

Syeda Tamkeen Fatima

OFF-SHORING AND WAGE INEQUALITY: WHERE
DO WE STAND?



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Abstract

The distributional impact of globalization is of great academic interest. This paper traces the progression of theoretical trade models and their ability to explain the differential impact of off-shoring on skill premiums (i.e. skilled-unskilled wage dispersion) in the recipient developing countries. In light of the increasing trend of off-shoring activities, it is important to look at its consequence on labor demand and skill composition in the south which can in turn affect the wage dispersion in these economies. The varied impact of off-shoring activities onto the wage dispersion in the south as supported by the empirical evidence calls for a comprehensive model that can reconcile these differences. The class of theoretical models pointing in only one direction of either an increase, decrease or no change in wage dispersion need to be enriched to take account of multiple equilibrium or asymmetric pattern of skill premium obtained under different circumstances.

Keywords: off-shoring, foreign direct investment, wage inequality, skill premium, developing south

JEL codes: F16, F66, J31

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1 INTRODUCTION

The phenomenon of off-shoring or international outsourcing has gained significance over the years¹. There are many factors which have facilitated this trend namely decrease in trade barriers, decrease in transportation cost and most importantly technological improvement. The latter has allowed the unbundling of production tasks into distinct units or modules which can then be moved abroad and later re-exported for final assembly or redistributive purposes. The possibility of fragmenting production into discrete units has allowed multinational corporations (MNCs) to exploit the efficiency seeking opportunities presented by better and cheaper resources and assets located abroad, altogether resulting in expansion in trade volumes and production activities.

In light of this trend, it is important to go beyond the growth and productivity impact of globalization and concentrate on its distributional effects (Görg & Figini, 2006). Most of the research pertaining to the distributional impact of globalization focuses on wage inequality and in particular “skill premium” which is the difference between the wages of skilled and unskilled workers. Since wages are a significant part of an economy’s income, a differential impact of off-shoring activities onto the wages of skilled-unskilled workers consequently induces changes in income inequality which in turn can have significant welfare implications for the economy. Therefore any policy stance by developing economies undertaken for attracting off-shoring or foreign direct investment (FDI)² must consider its implication in terms of its ability to transmit the benefits onto the desired category of workers in the form of higher wages, which in most cases is assumed to be the unskilled workers. This paper thus presents a review of the theoretical models rendered to explain the link between off-shoring and skilled-unskilled wage dispersion in the recipient economy. An evaluation of these models serves to provide the theoretical underpinnings for the observed increase or decrease in wage inequality i.e. it helps identify the winners and losers as a result of increased influx of off-shoring activities in the region and helps determine whether the outcome coincides with the desired category of workers which the policy intended to target.

The traditional trade model as embodied by the standard Heckscher³-Ohlin⁴ model and its companion Stolper-Samuelson theorem (1941) provides the first direct linkage between trade in final goods and wage inequality. The model asserts that trade liberalization allows developing countries to specialize in unskilled intensive production which in turn raises the product prices of unskilled labor intensive products. This will be followed by increase in factor demand and consequently factor price of unskilled labor, which is the factor used intensively in the production of these products, altogether resulting in a decrease in skilled-unskilled wage dispersion. The empirical evidence

1 Off-shoring involves production of tasks by an external supplier located abroad. This supplier can either be a foreign affiliate of the parent organization or an independent subcontractor.

2 Since foreign direct investment is a component of off-shoring, the two terms are used interchangeably in this paper.

3 Heckscher, E. (1919). The effect of foreign trade on the distribution of income. *The Ekonomisk Tidskrift*, Vol. 21, pp.497-512.

4 Ohlin, B. (1934). Interregional and International Trade. *Political Science Quarterly*, Vol. 49(1) , pp. 126-128.

however contradicts these conclusions, calling for alternative models for explaining the rising trend in wage inequality in many developing countries. This paper explores the new generation of trade models which incorporate the role of off-shoring into the picture to explain the rising trend of wage inequality in the developing countries. One category of these model attributes the increase in wage dispersion to high skill component involved in the outsourced task employed in the south⁵ (also referred to as composition effect) and the second category holds knowledge and technology externality of outsourcing as the culprit for this rise (also referred to as the technology effect). However even these models are rendered incomplete as they rightly capture only one dimension of reality of rising wage dispersion but fail to account for instances of falling or no change in wage dispersion following the influx of off-shoring activities in the south. These added dimensions are necessary to complete existing models. This paper thus traces the progression of theoretical models developed in this domain to explain the differential impact of off-shoring onto the wage inequality in the region.

The remainder of the paper is organized as follows: section 2 deals with the class of models explaining the increasing trend in wage dispersion following off-shoring activities in the south; section 3 deals with the class of models explaining the decreasing trend, section 4 presents more powerful models which can explain the asymmetric pattern of skill premium i.e. instances when wage dispersion can either increase or decrease as a result of off-shoring activities in the developing countries, section 5 concludes and presents the scope for future research.

5 The 'north' refers to a country engaged in off-shoring tasks whereas the 'south' is the recipient country of these off-shored tasks. In our context the former is presumed to be a developed country while the latter is a developing economy.

2 THEORETICAL MODELS RELATING OFF-SHORING TO INCREASE IN WAGE INEQUALITY

2.1 Composition effect

The pioneering work in this regard is by Feenstra & Hanson (1997). The trade model assumes that the production of a final good is divided into a continuum of tasks ranging from less skilled intensive to being high skilled intensive. The summary of which is represented in Fig. Since the cost of producing the less skilled intensive tasks is relatively lower in the south, it tends to specialize in its production. On the other hand the north specializes in the production of tasks that fall in the high end of the spectrum given their comparative advantage in skilled production. Given this setting any increase in off-shoring opportunity would push the dividing line, which separates the tasks being performed by the north and south, from A to B. In other words off-shoring allows the north to transfer its least skilled intensive components to the south, which are high skilled from the South's perspective thereby increasing the demand for skilled labor and consequently skilled-unskilled wage differential in both the regions.

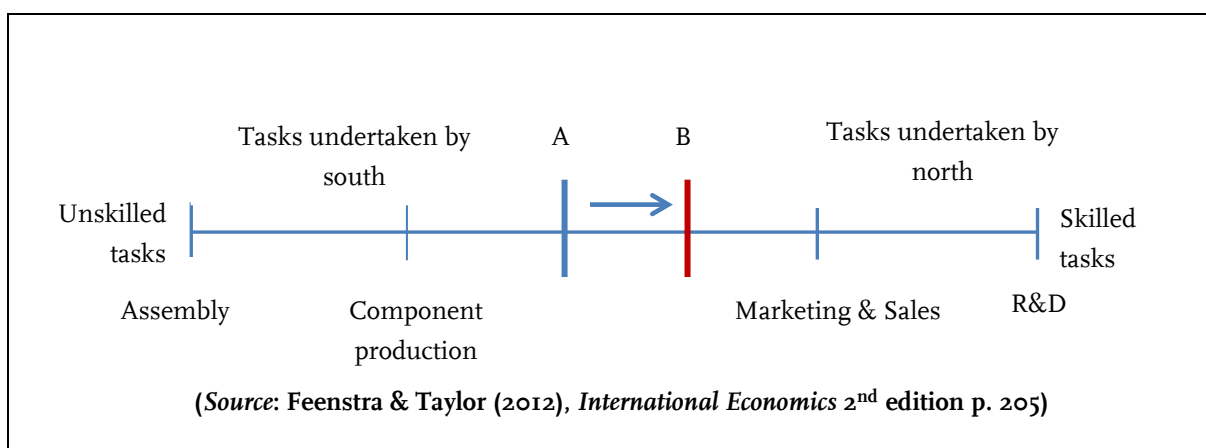


Fig. 1: Feenstra and Hanson (1997) Trade Model

A critical assumption of Feenstra & Hanson (1997) model is that trade liberalization precedes regimes of foreign investment liberalization. The free trade assumption allows both the north and south to specialize in low- and high-skilled labor intensive tasks, respectively. As explained earlier, in this setting any subsequent movement of capital from the north to the south following increased outsourcing activities occurs in the relatively skilled intensive stages of production thereby pushing the demand for skilled workers at the margin (i.e. movement from A to B in Fig). In the absence of trade, south would be incompletely specialized and FDI may not necessarily flow in the relatively skilled labor intensive stages of production, hence in that case wage inequality can either increase or decrease (Das, 2002 p. 17).

Similarly, Zhu (2004) and Zhu and Trefler (2005) resonate the arguments of Feenstra & Hanson (1997) in explaining the rising trend of wage inequality in the south. Zhu (2004)

explains northern product innovation being driven by product-cycle dynamics, whereby in the first stage the north innovates, in the second stage it outsources its least skilled intensive production to the south in pursuit of increasing its profits and in the third stage south drives northern producers out of the market given the southern indigenous firms new found access and exposure to state-of-the-art technology and its ability to replicate it at much lower costs⁶. This then reignites the entire cycle again with north investing in research and development (R&D) in search of more innovative products to reclaim its market shares. Since it is assumed that the outsourced tasks are more skill intensive from South's perspective therefore wage inequality in the south increases with every product cycle. Likewise, Zhu and Trefler (2005) link outsourcing to the change in South's composition of exports towards skill intensive goods which subsequently increases wage inequality in the region.

Another model explaining the rising trend of wage dispersion is by Ghosh (2008). The model asserts that FDI leads to an increase in skill premium in the south even if FDI flows in an unskilled intensive component of production of a skilled intensive good (i.e. FDI directed to the tasks on the left side of the spectrum in Fig). This line of reasoning is novel and departs from Feenstra & Hanson (1997) model's assertion of rising skill premium being driven by the assumption of the off-shored task being skilled intensive in the south but unskilled intensive in the north. Ghosh (2008) arrives at the same conclusion of rising wage inequality while continuing to assume that the off-shored task in the south is unskilled intensive. This is justified by the fact that off-shoring reduces the cost of intermediate goods for both the parent company located in the north and also the southern indigenous firms provided that the latter is allowed to purchase the intermediate goods from the foreign affiliates. For a given price level of the final good this increases their profit margins which in turn increases the demand for skilled workers since we are referring to a skill intensive product which requires large amounts of skilled workers to convert the intermediate good into a final product thereby increasing the wage dispersion in both north and the south.

Ghosh (2008) model is a two country model whereby both countries are engaged in the production of two goods, manufactured (M) and agricultural products (A). The production of good M involves a two stage production, the first stage (upstream production) involves the production of an intermediate good and the second stage (downstream production) involves combination of the intermediate good and skilled labor, in a fixed proportion, to produce the final good. The intermediate good is produced with unskilled labor alone. On the other hand product A is produced using both skilled and unskilled workers. The good M is characterized as being skilled intensive while good A is unskilled intensive. Furthermore north is taken to be the skilled-abundant nation whereas south is unskilled-abundant. This implies lower wage ratios for unskilled workers (w_{US}/w_{UN}) in the south as compared to the wage ratios of high-skilled workers (w_{HS}/w_{HN}) in the south, where w_{US} (w_{UN}) is the wage rate for the unskilled workers in the south (north) and w_{HS} (w_{HN}) is the wage rate of high skilled workers in the south (north). This comparative advantage in unskilled labor production is what induces the north to shift the production of its unskilled labor intermediate good to the south.

6 Refer to Caves (2007) and Markusen (1995) for a detailed analysis on the channels via which technology can get transferred from foreign to local firms.

Ghosh (2008) model assumes that the north possesses better technology which allows it to produce both goods M and A using fewer units of skilled and unskilled workers per unit of production than their southern counterparts. Therefore in the absence of outsourcing, whereby the firms in the north undertake the responsibility of both upstream and downstream production of M , the cost of producing intermediate good equals $(a_{UN}w_{UN})$ and cost of downstream production equals $(a_{HN}w_{HN})$, where a_{UN} and a_{HN} is the amount of unskilled and skilled labor required to produce one unit of good in upstream and downstream production in the north, respectively. For simplicity it is assumed that $a_{UN} = a_{HN} = 1$, therefore given a perfectly competitive market for final good M , its price equals, $P = w_{UN} + w_{HN}$ ⁷. Similarly in the south the cost of upstream and downstream production equals $(b_{US}w_{US})$ and $(b_{HS}w_{HS})$, respectively where b_{US} and b_{HS} is the amount of unskilled and skilled labor required to produce one unit of good in upstream and downstream production in the south respectively. Given that the north possesses better technology implies that $a_{UN} < b_{US}$ and $a_{HN} < b_{HS}$ or simply $b_{US}, b_{HS} > 1$. Hence the price of good M in the south equals $P = b_{US}w_{US} + b_{HS}w_{HS}$. In the absence of off-shoring, north would import the intermediate goods from south if and only if the cost of producing the intermediate good is greater in the north than in the south (i.e. $a_{UN}w_{UN} > b_{US}w_{US}$). The option of off-shoring, whereby producers of good M shift intermediate production to the south, would allow the foreign owned firms in the south to employ the same technology used in the north thereby further lowering the cost of good M for the parent organization from $b_{US}w_{US}$ to $a_{UN}w_{US}$ or simply w_{US} (as $a_{UN} = 1$). This is true in case the north reverts from importing the intermediate good to producing it in its foreign affiliate in the south. Otherwise if the north switches from the status of producing the intermediate good itself to shifting production to the south it decreases its cost of intermediate production from w_{UN} to w_{US} .

In this framework off-shoring can affect skill premium in the north and south in two ways. The first is the direct effect operating via holding the price of M constant. The second effect operates via changes in world price of M induced by changes in its global production. According to the direct effect a transition from producing in-house to off-shoring i.e. shifting of intermediate production to the south would decrease M 's production cost thereby changing the wage share of skilled vis-à-vis unskilled workers. For a fixed price of M a decrease in the cost of intermediate good from either $b_{US}w_{US}$ or w_{UN} to w_{US} would be followed by an increase in the skill premium of skilled workers in the north. This is referred to as the *localized* cost saving effect. The cost saving effect is confined to the northern producers of good M as it is assumed that the southern firms continue to produce the intermediate good in-house, using inferior technology and then use it in the final production process. Since nothing has changed for the southern firms wage dispersion in the south remains unaffected. However if the southern firms can buy the intermediate goods from the foreign owned firms operating in the south then their cost of intermediate good falls from $b_{US}w_{US}$ to w_{US} . For a fixed price level and given the fact that good M is skilled intensive this would increase the demand and consequently wages of skilled workers thereby increasing skilled-unskilled wage dispersion in the south as well (i.e. $\bar{P} = b_{US}w_{US} \downarrow + b_{HS}w_{HS} \uparrow$). This is referred to as a *globalized* cost saving effect. As an extension to this model, we propose that the same results would follow in

7 In a perfectly competitive market price of final good equals the marginal cost of production.

case of FDI induced technology spillovers to the indigenous southern firms. In this scenario instead of buying the intermediate good from foreign based firms in the south at a lower price, the indigenous firm can gain the ability to produce the intermediate good at lowered cost thereby inducing the same effects with respect to wage dispersion in the south as proposed by Gosh (2008).

The indirect effect which operates via changes in the global production of good M reinforces the rise in wage dispersion in both the north and the south. As a result of shifting production of intermediate goods to the south, the north would experience a decrease in manufacturing and subsequently increase in agricultural production since part of northern production is being moved to the south. However since empirical evidence does not support the notion that developed countries experience increase in agricultural activities as a result of globalization activities, we propose an introduction of a third sector in the north i.e. the service sector which grows as a result of its shrinking manufacturing sector. Likewise south will experience an increase in manufacturing and decrease in agricultural production. Since north is assumed to have an edge in the production of both sectors a decrease in manufacturing production in the north would exceed the increase in the south altogether decreasing its global production. This will be followed by increase in the price of manufactured goods. The Stolper-Samuelson theorem predicts increasing demand and wages of the factors used intensively in the production of good M thereby increasing the skilled-unskilled wage dispersion in both of the regions. In short off-shoring changes the global production which in turn induces the indirect price effects which can act as another channel via which offshoring can impact wage inequality.

2.2 Technology effect

Another genre of models that view FDI or influx of off-shoring activities as an engine of technology transfer to the south, link this trend to increase in skilled-unskilled wage dispersion in the recipient economies. This is based on the notion that improvement in technology which is accompanied by FDI increases the demand for skilled workers because of their complementarities with technology thereby increasing wage inequality (Velde & Morrissey, 2004).

Using this line of reasoning Görg & Figini (1999) reinterpret the endogenous growth model developed by Aghion & Howitt (1998) to explain the link between FDI, technology and wage dispersion. This model is based on the assumption that FDI has a direct and an indirect impact on wage dispersion. The direct impact ensues from the fact that FDI employs superior technology than the indigenous firms thereby increasing the relative demand for skilled workers in the FDI recipient firms. This technology is also transferred to the local firms via demonstration effect, labor mobility, competition effect and creation of backward and forward linkages thereby increasing the relative demand for skilled workers in the local firms as well (Markusen, 1995; Caves, 2007). This indirect effect results in two stages of development whereby the first stage is characterized as the imitation phase in which the indigenous firms continue to employ the old technology using unskilled workers but alongside invest in R&D and employ skilled workers to

replicate the imported production technology. Since the demand for skilled workers is still low relative to that of unskilled workers its implication on labor market i.e. wage dispersion would be insignificant. The second phase is marked by completion of imitation phase and a shift towards the skilled intensive technology. The transition from the first to the second phase would correspond to increase in the relative demand for skilled workers and a consequent increase in wage inequality. However as the transition gets completed i.e. as all firms in the industry enter the second stage, the demand for unskilled workers approaches zero consequently leaving behind only one category of workers i.e. the skilled workers and thereby dismissing the question of within-industry wage dispersion. In short, Görg & Figini (1999) hypothesize an inverted U-shape relationship between wage inequality and FDI in the south. In the initial phase, wage inequality increases but later it decreases as diffusion of foreign technology amongst the indigenous firms gets completed. Here the underlying assumption is that in the long run the un-skilled workers are able to upgrade their skill levels to cater to the increased demand for skilled personals.

The Görg & Figini (1999) model is based on the assumption of FDI being accompanied by a skilled biased technology transfer. This along with the assumption of technology being public good and easily replicated by other firms is what is driving the result of an increase in skilled-unskilled wage dispersion in the developing south. The model however overlooks the possibility of a skill neutral technology transfer whereby FDI raises the demand and productivity for both skilled and unskilled workers consequently bearing no impact on the relative wage dispersion of skilled-unskilled workers. This was proved true in the case of Hong Kong (1986-94), Singapore (1985-96) and Philippine (1985-94) whereby wages of skilled and unskilled workers increased by the same proportion as a result of increased offshoring activities in these countries (Velde & Morrissey, 2004). Furthermore the notion that FDI is accompanied by skilled biased technological transfer may be contingent on the sector in which it is flowing into. FDI in skilled-intensive sector is more likely to be followed by a technological transfer than FDI flowing in the unskilled-intensive sectors (Keller & Yeaple, 2009). Therefore the effects of off-shoring on wage inequality would be more pronounced in the former case than in the latter.

3 THEORETICAL MODELS RELATING OFF-SHORING TO DECREASE IN WAGE INEQUALITY

Das (2002) purports that FDI may not have the inequitable wage effects as were instigated by Feenstra & Hanson (1997), rather FDI is assumed to decrease wage dispersion even if it flows in the skilled-intensive sectors of the economy. Two possible explanations are rendered for a decreasing trend in wage inequality, (i) technology gap and (ii) endogeneity of the occupational choice of the skilled workers. FDI is accompanied by superior technology and if technology is not fully disseminated to domestic firms then in the long run this technology gap would result in the indigenous firms to wither away as foreign owned firms replace the less efficient domestic firms. As a result of job destruction in the skilled-intensive sector (since FDI is assumed to be mostly directed towards this sector), the demand for skilled workers decreases consequently decreasing wage dispersion in the south. On the other hand the assumption that the occupational choice of skilled workers is endogenously determined is based on the notion that skilled workers can either opt to work in the skilled-intensive sector or become entrepreneurs themselves as they possess the expertise to do so. This is true in certain skilled-intensive sectors where start-up costs are small and work is knowledge based. For example in computer software industry most of the firms are owned by computer experts. These skilled entrepreneurs enjoy the same skill set as that required by foreign owned firms therefore entry of MNCs will result in some of the local entrepreneurs to be displaced as their profits are curtailed because of the competition from their foreign counterparts. The resulting increase in the supply of skilled workers as former entrepreneurs re-enter the job market further depresses the wage dispersion in the south.

The persistence of technology gap in the long run as assumed by Das (2002) may not be a good approximation as technology spillover is seen to be significant for many FDI recipient countries at least in the long run (Görg & Strobl, 2001; Meyer & Sinani, 2009; Havranek & Irsova, 2011⁸). This trend is partly supported by the fact that poor intellectual property rights in developing countries coupled with the presence of some basic skill level in the recipient country allows for the possibility of imitation or adoption of foreign firms' superior technology by the indigenous firms. Moreover the shift from an oligopolistically competitive market structure of the skill-intensive sector which underlies Das (2002) model to a monopolistically competitive market structure would allow the indigenous firms to survive even if the foreign owned firms continue to possess superior technology than their local counterparts. Although under the monopolistically competitive market structure profits of domestic firms will be undermined because of foreign competition but since all firms are producing slightly differentiated products and as a result hold some market power, the return of skilled entrepreneurs back to the ranks of being skilled workers due to loss of their local firms may be a subdued phenomenon hence not inducing the effects as predicted by the model.

⁸ These are meta-analysis studies containing large number of country specific studies with cases which experienced a positive technology spillover effect due to foreign presence.

4 ASYMMETRIC PATTERNS OF WAGE INEQUALITY

The class of theoretical models which point in only one direction of either an increase, decrease or no change in wage dispersion as a result of increased influx of off-shoring activities in the developing south need to be enriched to take account of multiple equilibrium or asymmetric pattern of skill premium arising under different circumstances. These added dimensions complete existing models and improve their explanatory power. It is the mixed empirical results which point towards a need for such advanced models. **Appendix A** contains empirical evidence from various country specific and pooled country studies assessing the impact of off-shoring/FDI on wage inequality.

Wood (2002) contribution in this regard involves a synthesis of three trade models by Tang & Wood (2000), Feenstra and Hanson (1997) and Heckscher Ohlin (HO) so as to present a holistic picture of the impact of globalization in general, on wage inequality in the north and the south. Since this model implicitly encompasses the role of off-shoring which is a subset of globalization, stripping the complex model to this one aspect, whereby off-shoring is proxied via FDI, can enable us to decipher the relevant linkage between off-shoring and wage inequality.

The first building block in this model is provided by Tang & Wood (2000) whose focus is on the falling transaction costs (t) and the increased movement of highly skilled workers and capital from north to the south. Here reduction in t acts as a proxy for increased influx of off-shoring activities in the south. The basic model set up by Tang & Wood (2000) assumes that the production in the south involves high quality tradable sector (A) and a non-tradable sector (B). Both sectors employ high-skilled (H) and unskilled workers (U) although in different proportions. The Feenstra & Hanson trade model (1997) incorporates the features of Tang & Wood (2000) model and enriches it by allowing the production of good (A) to be broken down into a series of intermediate tasks of varying skill intensity levels (H/U). This creates the possibility of trade-in-tasks or trade in intermediate goods between the two regions. The original Feenstra & Hanson (1997) model is a partial equilibrium model since it concentrates on only one sector while ignoring the changes induced onto other sectors as a result of increased off-shoring activities in the economy. The fusion with Tang & Wood (2000) model converts it into a general equilibrium model since now changes in the skill intensity in sector A as a result of influx of off-shoring activities also effects the skill intensity employed in other sectors which is being captured in this model via the presence of a non-tradable sector. Ultimately the impact on skilled-unskilled wage dispersion would depend on how the overall skill intensity, H/U changes in the two sectors as a consequence of influx of off-shoring activities in the south.

The wage determination process in this modified model is based on the assumption that relative wages (w_H/w_U) are determined by the residual supply of H and U workers in the non-tradable sector. For example if more of unskilled than skilled-workers move from non-tradable to the tradable sector then the relative supply of skilled workers (H/U) decreases in sector B thereby resulting in increase in the relative wages (w_H/w_U). Likewise when more of unskilled than skilled workers move from sector B to A this results in increase in the relative supply of skilled workers in sector B resulting in

decrease in relative wages (w_H/w_U) to absorb the excess supply. Here the underlying assumption is that H and U workers are substitutable in the non-tradable sector.

In this model the average skill intensity employed in sectors A and B is defined as z_A and z_B , respectively. Moreover the marginal increase in skill intensity in sector A as a result of fall in transaction cost t or increase in off-shoring is defined as z^* . This is summarized as follows:

$$z_A = (H/U)_A \quad (0.1)$$

$$z_B = (H/U)_B \quad (0.2)$$

$$z^* = \Delta(H/U)_A / \Delta t \quad (0.3)$$

The changes in z_B is what determines the increase or decrease in the relative wages in the FDI recipient economy. If $z_B > z^*$, this implies that since the marginal increase in skill intensity in sector A as a result of increase in FDI is less than the average skill intensity employed in the rest of the economy therefore sector B would release more of U workers relative to H workers to flow to the expanding sector A . This tends to increase $(H/U)_B$ resulting in decrease in (w_H/w_U) . Likewise if $z_B < z^*$, this implies that since the marginal increase in skill intensity in sector A as a result of increase in FDI is more than the average skill intensity employed in sector B therefore the latter sector would release more of H workers relative to U workers to flow to the expanding sector A . This tends to decrease $(H/U)_B$ resulting in increase in (w_H/w_U) .

The implications of this model are similar to Venables (1999) which also endorses the view that if the skill intensity of the outsourced task is less than the average skill intensity employed in the south (similar to case when $z_B > z^*$), wage inequality decreases whereas if the skill intensity of the outsourced task is more than that employed locally (similar to case when $z_B < z^*$), wage inequality increases. The latter result coincides with Sayek & Şener (2006) dynamic product cycle model which concludes that off-shoring raises northern skill premium unambiguously but raises southern skill premium if and only if the second condition holds. In short the direction of the movement of (w_H/w_U) depends upon the skill intensity of the activities relocated from the north to the south relative to the skill intensity employed in the rest of the economy. However Venables (1999) is a static model that entertains either the first case or the second whereas Wood's model (2002) allows the possibility of transiting from one case to the other over time.

The south may experience both phases of increase and decrease in skill premium as transaction costs decrease over time. In the initial phase, case 1 where $z_B > z^*$ is more plausible because in the beginning tasks which are less skill intensive are the ones being shifted from the north to the south. Therefore in this phase the demand generated by sector A mostly comprises of unskilled workers resulting in a phase of falling wage dispersion. This is consistent with the experience of East Asian economies during the 1960s and 70s. In later phases i.e. as t continues to fall and nears zero the tasks being

shifted from the north to the south would now exceedingly involve higher skill intensity. This calls for a greater demand for skilled workers in sector A , ultimately resulting in a phase of rising wage dispersion.

This shows that the model proposed by Wood (2002) possesses a greater explanatory power in explaining the asymmetric response of wage dispersion to falling transaction costs or alternately increasing off-shoring activities in the south. This model presents the plausibility of both an increase and decrease in wage inequality under different circumstances as identified by the conditions whereby $z_B > z^*$ or $z_B < z^*$. The absence of any one phase depends upon the initial conditions of the country. In case of developing countries which possess higher educational level and consequently a higher (H/U) ratio would allow it to employ greater average skill intensity in its production i.e. z_B starts off from a higher level. This combined with the assumption of a slowly increasing z^* would keep z_B perpetually above z^* thereby disallowing the economy to enter phase 2, thus such an economy would perpetually experience a decline in wage dispersion. Contrary to this if the least skill intensive component outsourced to sector A is more skill intensive than that employed in local production which is common for developing countries with low educational level then one can expect only the presence of phase 2. The original Feenstra & Hanson (1997) model captures the possibility of phase 2 but misses out the possibility of phase 1 which this modified model is able to capture⁹. A possible extension of this modified model may incorporate a phase where $z_B = z^*$. In this special case a fall in t induces an increase in skill intensity in A which equals the average skill intensity employed in sector B . The displacement of skilled and unskilled workers from sector B to A would not alter the H/U ratio employed in sector B thereby not inflicting any impact on the skilled-unskilled wage dispersion. Here the number of jobs destroyed in sector B is equal to the number of jobs created in sector A .

Another attempt to establish the asymmetric pattern of skill premium as a result of off-shoring has been made by Cheng & Zhang (2007) by resurrecting a model which has elements of both Feenstra and Hanson (1997) and Heckscher-Ohlin (HO) model. The model evaluates how wage inequality in both north and south are affected as a result of moving from a stage which involves trade in only final goods to trade in both final and intermediate goods. The direction of change in skill premium is determined by the type of production technology employed in intermediate good production in both north and the south. In case the production technology is symmetrical i.e. if intermediate good is produced in both north and the south using the same unskilled labor intensive technique, then the switch to overseas purchase of intermediate good will increase wage inequality in the north and decrease wage inequality in the south as relative demand for unskilled worker falls in the north and rises in the south. This outcome is consistent with HO predictions but for different reasoning. As already explained Heckscher-Ohlin model and its complementary Stolper-Samuelson theorem predicts decrease in wage dispersion in the south as a result of increase in relative price of unskilled labor intensive goods, in which south possesses a comparative advantage. However in this model it is the fall in transaction costs which is driving the increase in the demand for unskilled workers and consequently a decrease in wage dispersion. The antithesis of this scenario is one where

9 Phase 1 is defined as where $z_B > z^*$ and phase 2 is defined as where $z_B < z^*$.

production technology is asymmetrical i.e. intermediate good is produced using different technologies in the two regions. More specifically if the intermediate good is unskilled intensive in north but skilled intensive in south this would increase wage dispersion in both the regions. This case is inspired from the Feenstra and Hanson (1997) model which makes similar assumptions about different countries producing a particular good by employing different factor intensities.

Likewise Khalifa and Mengova (2010) model of trading tasks between north and south presents another explanation for the asymmetric pattern in skill premium arising from FDI or outsourcing activities. Again off-shoring is driven by lower wages of skilled and unskilled workers in the south relative to wages in the north. The results of the model imply that there exists a threshold skill- abundance level in the south, $(H/U)_T$. All the developing countries that fall below (above) this threshold are relatively more endowed with unskilled (skilled) labor. In other words this model recognizes the heterogeneity across the developing countries and segregates them into different skill groups. The developing countries that fall below (above) this threshold will be the recipients of low (high) skill intensive tasks following an improvement in off-shoring technology. It is assumed that the wage share of unskilled workers in the south is the weighted average of the wages earned by the unskilled workers employed in foreign owned firms (w_U^*U) and domestic firms ($w_U^{**}U$). Given that foreign firms pay higher wages than their local counterparts, i.e. $w_U^* > w_U^{**}$ an increase in the proportion of unskilled workers employed in the offshored sector as a result of improvement in off-shoring technology would increase unskilled wage share and consequently depress skill premium. Similarly influx of high skilled task in the south would increase the proportion of skilled workers employed in the offshored sector and given that $w_H^* > w_H^{**}$ where w_H^* and w_H^{**} are wages of skilled workers in offshored and domestic firms respectively this would result in increase in wage premium in the south. In short it is the positioning of the developing countries above or below the threshold level which ultimately determines the direction of skill premium following the influx of off-shoring activities in the south. Yeaple's (2003) model demonstrates a similar idea whereby skill scarce countries attract FDI in low skilled industries and skill abundant countries attract FDI in high skilled sectors. The former would result in decrease in skill premium whereas the latter contributes in increasing wage dispersion in the recipient countries.

The model by Arndt (1997) can be modified to explain the impact of off-shoring on skill premium. It again assumes a north-south model where both countries are involved in the production of goods X and Y using two factors of production, high skilled (H) and unskilled workers (U). Good X is assumed to be unskilled intensive therefore it qualifies as the exportable sector for the south while Y is the skilled intensive good and North's exportable sector i.e. $(H/U)_X < (H/U)_Y$. Arndt (1997) then exploits the possibility of fragmentation which allows trade in intermediate goods. Suppose both X and Y comprise of two component activities with different factor intensities denoted by $X1, X2, Y1$ and $Y2$. Furthermore assume that $(H/U)_{Y1} > (H/U)_{Y2}$ and $(H/U)_{X1} > (H/U)_{X2}$ i.e. components $Y1$ and $X1$ are more skill intensive than components $Y2$ and $X2$. The final factor intensity employed in the production of X and Y (i.e. $(H/U)_X$ and $(H/U)_Y$) is simply the weighted average of the skill intensities involved in the two components. The model asserts that instead of producing goods X and Y in entirety in one place, the north and the south can

retain production in the component in which it possesses comparative advantage and subcontract the other components. For example north can retain production of component 1 and engage in offshore sourcing of component 2. Simultaneously south is assumed to retain production of component 2 and engage in offshore sourcing of component 1 or more realistically importing than component from the north.

The model implies that offshore sourcing by the skilled intensive exportable industry in the north (i.e. Y industry) of unskilled intensive component (i.e. Y_2) would raise skill premium in both north and south. North would experience increase in skill premium since this arrangement is cost-saving for a given price of Y . To restore the disequilibrium induced by declining costs and unchanged price level the relative wages must adjust. Since profit margins for good Y increases this encourages its production to increase. The increase in the demand for skilled workers would in turn increase relative wages of skilled workers. Likewise since south can now concentrate on the production of the unskilled component (Y_2) in the skilled sector (Y) and subcontract (or import) the skilled component (Y_1) from the north this tends to be again cost-saving. Since price of Y is assumed to be unchanged while production costs have fallen this encourages the producers to increase output of Y and ultimately increase the skill premium in the south (this is similar to Ghosh (2008) model which advocates global cost saving effects due to outsourcing). On the other hand offshore sourcing by the unskilled intensive importable industry in the north (i.e. X industry) of unskilled intensive component (i.e. X_2) would decrease skill premium in both north and south. Analogous to the case of offshore sourcing in sector Y , offshore sourcing in X is cost-saving in the production for both north and south. This encourages producers to increase output of good X resulting in increase in the demand for unskilled workers which ultimately decreases skill premium in both north and south. Hence countries which engage in offshore sourcing of unskilled component, which is part of the skilled sector in both north and south, would increase skill premium in both the host and recipient nation whereas if offshore sourcing occurs in the unskilled component which is part of the unskilled sector in both north and south then this results in decrease in skill premium in both the regions.

5 CONCLUSION

This paper traces the progression of theoretical models contributing in explaining the role of off-shoring activities on wage inequality of skilled-unskilled workers in the developing south. The empirical evidence fails to point in any one direction of either an increase or decrease in wage dispersion as a result of outsourcing activities in the south thus demanding a more comprehensive model incorporating the possibility of asymmetric pattern of wage dispersion under different circumstances. The notion that skill premium depends upon the skill intensity of the outsourced task relative to the average skill intensity employed locally provides a strong theoretical basis for predicting the direction of the change in skill premium as a result of increased influx of outsourcing activities in the south (Wood (2002), Venables (1999)). This implies that the inherent nature of the work being outsourced to the developing countries is important in determining the direction of the change in wage dispersion. If outsourcing is directed towards skilled intensive sectors which are characterized as those sectors that fall above the average skill intensity employed in the south, wage dispersion is expected to increase because the demand for skilled workers increases by greater proportion relative to that of unskilled workers. Likewise, if outsourcing is directed towards unskilled intensive sectors of production which are characterized as those sectors that fall below the average skill intensity employed locally, wage dispersion is expected to decrease. Since in the above mentioned cases factor demand is being driven by the inherent composition or nature of production we refer to these effects as the composition effect.

Another channel via which FDI can induce changes in wage dispersion is via technology transfer. Taken together the composition and technology effect predicts an increase in wage dispersion for the skilled intensive sector since both effects are vying for an increase in the demand for skilled workforce following the influx of outsourcing activities. However in the case of unskilled intensive sector, composition effect predicts a decrease in wage dispersion whereas the technology effect predicts an increase. The net effect depends upon the relative strengths of the two opposing forces. If composition effect dominates the technology effect, wage premium is expected to decrease. In instances where technology effect dominates the composition effect, wage premium is expected to increase and the last scenario where composition effect is equal to technology effect we would witness no change in wage dispersion.

Hence further work calls for a sector wise analysis for predicting the change in skill premium following influx of outsourcing activities in the developing countries. The current practice of grouping all the sectors together and studying the impact of outsourcing on wage inequality for a given economy tends to conceal how sectors belonging to different skill intensities react to the influx of outsourcing activities. This shift from a cumulative to a sector wise approach promises to increase the explanatory power of existing models and would serve as a more powerful tool in explaining the differential impact of outsourcing on wage inequality depending on the dominance of the sector in which outsourcing is directed to for a particular economy.

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APPENDIX

Table 1: Empirical Studies on Off-shoring and Wage Inequality in Developing Countries

Author	Country	Period	Dependent variable	Key Independent variables	Notes on Approach	Results
Feenstra & Hanson (1997)	Mexico	1975-1988	Wage share of skilled (i.e.non-production) workers (WSH)	Share of foreign owned fixed assets relative to domestic fixed assets $(1 + K^{FDI}/K^D)$	Industry level study using Berman & Griliches (1994) methodology. The empirical model is derived by differentiating translog cost function w.r.t labor endowments of skilled and unskilled workers to yield labor share equations. The resultant equations capture the within industry change in skill composition as a result of influx of FDI activities in 2-digit ISIC industries.	FDI results in an increase in the WSH
Lorentowicz, Marin & Raubold (2005)	Poland	1994-2002	Wage share of skilled (i.e.non-production) workers (WSH)	Share of foreign owned fixed assets relative to domestic fixed assets $(1 + K^{FDI}/K^D)$	Industry level regression analysis using Berman & Griliches (1994) methodology.	FDI results in an increase in the WSH
Tomohara & Yokota (2011)	Thailand	1998-2002	Wage share of skilled (i.e.non-production) workers (WSH)	A binary variable (FDI) which is equal to 1 if foreign equity share of a production unit is positive and 0 otherwise.	Plant level regression analysis using Berman & Griliches (1994) methodology.	FDI results in decrease in WSH. This result driven by FDI originating from Japan and Taiwan which are based on cost cutting incentives.

Table 1: Empirical Studies on Off-shoring and Wage Inequality in Developing Countries (Cont'd)

Author	Country	Period	Dependent variable	Key Independent variables	Notes on Approach	Results
Ramaswamy (2008)	India	1981-2004 (panel of 46 3-digit ISIC) 1991-2004 (panel of 113 4-digit ISIC)	Wage share of skilled (i.e. non-production) workers (WSH)	Capital output ratio (K/Q)	Industry level regression analysis using Berman & Griliches (1994) methodology.	Increase in capital output ratio results in increase in WSH. (The time period from 1991 onwards coincides with trade and investment liberalization in India, therefore part of the increase in capital deepening is attributed to FDI and imported capital)
Bruno, Crinò & Falzoni (2005)	Hungary, Czech Republic, Poland	1993-2000	Wage share of skilled (i.e. non-production) workers (WSH)	Share of foreign owned fixed assets relative to domestic fixed assets	Industry level regression analysis using Berman & Griliches (1994) methodology. Here data has been pooled for 3 different countries.	WSH is unaffected by FDI in all three countries implying FDI does not favor labor demand shifts.
Görg & Figini (1999)	Ireland	1979-1995	Skill premium, (W_H/W_U)	Share of foreign employment relative to total employment	Industry level study employing the theoretical model by Aghion & Howitt (1998) and capturing within-industry change in demand for skilled workers as a result of FDI.	In short-run increase in foreign presence increases skill premium but in long-run it results in decrease in skill premium.
Görg & Figini (2006)	Unbalanced panel of 81 developing countries	1980-2000	Skill premium, (W_H/W_U)	Share of foreign inflows in total gross domestic income	Country level study employing the theoretical model by Aghion & Howitt (1998) and capturing within-country change in demand for skilled workers as a result of FDI.	In short-run increase in foreign presence increases skill premium but in long-run it results in decrease in skill premium.

Table 1: Empirical Studies on Off-shoring and Wage Inequality in Developing Countries (Cont'd)

Author	Country	Period	Dependent variable	Key Independent variables	Notes on Approach	Results
Velde & Morrissey (2004)	Thailand, Hong Kong, South Korea, Singapore, Philippines	Thailand (1986-98), Hong Kong (1986-94), South Korea (1983-98), Singapore (1985-96), Philippines (1985-94)	Skill premium, (W_H/W_U)	Share of foreign inflows in total gross domestic income	Pooled and country specific study of the effects of FDI on the market for skills using the demand and supply framework developed by Katz & Murphy (1992).	FDI results in increase in (W_H/W_U) for Thailand decrease in (W_H/W_U) for Hong Kong and Philippines and no effect for Korea and Singapore.
Velde (2003)	Bolivia, Chile, Columbia, Costa Rica	Bolivia (1987-97), Chile (1993-2000), Columbia (1978-1994), Costa Rica (1987-1997)	Skill premium, (W_H/W_U)	Share of foreign inflows in total gross domestic income	Pooled and country specific study of the effects of FDI on the market for skills using the demand and supply framework developed by Katz & Murphy (1992).	FDI results in increase in (W_H/W_U) for Bolivia and Chile, decrease in (W_H/W_U) for Columbia and records no effect for Costa Rica. Latin American countries involved in natural resource seeking and skilled-intensive FDI in 1990s report increase in (W_H/W_U) . Latin American countries involved in market seeking or efficiency seeking FDI in 1990s report no effect on (W_H/W_U) .

Table 1: Empirical Studies on Off-shoring and Wage Inequality in Developing Countries (Cont'd)

Author	Country	Period	Dependent variable	Key Independent variables	Notes on Approach	Results
Owen & Yu (2007)	China	1995-2001	Skill premium, (W_H/W_U)	Share of foreign inflows in total gross domestic income.	Regional level study using the demand and supply framework developed by Katz & Murphy (1992).	FDI results in differential impact on (W_H/W_U) in different provinces. This differential impact is then explained by the type of FDI i.e. export vs. import oriented FDI predominant in each of the 29 provinces considered.
Gopinath & Chen (2003)	Colombia, Ecuador, India, Korea, Sri-Lanka, Venezuela	1980-1992	Wage share of low-skilled workers in total GNP, $Share_L$ Wage share of high-skilled workers in total GNP, $Share_H$	Share of foreign inflows in total gross national income.	Country level study using Wong's (1995) extension of specific-factor model to theoretically derive a relationship between FDI inflow and wages. The theory dictates that inflow of foreign capital tends to decrease (increase) the relative scarcity of capital (labor) therefore decreasing rents and increasing wages. The empirical model is derived via differentiating translog GNP function w.r.t labor endowments of skilled and unskilled workers to yield labor share equations.	FDI decreases $Share_L$ and increases $Share_H$ although the latter is not significant.
Khalifa & Mengova (2010)	29 developing countries	1982-2000	Skill premium, (W_H/W_U)	Share of foreign inflows in total gross domestic income	Country level study to assess the differential impact of FDI on wage dispersion across developing countries.	FDI decreases (W_H/W_U) for low income developing countries while it increases (W_H/W_U) for middle income and emerging economies.