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Outsourcing Versus Foreign Direct Investment: A Welfare Analysis

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Abstract

Foreign direct investment may not necessarily be the most welfare enhancing form of international investment. The host country may avail options like – Joint venture, technology licensing, franchising, outsourcing etc. A host country's choice of organizational form should depend on its growth and welfare effects. This paper compares the welfare effects of FDI with that of outsourcing in the host country using Grossman-Helpman quality ladders framework. If the host absorptive capacity is above a threshold level, outsourcing is more welfare enhancing vis-à-vis FDI; while even with lower than threshold absorptive capacity, outsourcing being welfare improving over FDI is not ruled out.

Keywords: outsourcing, foreign direct investment, absorptive capacity
JEL Classification: F12, F23

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Section 1: The Background

Globalization, measured by any form – foreign direct investment (FDI), outsourcing, international mergers and acquisitions, and cross-border firm linkages via joint venture or license agreements has undoubtedly increased in the recent decades. Along with FDI, Business Process Outsourcing (BPO) has been a growing global business[1]. Gartner group estimated that the global market demand for outsourced business services would be over $300 billion by the end of 2004. McKinsey & Co projected that India would generate $17 billion in outsourcing revenues, employing 1.1 million by 2008. This is indeed a phenomenal contribution not only to Indian GDP, but also to global GDP. Global trade thus expands the economic pie and may let both the participating nations raise their welfare levels. Blomström et al. (1998), Balasubramanyam et al. (1996) and Borensztein et al. (1998) present evidence that inward direct investment has raised the growth rate of many developing countries which according to Barrel and Pain (1997) and Borensztein et al. (1998) is due to transfer of technology. Increased competition, technology transfer, increased access to world markets due to spillovers to local firms, and worker training are some of the channels through which FDI can benefit the host economy. The impact of foreign investment on economic prosperity has significant policy implications and therefore any policy on foreign investment should be based on a more holistic view of FDI.

Despite the increasing importance of FDI in the past and recently of outsourcing, the impact of these two alternative forms of foreign investment on the host countries involved has received relatively little attention in the literature. A comparison of their affect on the welfare of the host country has become an important policy issue. This paper compares the affect of FDI with that of outsourcing on factor prices and aggregate welfare in the host country. The foreign firm's mode of entry affects the relative demand for skilled and unskilled labor. The model shows that one form of foreign investment may yield higher welfare than that of the other under certain conditions. Specifically, it is found that there is a strong possibility that outsourcing

[1] Between 1980-98, the amount of net FDI received by developing countries has increased from 4.4 billion dollars to 170.9 billion dollars, almost a forty times increase. Feenstra (1998) compares several different measure of international outsourcing and argues that they have all increased.

unambiguously leads to a higher welfare if the host country has high absorptive capacity. Such an unambiguous possibility does not exist for FDI. Welfare is different in the two alternative forms of foreign investment, because the extent of skilled and unskilled labor demand created by FDI and outsourcing are different, which impacts their wage rates and hence GDP or welfare.

The distinction between FDI and outsourcing in this paper is motivated essentially by Grossman and Helpman (2003) with a few elements added from Grossman and Helpman (2005) and (2002). In Grossman and Helpman's terms, FDI is self-production in a foreign land while outsourcing is production through a contract between the MNC and the domestic partner. Grossman and Helpman (2003) is, to the best of my knowledge, the only paper that formally highlights the difference between FDI and outsourcing. Their model studies the determinants of the extent of outsourcing and FDI in the home country industry in which the producer needs specialized components. They explain outsourcing in terms of production scale and argued that outsourcing takes place instead of FDI if it is prohibitively costly for an end product producer to manufacture in-house all intermediate inputs. They show how a host of factors like - the size of the cost differential (including search costs and cost of customizing inputs), extent of contractual incompleteness, size of industry, thickness of the host country market for input suppliers and the relative wage differential between the source and the host country affect the organization of industry production. Grossman and Helpman (2005) suggests that outsourcing serves as a means to exploit comparative advantage underlying in cross border differences with little onus of production process contracted out. This is unlike FDI, where extending specialization to the level of sub-processes and components comes with higher role for the parent company such as monitoring its subsidiary in the host country.

Another crucial difference that is not modeled mathematically in literature is what this paper shall focus on. In particular, we assume that FDI subsidiary is less skill intensive relative to outsourcing production unit in the host country. The rationale for this assumption is explained as follows.

First, FDI involves greater technology transfer relative to outsourcing for the simple reason that FDI is a part of the parent company, while the input suppliers under

outsourcing agreement are different entities than the multinational. Therefore, with higher technology transferred to the subsidiary, it need not engage more skilled (and expensive) laborers in order to bring about efficiency. This is one of the reason Das (2002) cites for the fall in demand for skilled laborers with FDI.

Second, the basic tenet of the theory of MNC is that operating in unfamiliar economic environment and higher technology transfer (under FDI) taxes a multinational in terms of production cost and may defeat their purpose of transitioning into a multinational company. Since, the relative wage of unskilled workers in the south is lower than their counterparts in the north; more unskilled workers are employed under FDI to save on production costs.

Third, the multinational firm usually chooses overseas direct investment instead of outsourcing, due to some internalization motivation. The multinational company operating a subsidiary in the host country looks at the skilled worker with suspicion as they are potential carriers of the MNC industrial secrets (as a consequence of worker attrition), thus a subsidiary inevitably hires less of skilled workers. This also explains the lower skill intensity of FDI production vis-à-vis outsourcing.

Fourth, a recent survey by Hewitt of outsourcing industries in the developing countries finds that IT operations and customer relations tops the most frequently globally outsourced functions (which are highly skill intensive jobs), whereas historically, FDI has been usually in the manufacturing sector. The survey further goes on to predict that three years down the line, outsourcing will also increase in finance and accounting and human resource, making outsourcing still more skill intensive relative to FDI.

Fifth, empirical evidence by Feenstra and Hanson (1996b), Sachs and Shatz (1994), slaughter and Swagel (1997), Slaughter (2000) also indicates that outsourcing leads to a greater divergence between the skilled and unskilled workers' wages in the source as well as the host country, while FDI does not. Greater divergence in factor prices of skilled and unskilled labor reflects the differential demand for the two types of labor under the alternative forms of foreign investment. Thus, empirical evidence favors the assumption that outsourcing is more skill intensive than FDI for the host.

Sixth, the above economic reasoning and empirical evidence regarding FDI and outsourcing is reflected in the formulation of theoretical economic models. Grossman

and Helpman (2005) and (2002) describe outsourcing as specialized or customized services by the input suppliers for the multinational companies, implying greater intensity of skilled labor in production by the outsourcing partner. Feenstra and Hanson (1996a) model also indicates that outsourcing is a skill intensive activity from the point of view of the host country (as well as the source country). Xu (2000) suggests for FDI that a relative increase in skilled biased demand shifts in all the sectors does not necessarily imply skill-biased demand shift in the country because *FDI may be unskilled labor-intensive activity in the host country*. Moreover, Markusen and Venables (1999a) comparison of the real wage of skilled labor between countries reveals that the entry of multinationals through FDI creates a tendency towards factor price equalization. Given that, to begin with, the developing country (South) has higher relative wage for skilled labor vis-à-vis the developed country (North), factor price equalization would imply that direct foreign investment entry might lower the wage of skilled labor in the skilled-labor scarce country (host country). Relative wages of skilled labor may fall under FDI if FDI has low skill intensity.

Two innovations are attempted in this paper. First we formally distinguish between the two forms of foreign investment - FDI and outsourcing in a unified framework and second we choose to address the problem from the point of view of a host country with non-homogeneous labor. This model is different from Feenstra and Hanson (1996b) as international outsourcing and FDI are together knit as part of a product cycle framework in which multinationals are triggered by cost saving opportunities. We allow for substitutability between skilled and unskilled labor in manufacturing, a feature, which is missing in Glass and Saggi (2001). The model is a variant of the standard North-South quality ladders growth model of Grossman and Helpman (1991) as in Glass and Saggi (2001) but enriched by introducing heterogeneity of labor. The model's framework shares similarity with Reis (2001), however, with one difference. In this model, we assume that the good produced by the multinational is not competitive with the good produced by the domestic firms in the South. Hence, multinationals do not drive the Southern firms out of the market. However, the multinationals do compete for labor with the Southern firms, which may affect wages and output of the perfectly competitive Southern firms.

Keeping the basic premise of our model in mind, that is, outsourcing partners use more skill intensive technique of production than their counterparts in a subsidiary, we move on to outline the organization of this paper. Section 2 builds up the model; section 3 characterizes equilibrium in the host country and the conditions under which one form of foreign investment scores over the other in terms of welfare. Section 4 demonstrates a comparative static exercise of the impact of investment in human capital in the South on welfare in the host country. Section 5 concludes the paper.

Section 2: The Model

This section builds a North-South framework that specifically revolves around the events happening in the host country. Each country is endowed with two types of inelastically supplied labor, the skilled and the unskilled labor, who are consumers of final goods.

Consumers in the world economy derive utility from consumption of two kinds of goods. One of the consumption goods is the homogeneous agricultural good, which is produced only in the South under perfect competition. The other good, which enters the utility function of the consumers, is the vertically differentiated manufacturing good. By definition, within the manufacturing products, consumers derive more utility from higher quality manufacturing products and are willing to pay a premium for higher quality. This gives manufacturing firms an incentive to do expensive R&D and innovate to climb up the quality ladder. The technological capability of the firms in the South is assumed to be low and therefore, only the northern firms carry out innovation. Imitation is ruled out in the model.

A product cycle is generated in which shifts in production to the South may occur either through FDI or outsourcing. FDI and outsourcing are modeled as mutually exclusive forms of foreign investment. This is unlike Grossman and Helpman (2003) where FDI and outsourcing co-exist in the industry. Even though the assumption is less realistic, its essential to evaluate the independent impact of each of these forms of foreign investment on host country welfare and factor prices. Our approach is similar to Ottaviano and Turrini (2003), where they model exports, FDI and outsourcing as

mutually exclusive ways of capturing the Southern market. Glass and Saggi (2002) also allow their forms of foreign investment, FDI and licensing to co-exist but this can be attributed to the simplicity of their model. The starting point of the model by Glass and Saggi is the optimal mode choice by the multinational firm and growth effects automatically follow. They assume away any changes in wages in their symmetric two-country model due to changes in mode shifts. Moreover, a change in innovation intensity emanating from the relative measure of FDI or licensing is the only driving force for growth in their model. In the model presented below, we ignore the problem of mode choice between FDI and outsourcing from the perspective of the multinational firm, and focus on the preferred mode of foreign investment by the host country government. This kind of approach comes from the belief that profit maximization is the only motive that drives a firm to choose a particular form of foreign investment. Therefore, a host country government can always frame incentive schemes to attract that very mode of foreign investment that brings higher welfare for its economy.

To make matters simple, we assume that the host country is a relatively small open economy to be able to affect any of the variables in the North or the source country. Therefore, variables like northern wages, measure of Northern firms are exogenously given for Southern steady state equilibrium. On the other hand, the multinationals in the host country are large enough to impinge on the labor markets in the host country and hence affect wages and welfare.

Section 2.1: Household Behavior

Section 2.1.1: Consumption

Consumers' problem is modeled in the spirit of Grossman and Helpman (1991) quality ladders model. Consumers live in one of the two countries, North or South, $h \in$ {N, S}, belong to one of the labor types, $l \in$ {1, 2}, 1 for unskilled labor and 2 for skilled labor. Consumers take market variables as given and maximize a Cobb Douglas Utility function increasing in consumption of homogeneous good *y* and an aggregate X of the vertically differentiated manufacturing good whose price varies according to the stage of the product cycle. For consumption of X, consumers choose from a continuum of manufacturing products indexed by $j \in$ [0, 1] available in discrete quality levels indexed

by *m*. Quality level[2] *m* of product *j* provides quality $q_m(j) \equiv \xi^m$. All consumers value higher quality of manufacturing goods, that is, $\xi > 1.\xi$ denotes the innovation size or magnitude of the quality jump.

The utility function of a representative consumer in country *h* and of labor type *l* is given by:

$$\cup_l = [\mathrm{X}_l]^{\gamma}[y_l]^{1-\gamma} \qquad l \in \{1(\text{unskilled}), 2(\text{skilled})\} \tag{1}$$

y, which is the homogeneous perfectly competitive agricultural good is chosen to be the numeraire while X, the aggregate vertically differentiated manufacturing good is represented as:

$$\mathrm{X}_l^h = \int_0^1 \sum_m \xi^m x_{l,m}^h(j)dj \tag{2}$$

Where ξ^m is the assessment of quality level *m* and $x_{l,m}^h(j)$ is the consumption of quality level *m* of product *j* by labor type *l* in country *h*.

The consumers maximize the utility as given by the utility function in (1) subject to the budget constraint:

$$y_l^h + P\ X_l^h = E_l^h \tag{3}$$

Where E_l^h is the income of a representative labor type *l* residing in country *h* and P is the composite price of the manufacturing good. Maximizing (1) subject to (3), and aggregating over both countries and both types of labor we get the aggregate demands of the homogeneous agricultural good and the vertically differentiated manufacturing goods as:

$$y = (1-\gamma)E \tag{4}$$

$$P\ X = \gamma\ E \tag{5}$$

Where

$$E = E^N + E^S = E^N + w_1 L_1^S + w_2 L_2^S \tag{6}$$

(L_l^S denotes employment of type *l* labor in South and w_l the corresponding wage).

[2] Since this is a static model we look at one discrete level jump in quality that generates a product cycle.

Specifically, *E* includes the wage income of the Southern laborers, wage income of the northern laborers and profits of the firms in the two countries. As mentioned before, South being small country cannot influence E^N.

A consumer utility maximization problem is broken in three stages. In stage one, they decide on the proportion of expenditure to be spent on manufacturing and agricultural goods. In stage two, they allocate the available expenditure for each product. In the final stage, the consumer allocates spending for each product to the quality level $\tilde{m}(j)$ offering the lowest quality adjusted price. Thus, in equilibrium, the consumers choose only one quality of a product that has lowest quality adjusted price. Same quality level is chosen irrespective of the country of residence or the type of labor because there is a unique quality of a product that has lowest adjusted price.

In the second stage, the consumer evenly spreads spending across the unit measure of all products, $\gamma\ E_l^h(j) = \gamma\ E_l^h$ as the elasticity of substitution between various products of the manufacturing sector is assumed to be unity. Aggregate Consumers demand $x_{\tilde{m}}(j) = \gamma\ E \big/ p_{\tilde{m}}(j)$ units of quality level $\tilde{m}(j)$ of product *j* and no other units of other quality level of that product.

Section 2.2: Producers

Section 2.2.1: Production Structure

The consumers are willing to pay a premium of ξ for a single jump in the quality of the product, which motivates the firm to indulge in costly R&D of innovating higher quality levels. Assuming that the potential for quality improvement is unbounded, only the northern firms has the ability to drive forward the world quality frontier for the existing products through innovation. While R&D races in the North occur simultaneously for all products within the X sector, entrepreneurs in the South are inefficient at innovation or imitation. Once a higher quality product is developed, northern firms undertake its production and reap profits. As in Vernon (1966), we also assume that a product developed in the north is produced by the northern firms till its production gets standardized. Once its production is standardized, as in Glass and Saggi (2001), Markusen and Venables (1998), the northern firm has the opportunity to

become a MNC by shifting its basic stage of production to a low cost nation either through FDI or outsourcing.

Outsourcing is a more transaction intensive process vis-à-vis subsidiary formation. Grossman and Helpman (2003) describe the formation of outsourcing relationship as a two-stage process – first, the investment contract and then the order contract. Even though the process of finding an outsourcing partner in South is much more complicated[3] than setting up a subsidiary unit, we abstract from such differences to focus on the welfare comparison issue. This simplifying assumption implies that the regime shift in the host country from FDI equilibrium to outsourcing equilibrium (or vice-versa) entails only one exogenous change, that is, the change in the technology of production (via the exogenous change in skill intensity).

At this stage, perhaps it is worth mentioning that outsourcing may seem to share similarities with licensing. However, in essence it is a very different process than licensing. Licensing implies sale of technology to a host country entrepreneur while outsourcing is a contract to produce a part/stage of total output, that is, outsourcing usually involves fragmentation of the production process while licensing does not. Outsourcing partners in the host country provide one of the inputs for the final good produced by the multinational company whereas, the licensee produces the entire product herself and directly sells it to the market. Second, even though licensing also involves finding a match between the licensor and the licensee but the nature of these search or matching process is very different under outsourcing. In literature, licensee search has been modeled more like an auction (Casson and Buckley, 1981 and Casson, 1979) while searching for outsourcing partners have been modeled in a manner similar to R&D (Grossman and Helpman, 2002a). Third, once the license is sold to the licensee he is usually free from any kind of inspection of production process, per contra, outsourcing partner contributes to an input in the final good produced by the MNC. Therefore, appraisal and quality check of the partner's product is a must. Thus, outsourcing is a much longer term and interactive relationship than simply licensing.

[3] Finding an appropriate partner in the South, Grossman and Helpman (2005), entails search R&D on the part of the prospective MNC. The probability of finding the partner as in Grossman and Helpman (2005) depends on market thickness, legal environment in the South and also by the skill intensity of production being transferred.

Fourth, if a licensor makes effort to internalize and assimilate and further improve the technology, it is purely his gain, while if the outsourcing partner builds on the technology given by the multinational, both agents gain. Fifth, usually the licensing contract specifies ex-ante how much a licensor earns in the profit and also the royalty fee while under an outsourcing contract this decision is made ex-post production.

Getting back to the model, shifting a part of a multinational firm production to the South whether through creating a subsidiary or through contracting out to outsourcing partner firm, lowers its cost of production and drives the northern firms out of the market. On the other hand, the MNC may also be driven out of the market by further innovation by the northern firms, (See figure 1).

Section 2.2.2: Manufacturing Technology

Assume that the production under the multinational firm is separated into two stages – the basic stage of production and the advanced stage. As in Glass and Saggi (2001), we assume that to produce one unit of final good, a multinational firm must combine α units of output from basic stage of production with (1 – α) units of output from advanced stage of production produced in the North. This can be envisioned as a fragmented production structure whereby advanced production[4] involves the manufacturing of sophisticated intermediate inputs and basic production involves the bundling of final goods by using these intermediate inputs. Per contra, Glass and Saggi (2001) assume that one unit of labor is required for producing one unit of output, which makes their production strategy very rigid as labor requirements do not respond to factor prices. Moreover, they do not distinguish between skilled and unskilled labor, and as a result their model does not allow for any substitutability across factors of production. We do away with these assumptions in our model.

We use a standard neoclassical production function. The production technology of MNC is represented as:

[4] Glass (2004b) explains the fundamental assumption behind the reason for not transitioning the entire production process to the South. This follows as a direct implication of the assumption of inefficiency of South in handling the advanced stage of production.

$$X^M = (1-\alpha) f^N(L_1^N, L_2^N) + \alpha \; f_i^B(L_1^S, L_2^S)$$

Out of the total manufacturing output produced by the multinational firm $(1-\alpha)$ is produced using multinational technology in North and α using the subsidiary or the outsourcing partner technology, $f_i^B(L_1^S, L_2^S)$ in South. It should be noted that the technology of production is different for FDI subsidiary and outsourcing partner and thus the subscript $i \; \varepsilon$ {q(FDI), o(Outsourcing)}.

The marginal cost (MC) of production of the Multinational firm is a weighted sum of basic stage MC incurred by the MNC production unit in the South, MC^B (by subsidiary or outsourcing partner) and advanced stage MC incurred by the MNC production unit in the North, MC_{MNC}^N

$$MC_i^M = (1-\alpha) \; MC_{MNC}^N + \alpha \; MC^B$$

Or

$$MC_i^M = (1-\alpha) \; MC_{MNC}^N + \; \alpha \left[a_{2,i}^B(w_i^S) w_{2,i}^S + a_{1,i}^B(w_i^S) w_{1,i}^S \right] \qquad (7)$$

$a_{l,i}^k(w^h)$ is the unit/marginal requirement[5] of type *l* Southern labor, under MNC entry mode *i*, by the firm type *k* ε {S(Southern domestic firms), B(subsidiary or outsourcing partner in South)}[6].

Southern domestic firms produce the homogeneous good *y* under perfect competition with a CRS production function, $f^S(L_1^S, L_2^S)$. The marginal cost of production in a Southern firm producing agricultural good *y* is given by:

[5] It is well known that for a neo-classical, constant returns to scale production function, the unit labor requirements is equal to the marginal labor requirement and that these coefficients of labor requirements can be expressed as a function of the relative wage. Let $w^h = \frac{w_2^h}{w_1^h}$ represent the relative wage of skilled labor for country h = N, S. To obtain the unit/marginal labor requirements, we consider the implied cost function and use Shephard's lemma along with homogenous of degree one property of the production function.

[6] For example, $a_{1,q}^S(w^S)$ is the unskilled labor requirement by the Southern firms under FDI and similarly, $a_{1,o}^S(w^S)$ is the skilled labor requirement by Multinational production unit in the South under outsourcing.

$$MC_i^S = a_{2,i}^S(w_i^S)w_{2,i}^S + a_{1,i}^S(w_i^S)w_{1,i}^S \quad (8)$$

Since northern wages are assumed to be given exogenously, marginal cost of the northern national firms is just equal to a constant, say, χ .

Section 2.2.3: Pricing Decisions of the firms

A multinational firm, which splits production between North and South, compete with a northern firm. The quality level of the product of a multinational firm is no better than that of the northern quality leader. Therefore, multinational firms engage in limit pricing and charge a price equal to the marginal cost of production of northern firms, χ . On the other hand, price competition among Southern firms drives down good *y* prices to marginal cost equal to one.

$$P^S = MC_i^S = AC_i^S = 1$$

Section 2.2.4: Industry Flows

Let n^N and n^M represent the measure of northern firms and multinational firms respectively. In equilibrium, these measures are constant and determined by Northern firms' innovation intensity, the probability of standardization and the probability of formation of subsidiary or outsourcing partner. In this model we assume these factors to be exogenous.

Section 2.2.5: Resource Constraints

The last building block of the model is the resource constraint of the South. Southern skilled labor required by Southern firms for good *y* production under *i* mode of foreign investment is $a_{2,i}^S(w_i^S)\ [(1-\gamma)E_i]$ and by multinational firms for good X is

$$\alpha\, n^M a_{2,i}^B(w_i^S)\left(\frac{\gamma E_i}{\chi}\right)$$

For skilled labor market equilibrium in South,

$$L_2^S = a_{2,i}^S(w_i^S)[(1-\gamma)E_i] + \alpha\, n^M a_{2,i}^B(w_i^S)\left(\frac{\gamma E_i}{\chi}\right) \quad (11)$$

Similarly, in equilibrium, unskilled labor demand in South is equal to the given unskilled labor supply:

$$L_1^S = a_{1,i}^S(w_i^S)\left[(1-\gamma)E_i\right] + \alpha\, n^M a_{1,i}^B(w_i^S)\left(\frac{\gamma E_i}{\chi}\right) \qquad (12)$$

This completes the formulation of the model. We can now turn to the next section that compares welfare under the two alternative forms of international investment in South.

Section 3: Equilibrium in South and Welfare Comparison

In this section, we compare the welfare impact of a regime shift of foreign investment from say, FDI equilibrium to outsourcing equilibrium (or vice-versa) in the host country. We can model the welfare effect of a change in the mode of foreign investment in the host country as a comparative static exercise. To carry out this exercise, we need to specify one of the two modes of foreign investment as the initial equilibrium. Without loss of generality, we may assume that FDI constitutes the initial equilibrium[7] in the host country. This implies that, to begin with, the world economy being analyzed has all its international investment or fragmented production through foreign subsidiaries. Then we may ask whether a regime shift from FDI to outsourcing can increase the real GDP of the South and if it is possible, we qualify these conditions. We can also reverse our question and qualify conditions under which aggregate real wage earnings fall representing a welfare loss after regime shift from FDI to outsourcing.

There are two different components of change in the skill requirements under outsourcing. The first of this change is endogenous, which comes about due to changes in wages as we move from initial FDI equilibrium to the outsourcing steady state. Besides this endogenous change, there also exists an exogenous change in the relative demand for the two types of labor emanating from the change in technology of

[7] There is nothing sacrosanct about choosing FDI as the initial equilibrium and we could also choose outsourcing to constitute the initial equilibrium. This will not change the nature of our results and conditions obtained.

production used under outsourcing vis-à-vis FDI. As noted in the introduction we use our assumption that outsourcing production by partners of MNC in the South uses a higher skill intensive technique of production vis-à-vis FDI production in foreign subsidiaries.

We split the changes in marginal labor requirements that result from the regime shift of foreign investment into the exogenous and endogenous components. Let the exogenous rate of change (that corresponds to the change in technology of production) in marginal labor requirements with regime switch by the multinational production unit in the South for *l* type of labor be represented by

$$\hat{u}_l = \frac{da_l^B(exogenous)}{a_l^B} \qquad l = 1, 2$$

Similarly, the endogenous counterpart change is represented by

$$\hat{a}_l^k = \frac{da_l^k(w^S)}{a_l^k} \qquad l = 1, 2 \text{ and } k = S, B$$

Both exogenous and endogenous changes in marginal labor requirement entails a change in marginal cost of production with a shift from FDI equilibrium to outsourcing equilibrium. Totally differentiating MC^B to get the change in marginal cost of production of the Southern unit of the multinational firm (as we move from FDI equilibrium to outsourcing steady state):

$$\hat{MC}^B = \theta_2^B\,\hat{w}_2^S + \theta_1^B\,\hat{w}_1^S + \theta_2^B\,\hat{u}_2 + \theta_1^B\,\hat{u}_1 \qquad (14)$$

And totally differentiating equation (8), we get:

$$\hat{MC}^S = \theta_2^S\,\hat{w}_2^S + \theta_1^S\,\hat{w}_1^S = 0 \qquad \text{(Since } y \text{ is the numeraire good)} \qquad (15)$$

$$\Rightarrow \hat{w}_1^S = -\frac{\theta_2^S\,\hat{w}_2^S}{\theta_1^S}$$

In equation (14) and (15) $\theta_l^k = \frac{a_l^k \cdot w_l^k}{MC^k}$ represents the cost share of type *l* labor in production by *k* type firm in the host country.

Using the above expression we get that,

$$\hat{a}_1^k = -\theta_2^k\,\sigma_k(\hat{w}_1^S - \hat{w}_2^S) \quad \text{and} \quad \hat{a}_2^k = \theta_1^k\,\sigma_k(\hat{w}_1^S - \hat{w}_2^S) \qquad k = S, B \qquad (16)$$

Where σ_k is the elasticity of substitution between the two factors of production. Totally differentiating the Southern resource constraints, and substituting for $\hat{a}_l^k$ from (16) and

using $\hat{E} = \hat{w}_1^S e_1 + \hat{w}_2^S e_2$

Where $e_l = \frac{w_l^S L_l^S}{E^S}\frac{E^S}{E} = \frac{w_l^S L_l^S}{E^S}\psi$ and ψ is the share of the host country GDP in global GDP, we get the following two equations in $\hat{w}_1^S$ and $\hat{w}_2^S$ [8]

$$\lambda_2^B\ \hat{u}_2 = \left[A_1 - e_2\left(\lambda_2^S + \lambda_2^B\right)\right]\hat{w}_2^S - \left[A_1 + e_1\left(\lambda_2^S + \lambda_2^B\right)\right]\hat{w}_1^S \qquad (17)$$

$$\lambda_1^B\ \hat{u}_1 = -\left[A_2 + e_2\right]\hat{w}_2^S + \left[A_2 - e_1\right]\hat{w}_1^S \qquad (18)$$

Where $A_1 = \lambda_2^S\sigma_S\theta_1^S + \lambda_2^B\sigma_B\theta_1^B$

$A_2 = \lambda_1^S\sigma_S\theta_2^S + \lambda_1^B\sigma_B\theta_2^B$

The above system of equations may be represented in the following matrix form:

$$\begin{bmatrix} \left[A_1 - e_2(\lambda_2^S + \lambda_2^B)\right] & -\left[A_1 + e_1(\lambda_2^S + \lambda_2^B)\right] \\ -\left[A_2 + e_2\right] & \left[A_2 - e_1\right] \end{bmatrix}\begin{bmatrix} \hat{w}_2^S \\ \hat{w}_1^S \end{bmatrix} = \begin{bmatrix} \lambda_2^B & 0 \\ 0 & \lambda_1^B \end{bmatrix}\begin{bmatrix} \hat{u}_2 & \hat{u}_1 \end{bmatrix}$$

The set of two equations and the subsequent matrix can be solved to get the change in wages due to exogenous increase in skill intensity that happens as a result of regime shift of foreign investment from FDI to outsourcing, that is, we can derive

$$\frac{dw_l^S}{d\left(\frac{u_2}{u_1}\right)}\frac{\left(\frac{u_2}{u_1}\right)}{w_l^S} = \frac{\hat{w}_l^S}{\hat{u}_2 - \hat{u}_1} \qquad \text{for } l = 1, 2.$$

[8] λ_s are the proportional labor shares. For example, $\lambda_l^B = \alpha\ \frac{n^M a_l^B(w^S)}{L_l^S}\left(\frac{\gamma E}{\chi}\right)$ is the proportion of type l labor of South employed by MNC manufacturing production unit in the South.

$$\frac{\hat{w}_2^S}{\hat{u}_2-\hat{u}_1}=\frac{\left[A_1+e_1(\lambda_2^S+\lambda_2^B)\right]\left[A_2-e_1\right]}{\Delta\left[(\lambda_2^B+(\lambda_2^S+\lambda_2^B)\lambda_1^B)e_1+(A_1\lambda_1^B-A_2\lambda_2^B)\right]}\lambda_2^B\,\lambda_1^B$$

Intuitively, when the skill intensity of production increases[9], we would expect the skill premium to increase and by equation (15), this implies that an increase in wages of skilled labor should necessarily be matched by a fall in wages of unskilled labor.

To make welfare comparisons across the two alternative regimes of foreign investment, we need to look at real wage effect. In the current setup, the Southern domestic good is chosen as the numeraire while the price of the multinational good depends on the exogenously given marginal cost of northern firms, χ. The only difference that arises in price index under the alternative regimes of international investment is due to price of the northern firms' goods[10]. The price of northern firm's good is a quality mark up over the marginal cost of the multinational's production unit in the South. Thus, a comparison of real wages in the two mutually exclusive forms of international investment must depend on the MC of production of the subsidiary and the outsourcing partner[11].

$$\hat{p} = M\hat{C}^B$$

FDI leads to a higher welfare vis-à-vis outsourcing if the real GDP after the regime shift to outsourcing is lower, that is:

$$\frac{\hat{w}_2^S-\hat{p}}{\hat{u}_2-\hat{u}_1}L_2^S+\frac{\hat{w}_1^S-\hat{p}}{\hat{u}_2-\hat{u}_1}L_1^S<0$$

or, $$\frac{\hat{w}_2^S}{\hat{u}_2-\hat{u}_1}\frac{L_1^S}{\theta_1^S}\left(\zeta\,\theta_1^B-\theta_2^B\right)+\hat{K}<0$$

[9] See Appendix for conditions under which $\frac{\hat{w}_2^S}{\hat{u}_2-\hat{u}_1} > 0$

[10] Since the host is small by assumption a change in marginal cost of MNC production unit in South which changes the prices of northern goods is a very small component of price index of the North.

[11] Strictly speaking the price index should change by a proportion of change in marginal cost of multinational production, however, to simplify the algebra we assume an equi-proportional change.

Where, $\zeta = \frac{L_2^S}{L_1^S}$ and $\hat{K} = -\frac{\theta_2^B \hat{u}_2 + \theta_1^B \hat{u}_1}{\hat{u}_2 - \hat{u}_1} > 0$ is exogenous. If, we restrict $\frac{\hat{w}_2^S}{\hat{u}_2 - \hat{u}_1} > 0$, given by the conditions in the appendix, then a necessary condition for FDI to generate higher welfare vis-à-vis outsourcing is

$$\zeta < \frac{\theta_2^B}{\theta_1^B} \qquad (19.1)$$

Thus, FDI *may* lead to a higher welfare relative to outsourcing if the host country has a lower absorptive capacity relative to foreign sector absorption of skilled labor. On the other hand, the above result also indicates that a sufficient condition for outsourcing to generate higher welfare is:

$$\zeta > \frac{\theta_2^B}{\theta_1^B} \qquad (19.2)$$

This implies that if the absorptive capacity of the host country is above the foreign sector absorption given by relative cost share of skilled labor to unskilled labor in the foreign sector, then outsourcing definitely leads to higher welfare. This result is intuitive because of the fact that outsourcing values skilled labor more than FDI. Thus, outsourcing certainly leads to higher welfare provided the host country has the required absorptive capacity.

This result indicates some lesson for the developing countries that compete blindly for FDI offering subsidies and attractive package incentives to the multinationals. It makes sense for the host country to attract FDI only if they have low level of skills relative to foreign sector absorption in the host country. However, the results also indicate that even if the domestic absorptive capacity, ζ, is low, FDI may still not lead to higher welfare. On the other hand, if the domestic absorptive capacity is above the threshold defined, then, the host country certainly gains from outsourcing contracts rather than FDI.

Section 4: Comparative Static: The Effect of Investment in Human Capital

Suppose we allow for investment in human capital formation in South. With an investment in education that leads to higher relative supply of skilled labor over the long run period, the welfare of the economy is impacted due to changes in wages in steady state. Does this necessarily imply a higher level of welfare for the host country and whether this impact is higher under FDI or outsourcing? We carry out a comparative static exercise within each regime of foreign investment – FDI and outsourcing – and we ask the question that under what condition does the real GDP increase with investment in human capital. In the current set up of the model, we cannot directly compare the differential effects of increase in the relative supply of skilled labor on FDI with that of outsourcing. However, we may do so indirectly by comparing conditions under which they generate similar result.

Section 4.1: Effect of Human Capital Formation under FDI and outsourcing

Investment in human capital formation is such that unskilled workers upgrade their skills and move to the skilled labor category of workers, keeping the total labor force constant.

Therefore,

$$dL_2^S = -dL_1^S$$

$$\Rightarrow L_2^S \frac{dL_2^S}{L_2^S} = -L_1^S \frac{dL_1^S}{L_1^S} \qquad \Rightarrow \hat{L}_1^S = -\zeta\, \hat{L}_2^S \tag{20}$$

Totally differentiating the resource constraints, that is, equations (11) and (12) and substituting equations (14), (15) and (20), we get the following two total differential equations:

$$\hat{L}_2^S = \left[e_{2,i} - A_{1,i}\right] \hat{w}_2^S + \left[e_{1,i} + A_{1,i}\right] \hat{w}_1^S \tag{21}$$

$$-\zeta\, \hat{L}_2^S = \left[e_{2,i} + A_{2,i}\right] \hat{w}_2^S + \left[e_{1,i} - A_{2,i}\right] \hat{w}_1^S \tag{22}$$

Putting the above system of equations in matrix form, we get the following matrix.

$$\begin{bmatrix} e_{2,i} - A_{1,i} & e_{1,i} + A_{1,i} \\ e_{2,i} + A_{2,i} & e_{1,i} - A_{2,i} \end{bmatrix} \begin{bmatrix} \hat{w}_2^S \\ \hat{w}_1^S \end{bmatrix} = \begin{bmatrix} 1 \\ -\zeta \end{bmatrix} \left[\hat{L}_2^S\right]$$

$$\frac{\hat{w}_2^S}{\hat{L}_2^S} = \frac{\left[e_{1,i} - A_{2,i}\right] + \zeta\left[e_{1,i} + A_{1,i}\right]}{\Omega_i}, \quad \frac{\hat{w}_1^S}{\hat{L}_2^S} = -\frac{\left[\zeta\left(e_{2,i} - A_{1,i}\right) + \left(e_{2,i} + A_{2,i}\right)\right]}{\Omega_i}$$

Since the wages of the two types of labor move in opposite direction by virtue of equation (15), it is therefore likely that with investment in human capital, which increases the relative supply of skilled labor, the skill premium goes down[12].

Section 4.2: FDI Vs Outsourcing: The Effect of Human Capital Investment

Welfare rises under FDI or outsourcing after investment in skill if the following condition holds:

$$\frac{\hat{w}_2^S - \hat{p}_{sf}}{\hat{L}_2^S}\left(L_2^S + \hat{L}_2^S\right) + \frac{\hat{w}_1^S - \hat{p}_{sf}}{\hat{L}_2^S}\left(L_1^S + \hat{L}_1^S\right) > 0$$

Using equation (7) we get, $\hat{p}_{sf} = M\hat{C}^M = \theta_2^B\,\hat{w}_2^S + \theta_1^B\,\hat{w}_1^S$. Substituting equation (15), we get

$$\hat{p}_{sf} = \hat{w}_2^S\left(\theta_2^B - \theta_1^B\frac{\theta_2^S}{\theta_1^S}\right)$$

Substituting equation (15), and the price change after skill formation, $\hat{p}_{sf}$ into the above expression, we get:

$$\Rightarrow \frac{\hat{w}_2^S}{\hat{L}_2^S} L_1^S\left[\left(\frac{\theta_1^B\zeta - \theta_2^B}{\theta_1^S}\right) + \frac{\hat{L}_2^S}{L_1^S}\left(\frac{\theta_1^B + \theta_2^B\zeta}{\theta_1^S}\right)\right] > 0 \qquad (23)$$

Thus, condition (23), needs to be satisfied in any regime of foreign investment for investment in skill formation to be welfare enhancing. Thus, a necessary condition for

[12] Sufficient condition for $\frac{\hat{w}_2^S}{\hat{L}_2^S} < 0$ is: $\frac{A_{2,i}}{e_{1,i}} < \zeta$, while the sufficient condition for $\frac{\hat{w}_1^S}{\hat{L}_2^S} > 0$ is: $\zeta < \frac{e_{2,i}}{A_{1,i}}$. Combining the two conditions, we get: $\frac{A_{2,i}}{e_{1,i}} < \zeta < \frac{e_{2,i}}{A_{1,i}}$

real GDP to rise with investment in skill formation, given that skill premium falls with increase in skilled labor is: $\zeta < \frac{\theta_2^B}{\theta_1^B}$.

Now, to compare the impact of skill investment under FDI with that of outsourcing, we note that, at given relative wages in the South, higher skill intensity of outsourcing partner vis-à-vis foreign subsidiary implies that $\theta_2^B\big|_q < \theta_2^B\big|_o$ and $\theta_1^B\big|_q > \theta_1^B\big|_o$. This implies that $\frac{\theta_2^B}{\theta_1^B}\Big|_o > \frac{\theta_2^B}{\theta_1^B}\Big|_q$ Thus, there is a greater chance that the domestic absorptive capacity, ζ, is lower (than actual absorption by the MNC production unit) for outsourcing rather than FDI. In other words, if $\zeta < \frac{\theta_2^B}{\theta_1^B}$ is satisfied by FDI regime, then it necessarily is satisfied under outsourcing but not vice-versa. Hence, it may pay more to have investment in human capital under outsourcing rather than FDI because outsourcing values skilled labor more than FDI. Therefore, it is more probable for investment in skills under outsourcing to be welfare improving vis-à-vis FDI.

Section 5: Conclusions

In this paper foreign investment in the form of either FDI or outsourcing is taken as an exogenous event and the focus of interest lies on their affect on welfare in the host country. The approach that we choose runs as follows. We developed a product life-cycle model in this paper that focuses specifically on the events in the host country. The distinction between FDI and outsourcing in the model presented is motivated essentially by Grossman and Helpman (2003) with a few elements added from Grossman and Helpman (2005) and (2002). The empirical and theoretical differences between FDI and outsourcing leads to the conclusion that FDI is relatively less skill intensive vis-à-vis outsourcing. This conclusion drives a number of results[13] in this

[13] It is also possible accommodate the differential impact of FDI and outsourcing on skill formation in the host country by endogenizing the skill acquisition decision of workers as in Sayek and Sener (2001) and Beaulieu et al. (2003). In such a setting, FDI induces skill formation by getting the unskilled labor in close contact with the new technology of the North, while under outsourcing, individuals respond to increased skill premium by undertaking training and becoming skilled.

paper. It is found that under certain conditions, depending on the absorptive capacity of the host country, elasticity of substitution in production and the relative demands generated by FDI and outsourcing for the two factors of production, outsourcing or FDI may lead to a higher level of real GDP. Specifically, a very interesting result comes about through our formal treatment of the model. It is found that, if the absorptive capacity of the host is higher than the foreign absorption (given by the ratio of costs shares of the skilled and unskilled labor in the foreign sector), then, outsourcing certainly leads to higher welfare. However, if the absorptive capacity of the host country is below this derived threshold, then, FDI *may* lead to higher welfare. Even in this case, outsourcing being welfare enhancing is not ruled out. This result should raise alarm for countries blindly trying to attract FDI by giving incentives especially in the form of subsidies and tax relaxation. The second crucial result of this paper concerns the relative importance of investment in skill formation in the two alternative modes of foreign investment. It is found that efforts to increase skills in the host country is more likely to payoff under outsourcing relative to FDI, since outsourcing values skilled labor more than FDI.

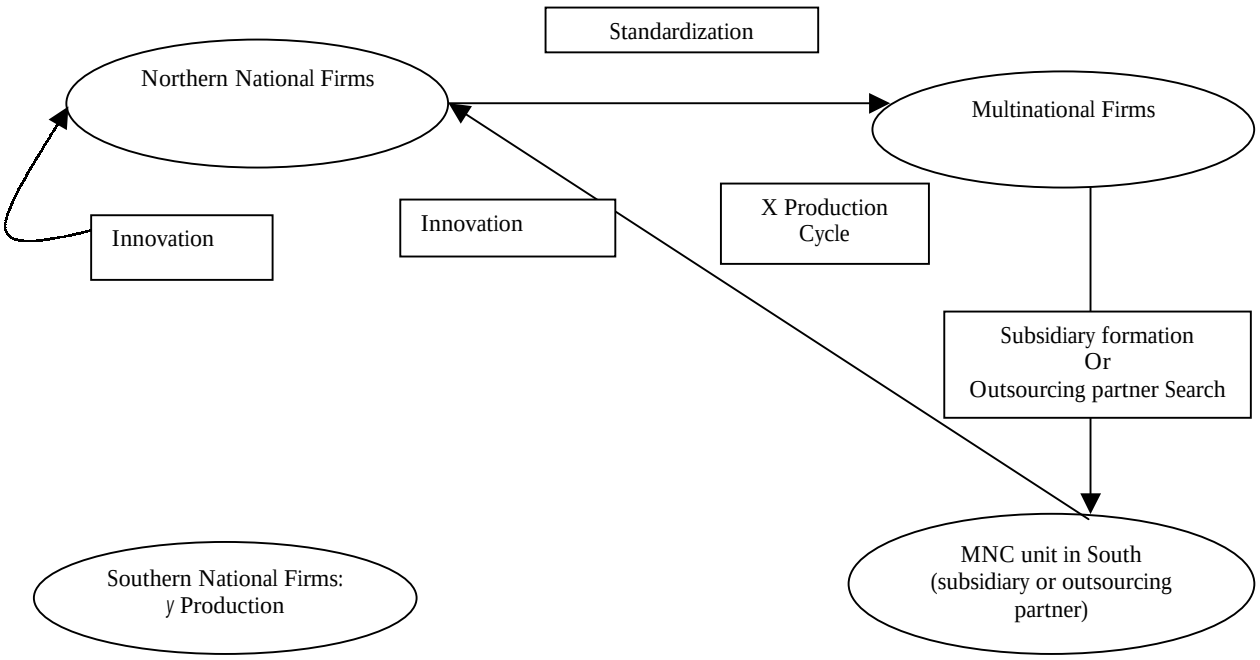

Figure 1: Production Structure of the World Economy

Appendix

The two alternative conditions under which skill premium to increases with outsourcing are:

Case a.1: If $A_2 < e_1$, then a sufficient condition for skill premium to increase with outsourcing is: $A_2\lambda_2^B < A_1\lambda_1^B \Rightarrow \theta_2^B < \theta_1^B$. Thus, if a weighted measure of elasticity of substitution between the two types of labor is lower (than the expenditure share of the unskilled labor), then, a sufficient condition for skill premium to rise with outsourcing is that the cost share of unskilled labor must be greater than the share of skilled labor in the foreign sector. The intuition for this result is simple. With high unskilled labor share in the foreign sector, a shift to outsourcing (from FDI) dramatically increases the demand for skilled labor that tends to raise skill premium. On the other hand, a low degree of substitutability between the factors does not allow easy substitution of unskilled with skilled labor. Therefore the wages of skilled labor definitely rise.

Case a.2: If $A_2 > e_1$, then a necessary condition for skill premium to increase with outsourcing is: $A_2\lambda_2^B > A_1\lambda_1^B \Rightarrow \theta_2^B > \theta_1^B$. That is, if a weighted measure of elasticity of substitution is higher (than the expenditure share of the unskilled labor), then, a *necessary* condition for skill premium to rise with outsourcing is that the cost share of skilled labor in the foreign sector of must be greater than that of the unskilled labor.

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