. This capital is freely mobile between two formal sector X and H. From equation (1) it is also evident that the wage rate of skilled labor in sector H must increase to compensate the decrease in rate of return to capital as price of the intermediate ( $P_h$ ) is given exogenously. An increase in the wage of skilled labour reduces the rate of return to land (see equation (4)) for a given price of Z. This will jack up the wage rate of informal workers (w). Thus both the skilled and unskilled labour gains in absolute terms due to trade reform which is marked by a reduction in tariff rate or protection rate.

**Proposition II:** *The relative wage gap between skilled and unskilled workers depends on factor intensities.*

**Explanation:** First let us consider that Sector Y uses land more intensively than sector Z. This would be more realistic since Y is an informal sector. In most developing countries, the informal commodities are produced using unskilled (informal) labor and land. It is evident from equation (13) that  $(\widehat{w}_s - \widehat{w}) < 0$  if  $\theta_{Ty} > \theta_{Tz}$  since  $0 < \theta_{Tz}, \theta_{ly}, \theta_{kx}, \theta_{sh}, \theta_{kh} < 1$  and  $\hat{t} < 0$ . If it is the informal sector that uses land more intensively than the exportable sector then skilled-unskilled wage gap may decrease due to trade reform. From (11) we find that rate of return to land (R) decreases due to reduction in tariff rate. Since sector Y uses land more intensively than unskilled labour,  $Ra_{Ty}$  decreases by significant amount. To compensate this  $wa_{ly}$  must increase through increase in w. On the other hand, a decrease in R affects sector Z

by reducing  $Ra_{TZ}$  but this is compensated by an increase in  $w_s a_{sz}$ . Since sector Y uses land more intensively, fall in  $Ra_{Ty}$  is greater than the fall in  $Ra_{Tz}$ . Alternatively, we may say that rate of increase in  $w$  is more than the rate of increase in  $w_s$ . Thus, the wage gap will decrease given the condition that  $\theta_{Ty} > \theta_{Tz}$ . If factor intensity assumption is reversed,  $\theta_{Ty} < \theta_{Tz}$ , then the result also gets reversed. If  $\theta_{Ty} < \theta_{Tz}$ , then the wage gap between the formal and informal labor would increase following a reduction in tariff for formal sector X. It is evident from equation (13) that  $(\widehat{w}_s - \widehat{w}) > 0$  if  $\theta_{Ty} < \theta_{Tz}$  since  $0 < \theta_{Tz}, \theta_{ly}, \theta_{kx}, \theta_{sh}, \theta_{kh} < 1$  and  $\hat{t} < 0$ . Since sector Z uses land more intensively than its other factor skilled labor,  $R_{TZ}$  decreases by significant amount. Decrease in  $R_{TZ}$  is compensated by increase in  $w_s a_{sz}$  through improvement in wage of skilled labor ( $w_s$ ). Similarly, a reduction in rate of return to land reduces  $Ra_{Ty}$  which is again compensated by increase in  $wa_{ly}$  through improvement in wage of unskilled or informal labor ( $w$ ). Since, sector Z is more land intensive, decrease in  $R_{TZ}$  is more than the fall in  $Ra_{Ty}$ . Thus, wage of skilled labor must increase more than the increase in wage of unskilled or informal labour leading to widening of the wage gap.

## II. Conclusion

The present paper has investigated the relationship between trade policy and the wage gap between the skilled and unskilled workers employed in the formal and informal sectors of a small open economy. We have developed a general equilibrium model to investigate this. The results of the model show that though the return to both the skilled and unskilled labor improves due to trade reform irrespective of factor intensities, the wage gap between them depends on the factor intensities of the commodities produced. If the informal sector uses land more intensively than the formal export sector then the skilled-unskilled wage gap decreases due to trade reform.

## APPENDIX

A reduction in the tariff rate and the consequent equations of change are given below.

$$\begin{aligned} \frac{dP_x P_x(1+t)}{P_x P_x(1+t)} + \frac{dt}{t} \frac{tP_x}{P_x(1+t)} \\ = \frac{d\bar{w}}{\bar{w}} \frac{a_{Lx}\bar{w}}{P_x(1+t)} + \frac{da_{Lx}}{a_{Lx}} \frac{a_{Lx}\bar{w}}{P_x(1+t)} + \frac{dr}{r} \frac{a_{kx}r}{P_x(1+t)} + \frac{da_{kx}}{a_{kx}} \frac{ra_{kx}}{P_x(1+t)} \\ + \frac{dP_h}{dP_h} \frac{a_{hx}P_h}{P_x(1+t)} + \frac{da_{hx}}{a_{hx}} \frac{P_h a_{hx}}{P_x(1+t)} \end{aligned}$$

Since  $\bar{w}$  and  $P_x$  do not change,  $P_h$  is given exogenously and using the envelope condition the above expression yields:

$$\hat{r}\theta_{kx} = \alpha \hat{t}, \text{ where } \alpha = \frac{t}{(1+t)} \text{ and } \theta_{kx} = \frac{a_{kx}P_x}{P_x(1+t)}, \text{ the income share of capital in sector X.}$$

Thus,

$$\hat{r} = \alpha \frac{\hat{t}}{\theta_{kx}} < 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (9) \text{ where } \alpha = \frac{t}{1+t} \quad (9)$$

Now differentiating equation (1) and substituting the expression for  $\hat{r}$  we get,

$$\widehat{w}_s = (-)\alpha \frac{\hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} > 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (10)$$

Again, using equation (4) and substituting the above information, we obtain

$$\widehat{R} = \alpha \frac{\hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} \frac{\theta_{sz}}{\theta_{Tz}} < 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (11)$$

Differentiating equation (3) and substituting the above results yields:

$$\widehat{w} = (-)\alpha \frac{\hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} \frac{\theta_{sz}}{\theta_{Tz}} \frac{\theta_{TY}}{\theta_{IY}} > 0 \text{ as } \hat{t} < 0 \quad \dots\dots\dots (12)$$

Equation (10) and (12) show that both the wages of skilled and unskilled labor increases. The expression for wage gap ( $\widehat{w}_s - \widehat{w}$ ) is derived by substituting the values of  $\widehat{w}_s$  and  $\widehat{w}$  from equation (10) and (12) respectively.



The wage gap is given by

$$\widehat{W}_S - \widehat{W} = \frac{\alpha \hat{t}}{\theta_{kx}} \frac{\theta_{kh}}{\theta_{sh}} \frac{\theta_{Ty} - \theta_{Tz}}{\theta_{Tz} \theta_{ly}} \dots\dots\dots (13)$$

Now the absolute value of wage gap depends on  $\theta_{Ty}$  and  $\theta_{Tz}$ .

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