Vertical FDI Vs Outsourcing: A Welfare Comparison from the Perspective of the Host Country

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Abstract: The theory of internalization has always been viewed through the lens of a sourcing firm, especially so in a vertical relationship. In this paper we recognize the importance of mode of organization of fragmented production for the host country. Whether production sharing arrangement with a low wage host is internal to the firm (vertical Foreign Direct Investment relationship) or happens externally through outsourcing contracts affects the welfare of the host country in a significant way. Using a Grossman-Helpman quality ladders product cycle model, we compare the welfare derived from the two alternative regimes of production sharing arrangements. The ability to maximize welfare in the alternative regimes is found to be contingent on host country factors. If the host country’s 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

Section 1: The Background

Global production sharing, as represented by sustainable growth in vertical foreign direct investment (VFDI), outsourcing or fragmented production continues to thrive\(^1\). Offshoring expands the economic pie and may let all the participating nations raise their welfare levels. The main benefits from offshore production can be in the form of increased export earnings, job creation, higher wages and upgrading of skills. 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 existing literature on welfare effects of international fragmentation in the host country yields ambiguous results. For example, Glass and Saggi (1999), Reis (2001) are cautious about the widely cited economic prospects of production sharing on the host country, while Markusen and Venables (1998) are positive that FDI benefits the host country. We also observe that this strand of literature stands at a distance from the internalization theory, that is, the literature on welfare effects of international fragmentation does not deal with its mode of organization. For example, Glass and Saggi (2001) focus on the welfare implications of outsourcing in the source country; however, in their model the term “outsourcing” is not distinct from fragmentation or offshoring. In a similar manner, none of the existing models which differentiate between VFDI and outsourcing deal with their relative welfare effect. For example Antràs (2003, 2005), Grossman and Helpman (2002, 2003, 2004) distinguish between VFDI and outsourcing but do not deal with their relative welfare implications. Another point worth noting is that, the issue of internalization has always been viewed through the lens of the sourcing firm. For example Antràs (2003, 2005), Antràs and Helpman (2004), Grossman and Helpman (2002, 2003, 2004) discuss the decision to internalize of the sourcing firm without any reference to the host country. Grossman and Helpman (2003) in some sense highlight that the host country legal framework influence the decision to outsource. However, what has been missed out in the literature is that not only is the mode of organization of fragmented production influenced by host country parameters, but the host country variables itself are influenced by the internalization decision. The mode of organization of production sharing arrangement is crucial for the host country since the choice of mode determines skill formation, technology transferred, growth and welfare.

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\(^1\) Between 1980-98, the amount of net FDI received by developing countries increased from $4.4 billion to $170.9 billion, almost a forty times increase. Feenstra (1998) compares several different measure of international outsourcing and argues that they have all increased. Outsourcing of business processes is expected to grow from $1.3 billion in 2002 to $24 billion in 2007.
Thus there is a pressing need to link the two strands of literature and specifically so from the host country's perspective. This is what we intend to do in this paper.

This paper aims to evaluate the effect of VFDI with that of outsourcing on factor prices and aggregate welfare (real Gross Domestic Product) in the host country. We formally distinguish between VFDI and outsourcing in terms of their technology of production in a general equilibrium framework to contrast their relative effects on the host country welfare. A product life cycle is generated in our model where production is transferred to a low wage country either internally through a VFDI contract or externally through outsourcing relationship. Assuming that “all pervasive” VFDI constitutes the initial equilibrium, we analyze the impact of a comparative static exercise of a change in production technology, implying a regime switch from VFDI to outsourcing. Change in technology of production changes the relative demand for factors of production and hence their payoffs. Therefore a regime switch from VFDI to outsourcing changes real GDP of the host country which is our metric for welfare. In our model, north is exogenous and so is the internalization decision of the sourcing firm. It is found that the ability to maximize welfare from any regime of international production sharing is contingent on the host country factors, specifically the absorptive capacity of the host country. The factors that cause a change in production technology are also pivotal in determining welfare derived from each mode.

The paper beyond this point is organized in the following way: Section 2 discusses related literature on VFDI and outsourcing. Section 3 describes the model for comparing the welfare impact of VFDI relative to outsourcing; section 4 describes equilibrium in the host country and the conditions under which one form of foreign sourcing scores over the other in terms of welfare. Section 5 concludes the paper.

Section 2: Related Literature

This paper benefits from and assimilates two strands of literature which surprisingly till date have not been integrated. The string that links foreign sourcing with welfare in the host country is totally divorced from the available literature on distinction between the various modes of foreign sourcing. More importantly, unlike models of horizontal FDI, like Markusen and Venables (1998), which are optimistic about welfare impact of FDI in the host country, offshoring models like Glass and Saggi (1999), Reis (2001) and Das (2002) are more cautious and believe that under certain conditions foreign sourcing may well lower the host country welfare.

In the paper, we integrate the welfare literature on offshoring with recent contributions to the theory of organization of production sharing arrangements. Internalization decision has always been viewed through the lens of the sourcing firms and completely disconnected from welfare issues. Topical papers on vertical multinationals and has filled many gaps in our understanding of the different modes of organizing international production. The key difference between VFDI and outsourcing is that of ownership and control. The sourcing firm maintains control over its subsidiary while it has little control over its outsourcing partner in the host country. In literature, different approaches, viz., factor endowment, contract theory and incentive system - have been used to model the internalization decision of a sourcing firm which have brought to fore many other differences between VFDI and outsourcing. Grossman and Helpman (2002, 2003) emphasize the importance of search and matching, customization cost, market thickness and protection of intellectual property rights in the host country for the relative prevalence of outsourcing vis-à-vis VFDI. Ownership and control difference is also formally modeled in Grossman and Helpman (2004) where they assume that a VFDI subsidiary is always monitored while an outsourcing partner is not. Similarly ownership in their model also comes with a responsibility of incurring the cost of inputs while it is borne by the input supplier under outsourcing. Incompleteness of contracts and contractual problems is another feature that sets in when transaction happens between two independent entities as in case of Antràs (2003, 2005) and Antràs and Helpman (2004). With incomplete contracts, Antràs and Helpman (2004) show that the bargaining power of the MNC is higher in an internalized transaction vis-à-vis outsourcing. They emphasize that the organizational fixed cost of VFDI and outsourcing are different and one can rank them in order of one’s belief about the relative importance of managerial economies of scope relative to managerial overload. In an economy where managerial overload dominates, then the fixed cost for setting up a subsidiary is higher, it is always the more productive firms that venture into VFDI. Antràs (2003) marries Grossman-Hart-Moore contract theory with Heckscher-Ohlin trade theory to produce a direct relationship between capital intensity of fragmented intermediate good and the organizational mode of foreign sourcing. Specifically, probability of VFDI increases with capital intensity of the offshored intermediate good. Antràs (2005) also capture the fact that a relatively new product can only be sent offshore within the firm boundaries. However, with time, as the intensity of headquarter service of the fragmented good falls it can be
outsourced. Thus, the degree of standardization of a good is also different for a product that is outsourced relative to a product that is transferred through vertical FDI.

The available literature differentiates between outsourcing and VFDI in ways relating to contractual incompleteness, relative importance of fixed costs, degree of standardization, productivity of sourcing firms, factor intensity of the fragmented good, intensity of headquarter services, ease of monitoring and so on. In this paper, we experiment modeling with yet another difference between VFDI and outsourcing which is lesser known and explored. We assume that VFDI and outsourcing differ in their technology of production of the fragmented good in the host country. On one hand, difference in production technology between a subsidiary and an outsourcing partner is manifested in their relative marginal costs of production. For example, CRIS INFAC (2005) update questions the sustainability of captives in the Indian BPO industry due to their high employee and training costs. Grossman and Helpman (2003) also assume that the marginal cost of production of a subsidiary is always higher than an outsourcing partner because a local producer has better information on resource usage vis-à-vis a foreign producer. On the other hand, difference in production technology between a subsidiary and a third party vendor is caused by differences in skill intensity of production.

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Differences in technology of production exist between a subsidiary and an outsourcing partner is testified if we look at the marginal costs of production, which are lower for an external vendor. Now, the point is what constitutes this difference in technologies. Though it is probable that the subsidiary production technology is more skill intensive vis-à-vis an outsourcing partner, we are inclined to assume the converse. The rationale for this assumption is explained as follows.

First, a recent survey by Hewitt Quarterly Asia Pacific (2005) on outsourcing industries in the developing countries finds that IT operations and customer relations tops the most frequently globally outsourced functions (which are medium to high skill intensive jobs from the host perspective), whereas historically, VFDI has usually been in the manufacturing sector. World Investment Report, 2004 finds that outsourcing has mainly been in the services sector which affects mainly white collar jobs whereas relocation of manufacturing through vertical FDI involved primarily blue collar workers. Second, empirical evidence by Feenstra and Hanson (1996a, 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, while FDI does not. Greater divergence of skilled and unskilled labor factor prices implies differential demand created by FDI and outsourcing for the two types of labor. Similarly, using intra-firm US multinational’s data Hanson, Mataloni and Slaughter (2005) estimate that the demand for imported intermediate inputs for further processing in affiliates is negatively related to lower-skill wages (absolute and relative) implying a greater usage of low-skill labor in affiliate operation. Thus, empirical evidence favors the assumption that outsourcing is a more skill intensive activity than VFDI.

Third, Mansfield and Romeo (1980) document that the technology transferred to a subsidiary is on an average 9.8 years old while that for an arm’s length transaction is 13.1 years old. Empirical evidence in Pack and Saggi (1997) also indicates that the best technologies are transferred internally through FDI while older or obsolete technologies are licensed. Assuming that skilled labor can substitute for technology, an outsourcing partner will have to employ more skilled labor to match a subsidiary’s quality level.

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2 From the perspective of the home country, these may not be high-skill activities, however, from the perspective of South, if we were to divide the labor force into two cohorts, namely skilled and unskilled, IT operations, customer relations, finance and accounting certainly do not belong to the unskilled labor segment.

3 Outsourcing may seem to share similarities with licensing but in essence it is different. First, 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, 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 using probability theory (Grossman and Helpman, 2002). Third, an 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 inevitable. Fourth, if a licensor makes effort to internalize, 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. The differences between horizontal FDI and vertical FDI could perhaps come close to the differences between licensing and outsourcing.
A recent internalization model by Stähler (2005) assumes that VFDI does not require training of host labor while outsourcing does. His assumption supports our view that unskilled labor of the host country together with skilled labor of the home country (or technology) can be substituted with trained labor of the host country (skilled labor in our case) to produce the same fragmented piece of the final good. Therefore, it is clear in his model that to produce a basic stage of production, a sourcing firm has two choices. Either it hires unskilled labor in the host, incurs fixed operational costs and adds its own pool of skilled labor/technology if it has to avoid spillovers (internal transfer - VFDI) or it trains the host labor (or hires an already trained/skilled labor) and transfers production to an arm’s length agent. This is essentially what we also intend to assume in a more general form, that is, outsourcing uses greater proportion of the host country skilled labor vis-à-vis VFDI.

Fourth, since greater technology is transferred to a subsidiary, the desire to protect their technology from leaking to other firms may also induce them to hire less skilled workers because skilled workers can be potential carriers of the MNC industrial secrets. Since more recent technology is transferred to a subsidiary vis-à-vis an arm’s length agent, hence a multinational has a greater incentive to prevent dissipation of this technology from a subsidiary and hence lesser employment of skilled labor.

Fifth, the above economic reasoning and empirical evidence regarding FDI and outsourcing is reflected in the formulation of crucial economic models. For example, Grossman and Helpman (2003, 2005) describe outsourcing as specialized or customized services by the input suppliers involving relationship specific investment. A similar investment by a subsidiary manager is not expected, implying greater usage of skilled labor in production by the outsourcing partner. Feenstra and Hanson (1996a) also model outsourcing as a skill intensive activity from the point of view of the host country. Per contra, when it comes to describe FDI, Xu (2000) suggests that FDI may be unskilled labor-intensive activity in the host country6.

We build a standard quality-ladder product life-cycle model, and initialize the equilibrium with all pervasive VFDI. Then we carry out a comparative static exercise of an increase in skill intensity since our distinction between VFDI and outsourcing entails only one exogenous change, that is, the change in the technology of production (via the exogenous change in skill intensity). From there, we proceed to evaluate the effect of this change in skill intensity on wages and welfare. Our model is different from Feenstra and Hanson (1996b) and Glass and Saggi (2001) as we compare the welfare and factor price effects of international outsourcing and VFDI. We allow for substitutability between skilled and unskilled labor in manufacturing, a feature, which is missing in Glass and Saggi (2001). The model’s framework shares similarity with Reis (2001), however, he focuses on VFDI only.

Most of the research in this area focuses on the home country and therefore the internalization decision of the firm has been explored to some extent. For example, Antràs (2003, 2005), Antràs and Helpman (2004), Grossman and Helpman (2003, 2004) which discuss the source firm’s profits in the two alternative regimes while Glass and Saggi (2001) discuss the source country’s welfare and the multinational firm’s profits, taking the host country as given. Exceptions to this are found in Feenstra and Hanson (1996b) which discusses the home and the host while Reis (2001) focuses only on the host. We address the problem from the perspective of a host country. We take the source country and the source firm’s internalization decision – the choice between VFDI and outsourcing as given, and analyze the host country’s perspective to the problem. This paper is about the preferred mode of organization of foreign sourcing in the host country taking the home country as given.

Keeping the basic premise of this paper in mind, that is, outsourcing partners differ in terms of technology of production from that of their captive counterparts (and more likely use higher skill intensive technique), we model the differential impact of VFDI and outsourcing on welfare in the host country. The model shows that outsourcing leads to higher welfare vis-à-vis VFDI if the host country has high absorptive capacity7. However, in case the host country has a low absorptive capacity then it is not clear which mode of foreign sourcing may lead to higher welfare. The results are in conformity with our intuition. Outsourcing creates greater

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4 High-end technology is surely a complement to skilled labor; however, the technology that is transferred by a foreign firm to a subsidiary or to an outsourcing partner is never a high-end technology. Yeaple (2003) finds that the U.S. outward FDI to LDCs is concentrated mostly in low to medium skilled industries and least of all in the high skill industry. In such a situation it is possible to substitute technology for skilled labor.

5 The fact that we mention technology transfer is only to build a general rationale of the assumption. It does not mean that we shall explain the mechanism of how outsourcing will be relatively skill intensive when technology transfer occurs.

6 None of the authors have modeled outsourcing as an unskilled labor-intensive activity relative to the rest of the economic activity in the host country. However, some authors have not ruled out that FDI in the host country may be unskilled labor intensive relative to the rest of the host country.

7 Absorptive capacity in our model is measured by the ratio of skilled to unskilled labor.
demand for skilled labor and therefore raises the wage premium. Hence, higher the proportion of skilled labor in 
the economy (which is our measure of absorptive capacity), higher is the percentage of labor who earn this 
premium and therefore greater is the aggregate income vis-à-vis a VFDI regime. On the other hand, when the 
proportion of skilled labor is low in the host country, aggregate real income can be higher in any regime 
depending on certain parameters. The extent of relative demand for skilled and unskilled labor created by VFDI 
and outsourcing are different, which in turn gives rise to different wage rates and therefore different aggregate 
GDP or welfare. Therefore, the impact that one mode of foreign sourcing has on the welfare of a country differs 
from that of the other.

Section 3: The Model

This section builds a north-south framework that specifically revolves around the events happening in the 
low wage south, which acts as the host country for offshored production. Each country is endowed with two 
types of inelastically supplied labor, the skilled and the unskilled labor, who are consumers of final goods. 
Consumers derive utility from consumption of two kinds of goods. One of the consumption goods is the 
homogeneous agricultural good, produced only in the south under perfect competition. The other good, 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 VFDI or outsourcing. VFDI and outsourcing are modeled as mutually exclusive forms of foreign sourcing. This is 
unlike Grossman and Helpman (2003) where VFDI and outsourcing co-exist in the industry equilibrium. Even 
though the assumption is less realistic, it is essential to evaluate the independent impact of the two forms of 
foreign sourcing on host country welfare. Our approach is similar to Ottaviano and Turrini (2003), where they 
model exports, VFDI and outsourcing as mutually exclusive ways of capturing the southern market. Even Antràs 
(2003, 2005) has this feature of all pervasive VFDI or outsourcing for one product line, that is, both forms cannot co-exist for transacting one good.

In the model presented below, we ignore the problem of mode choice between VFDI and outsourcing 
from the perspective of the sourcing firm, and focus on the preferred mode of foreign sourcing by the host 
country government. We therefore need to assume that the host country is a relatively small open economy to be 
able to affect any of the variables in the north. Therefore, variables like northern wages, innovation intensity, 
probability of standardization, search costs of finding an outsourcing partner or fixed cost of setting up a 
subsidiary etc. are exogenously given for southern steady state equilibrium. On the other hand, the multinationals 
or more accurately called the sourcing firms in the host country are large enough to impinge their impact on the 
labor markets in the host country and hence affect its wages and welfare.

Section 3.1: Household Behavior
Section 3.1.1: Consumption

Consumers live in one of the two countries, North or South, \( h \in \{N, S\} \), belong to one of the two 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.

The utility function of a representative consumer is given by:

\[
U = \prod_x y^\gamma \prod_y^\delta \quad (1)
\]

Where \( y \) is the homogeneous perfectly competitive agricultural good and is chosen to be the numeraire 
while \( X \), the aggregate vertically differentiated manufacturing good is represented as:

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8 The term VFDI may sound a bit misleading since our model does not involve any capital formation. However, we stick to this term 
because it is commonly used to indicate internal, instead of arms-length, transactions.

9 Antràs (2005) point out that a sourcing firm is a multinational only if it vertically integrates with its input supplier not otherwise. 
Therefore, we prefer to call the final good producer firm as a sourcing firm.
\[ X = \int \sum_{m} \xi^m x_m(j) dj \tag{2} \]

\( \xi^m \) is the assessment of quality level \( m \) and \( x_m(j) \) is the consumption of quality level \( m \) of product \( j \).

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 \( m \) of product \( j \) provides quality \( q_m(j) = \xi^m \).

All consumers value higher quality of manufacturing goods, that is, \( \xi > 1 \). Where \( \xi \) denotes the innovation size or magnitude of the quality jump.

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. Since the elasticity of substitution between various products of the manufacturing sector is assumed to be unity, the consumer evenly spreads spending across the unit measure of all products, that is, \( \gamma E(j) = \gamma E \). Aggregate Consumers demand \( x_m(j) = \gamma E / p_m(j) \) units of quality level \( m \) of product \( j \) and no other units of other quality level of that product. In the final stage, the consumer allocates spending for each product to the quality level \( m \) offering the lowest quality adjusted price. Thus, in equilibrium, the consumers choose only one quality of a product that has lowest quality adjusted price. Consumers maximize utility as given by the utility function (1) subject to the budget constraint:

\[ y + PX = E \tag{3} \]
\[ E = EN + ES = EN + w_1L_1 + w_2L_2 \tag{4} \]
\( E \) is the aggregate income of the world. \( E^N \) is the income of a representative labor type \( l \) residing in country \( h \). Specifically, \( E \) includes the wage income of the southern laborers, wage income of the northern laborers and profits of the firms in the north\( ^1 \). As mentioned before, south being small cannot influence \( E^N \). \( L^s \) denote the stock of type \( l \) labor in south and \( w^s \) the corresponding wage. \( P \) is the composite price of the manufacturing good.

Maximizing (1) subject to (3), we get the aggregate demands for \( y \) and \( X \) as:

\[ y = (1 - \gamma) E \tag{5} \]
\[ PX = \gamma E \tag{6} \]

**Section 3.2: Producers**

**Section 3.2.1: Production Structure**

The consumers are willing to pay a premium of \( \xi \) for a single jump in the quality of the product, which motivates the firm to undertake costly R&D for innovating higher quality levels. Assuming that the potential for quality improvement is unbounded, only a northern firm has the ability to drive forward the world quality frontier for the existing products through innovation. In figure 1, the northern firms are shown to be innovating with the followers targeting the leaders as well as the southern production units of sourcing firms. 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 completely by the northern firms till its production gets standardized\( ^2 \). Once standardized, the northern firm has the opportunity to become a sourcing firm by shifting its basic stage of production to a low cost nation either through VFDI or outsourcing. This is depicted in figure 1. Sourcing firms then in turn decide on internalization by choosing between VFDI and outsourcing. We separate figure 1 in two parts by a dotted horizontal line. All entities lying above the line are assumed to be exogenous, while this model focuses on entities lying below the line, namely, the southern national firms and the subsidiary or the outsourcing partners.

Product cycle in this model is generated because shifting a part of a sourcing firm production to the south whether through creating a subsidiary or through contracting out to outsourcing partner firm, lowers its

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\( ^1 \) Since this is a static model we look at one discrete level jump in quality that generates a product cycle.

\( ^2 \) As we will see later, the profits of firms in the south are always driven to zero.

\( ^2 \) Also see Glass and Saggi (2001), Markusen and Venables (1998) for further reference.
cost of production and drives the northern firms out of the market. On the other hand, the sourcing firm may also be driven out of the market by further innovation by the northern firms. (See figure 3).

Figure 1: Production Structure of the World Economy

**Section 3.2.2: Manufacturing Technology**

Assume that the production under the sourcing 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 sourcing firm must combine \( \alpha \) units of output from basic stage of production with \( (1 - \alpha) \) units of output from advanced stage of production produced in the north. This can be envisioned as a fragmented production structure whereby advanced production involves the manufacturing of sophisticated intermediate inputs and basic production involves the bundling of final goods by using these intermediate inputs. Unlike this model, 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.

Using a standard neoclassical production function, the production technology of a sourcing firm is represented as:

\[
X^M = (1 - \alpha) f^N (L^N_1, L^N_2) + \alpha f^B (L^B_1, L^B_2)
\]

Out of the total manufacturing output produced by the sourcing firm \( (1 - \alpha) \) proportion is produced using the sourcing firm’s technology in north and \( \alpha \) proportion using the subsidiary or the outsourcing partner technology, \( f^B_i (L^S_i, L^S_i) \) in south. It should be noted that the technology of production is different for VFDI subsidiary and outsourcing partner and thus the subscript \( i \in \{q \text{ (VFDI)}, o \text{ (Outsourcing)}\} \).

The marginal cost (MC) of production of the sourcing firm is a weighted sum of basic stage MC incurred by the sourcing firm’s production unit in the south, \( MC^B \) (by subsidiary or outsourcing partner) and advanced stage MC incurred by the sourcing firm’s production unit in the north, \( MC^N_{MNC} \)

\[
MC^M_i = (1 - \alpha) MC^N_{MNC} + \alpha MC^B
\]

\[
\Rightarrow MC^M_i = (1 - \alpha) MC^N_{MNC} + \alpha [a^B_{ji} (w^B_i) w^S_{ji} + a^B_{i} (w^B_i) w^S_{i}]
\]

Where \( a^B_{ji} (w^B_i) \) is the marginal requirement\(^{14}\) of type \( l \) southern labor, under sourcing firm’s offshoring mode \( i \), by the firm type \( k \in \{S \text{ (Southern domestic firms)}, B \text{ (subsidiary or outsourcing partner in south)}\} \).\(^{15}\)

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\(^{13}\) Glass (2004) 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.

\(^{14}\) 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 \( w^l = w^l_h \) 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.
Southern domestic firms produce the homogeneous good \( y \) under perfect competition with a CRS production function, \( f^S(L^S_1, L^S_2) \). The marginal cost of producing good \( y \) in a southern firm is given by:

\[
MC^S_i = a^S_{x, i}(w^S_i)w^S_{2,i} + a^S_{y, i}(w^S_i)w^S_{1,i}
\]  

(8)

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

**Section 3.2.3: Pricing Decisions of the firms**

A sourcing firm, which splits production between north and south, compete with a northern firm. The quality level of the product of a sourcing firm is no better than that of the northern quality leader. Therefore, sourcing firms engage in limit pricing and charge a price equal to the marginal cost of production of northern firms, \( \chi \). On the other hand, competition among southern firms drives down good \( y \) price to its marginal cost, which is equal to one\(^{16} \). \( P^S = MC^S_i = 1 \)

**Section 3.2.4: Industry Flows**

Let \( n^M \) represent the measure of sourcing firms. In equilibrium, it is constant and determined by the probability of standardization and the probability of formation of subsidiary or outsourcing partner. In this model all these factors are exogenous, which implies that the measure of firms is also exogenous.

**Section 3.2.5: 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 sourcing is

\[
a^S_{x, i}(w^S_i) \left[ (1 - \gamma)E_i \right]
\]

and by sourcing firm’s production unit in south for good \( X \) is

\[
\alpha n^M a^B_{x, i}(w^S_i) \left( \frac{\gamma E_i}{\chi} \right)
\]

Thus, skilled labor market equilibrium in south is represented by an equality of supply with demand

\[
L^S_2 = a^S_{x, i}(w^S_i) \left[ (1 - \gamma)E_i \right] + \alpha n^M a^B_{x, i}(w^S_i) \left( \frac{\gamma E_i}{\chi} \right)
\]  

(9)

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

\[
L^S_1 = a^S_{u, i}(w^S_i) \left[ (1 - \gamma)E_i \right] + \alpha n^M a^B_{u, i}(w^S_i) \left( \frac{\gamma E_i}{\chi} \right)
\]  

(10)

This completes the formulation of the model. We can now turn to the next section that compares welfare under the two alternative regimes of international sourcing in south.

**Section 4: Equilibrium in South and Welfare Comparison**

VFDI and outsourcing differ only with regard to the skill intensity employed in the foreign sector in the host country. Therefore, we can analyze the regime switch from one mode of governance to the other as a comparative static exercise of a change in skill intensity of basic stage of production of \( X \) sector. To execute this exercise, we need to specify one of the two modes of foreign sourcing as the initial equilibrium. Without loss of generality, we assume that VFDI constitutes the initial equilibrium in the host country, that is, the world economy initially carries all its fragmented production through foreign subsidiaries. Then we may ask whether a regime shift from VFDI to outsourcing can increase the real GDP of the host country and if so, we qualify the conditions for which it holds true. We also find conditions under which aggregate real wage earnings fall, that is, the host experiences a welfare loss after regime shift from VFDI to outsourcing.

There is only one exogenous change as we move from VFDI equilibrium to outsourcing steady state. As per our assumption, the skill intensity of basic stage of production rises exogenously. The unit requirement of

\(^{15}\) For example, \( a^S_{x, i}(w^S) \) is the unskilled labor requirement by the southern firms under FDI and similarly, \( a^S_{u, i}(w^S) \) is the skilled labor requirement by the sourcing firm’s production unit in the south under outsourcing.

\(^{16}\) Even though northern firm’s price depends on sourcing firm’s MC and therefore on southern wages, however, by assuming the south to be a relatively small open economy, we can preclude any effect on northern variables or even repercussion effect and focus only on the host country effects.
labor, \( a^k_l \) depends on wages, and also the mode of organization. Let the exogenous rate of change in marginal labor requirements of \( l \) type of labor with regime switch in south be represented by

\[
\dot{\hat{a}}_l = \frac{da^k_l (\text{exogenous})}{a^k_l} \quad l = 1, 2
\]

Our assumption of a subsidiary being less skill intensive implies that skill intensity increases after regime switch, that is:

\[
\dot{\hat{u}}_2 - \dot{\hat{u}}_1 > 0 \quad \text{(A.1)}
\]

Moreover, as the regime changes from VFDI to outsourcing, wages also change, which impact the skill requirement endogenously after the regime shift. Similarly, the endogenous counterpart change is represented by

\[
\dot{\hat{a}}_k^l = \frac{da^k_l (w^S)}{a^k_l} \quad l = 1, 2 \text{ and } k = S, B
\]

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

\[
MC^B = \theta^k_S \hat{w}^S + \theta^k_S \hat{w}^S + \theta^B_S \hat{u} + \theta^B_S \dot{\hat{u}}
\]

Totally differentiating equation (8), we get:

\[
\dot{\hat{w}}^S = - \frac{\theta^k_S \hat{w}^S}{\theta^k_l}
\]

In equation (11) and (12) \( \theta^k_l = \frac{a^k_l \cdot w^S}{MC^k} \) is the distributive share of type \( l \) labor in type \( k \) firm in the host country.

Using the above expression we get that,

\[
\dot{\hat{a}}^k_l = - \theta^k_l \sigma_k (\hat{w}^S - \hat{w}^S) \quad \text{and} \quad \dot{\hat{a}}^k_l = \theta^k_l \sigma_k (\hat{w}^S - \hat{w}^S) \quad k = S, B
\]

Where \( \sigma_k \) is the elasticity of substitution between the two factors of production.

Totally differentiating the southern resource constraints, and substituting for \( \dot{\hat{a}}^k_l \) from (13) and using \( \hat{E} = \hat{w}^S e_1 + \hat{w}^S e_2 \)

\[
\hat{E} = \frac{w^S L^S}{E} \quad \text{and} \quad \psi \text{ is the share of the host country GDP in global GDP, we get the following two equations in } \dot{\hat{w}}^S \text{ and } \hat{w}^S \text{ represented in matrix form }^{17}
\]

\[
\begin{bmatrix}
-A_1 - e_2 \\
-A_2 + e_2
\end{bmatrix}
\begin{bmatrix}
\dot{\hat{w}}^S \\
\hat{w}^S
\end{bmatrix}
= \begin{bmatrix}
\lambda^B_S \\
0
\end{bmatrix}
\begin{bmatrix}
\hat{u}_2 \\
\hat{u}_1
\end{bmatrix}
\]

Where

\[
A_1 = \lambda^S_l \sigma_k \theta^S_l + \lambda^B_l \sigma_k \theta^B_l
\]

\[
A_2 = \lambda^S_l \sigma_k \theta^S_l + \lambda^B_l \sigma_k \theta^B_l
\]

The set of two equations 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 sourcing from VFDI to outsourcing, that is, we can derive:

\[
\frac{d(w^S)}{du^S} = \frac{\dot{\hat{w}}^S}{\hat{u}_2 - \hat{u}_1}
\]

\^{17} \lambda_s \text{ are the proportional labor shares. For example, } \lambda^B_S = \alpha \frac{n^M w^B (w^S)}{L^S} \frac{\psi E}{x} \text{ is the fraction of type } l \text{ labor of south employed by the sourcing firm’s manufacturing unit in the south.}
\[
\frac{\hat{u}_2 - \hat{u}_1}{\hat{w}_1^S} = - \left[ \frac{1}{\theta_2^S} \left( \frac{A_1}{\lambda_2^B} + A_2 \right) + \left( \frac{1}{\lambda_2^B} - \frac{1}{\lambda_1^B} \right) \left( e_1 - \frac{\theta_1^S}{\theta_2^S} e_2 \right) \right]
\]

Intuitively, when the skill intensity of production increases, we would expect the skill premium to increase and by equation (12), this implies wages of unskilled labor falls. The following two alternative sets of conditions can ensure signs according to our intuition.

Set 1: \( \lambda_2^B > \lambda_1^B \) and \( \zeta > \frac{a_2^S}{a_1^S} \) or

Set 2: \( \lambda_2^B < \lambda_1^B \) and \( \zeta < \frac{a_2^S}{a_1^S} \)

Where \( \zeta = \frac{L^S_2}{L^S_1} \)

Either one of set 1 or 2 should hold to have \( \frac{\hat{u}_2 - \hat{u}_1}{\hat{w}_1^S} < 0 \). If the relative skill availability in the host country is above the skill intensity of the domestic sector, then the foreign sector should be intensive in skilled labor for skill premium to rise with outsourcing. On the other hand, if intensity of skilled labor employed in the foreign sector is lower, then it is imperative that the relative skill availability in the host country be low for the skilled labor wages to rise with outsourcing.

To make welfare comparisons across the two alternative regimes of foreign sourcing, 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 sourcing firm’s good depends on the exogenously given marginal cost of northern firms, \( \chi \). In our model, the variation of price index across regimes is attributed to the difference in marginal cost of production of the basic stage of fragmented good. The price of northern firm’s good is a quality mark up over the marginal cost of multinational good. \( P^N = \xi \left[ (1 - \alpha) MC^N_{MNC} + \alpha MC^N_B \right] \)

Marginal cost of the advanced stage is given in our model; therefore the only force that can change the price of northern goods is the marginal cost of basic stage (which is produced in the south). It must be noted that even though \( P^N \) change is small for the north, it cannot be ignored for the south. Thus, the south’s price index is impacted by changes in \( P^N \). Thus, a comparison of real wages in the two mutually exclusive forms of international sourcing must depend on the MC of production of the subsidiary and the outsourcing partner.

\[
\hat{\rho} = \tau MC^B
\]

Where \( \tau \) is the contribution of northern goods price to the price index. For algebraic convenience\(^{18} \) we assume \( \tau = 1 \).

At this point we may find it useful to invoke the Grossman-Helpman (2003) assumption that the marginal cost of production for outsourcing partners is lower than that of a subsidiary. They used this assumption to highlight the tradeoff between high costs incurred by the sourcing firms to search for outsourcing partners and hence lower their marginal cost of production. VDFI in their model did not have this component of search costs but had higher variable costs relative to outsourcing. The rationale behind this assumption can be explained by the familiarity of domestic producers with the host country market where the fragmented piece is produced.

Northern variables are assumed to be exogenous in our system; therefore, search cost is exogenous. However, the cost incurred by outsourcing partner is determined by southern wages and therefore is endogenous. By the Grossman-Helpman (2003) assumption, marginal cost of the foreign sector falls, that is, \( MC^B < 0 \). Therefore, the price index lowers with outsourcing. Therefore, to make welfare comparison in favor of outsourcing, an evaluation of nominal GDP is enough. Outsourcing regime leads to higher welfare for the host even if the nominal GDP after regime switch is higher, that is,

\[
\frac{\hat{w}_2^S}{\hat{w}_2 - \hat{w}_1} > 0 \quad \text{and} \quad \frac{\hat{w}_2^S}{\hat{w}_2 - \hat{w}_1} > 0
\]

If, we restrict \( \frac{\hat{w}_2^S}{\hat{w}_2 - \hat{w}_1} > 0 \), a sufficient condition for outsourcing to generate higher welfare is:

\(^{18} \) This assumption does not alter the qualitative nature of our results. It just simplifies algebra by removing a not so necessary parameter.
Thus, if the absorptive capacity of the host country is above domestic absorption, then outsourcing definitely leads to higher welfare.

On the other hand, VFDI regime will produce a higher magnitude of welfare vis-à-vis outsourcing if the real GDP after the regime shift from VFDI to outsourcing falls, 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,

\[
\frac{\hat{w}_2^s}{\hat{u}_2 - \hat{u}_1} L_2^s (\zeta \theta_t^B - \theta_s^B) + \hat{K} < 0
\]

Where \( \hat{K} = -\frac{\theta_t^B \hat{u}_2 + \theta_s^B \hat{u}_1}{\hat{u}_2 - \hat{u}_1} \) is exogenous.

 Following the CRIS INFAC (2005) update, we believe that, ceteris paribus, marginal cost of production is lower for an external vendor relative to a subsidiary. Thus, the exogenous component of marginal cost, given by, \( \theta_t^B \hat{u}_2 + \theta_s^B \hat{u}_1 < 0 \). Hence \( \hat{K} > 0 \). Then if we restrict \( \frac{\hat{w}_2^s}{\hat{u}_2 - \hat{u}_1} > 0 \), a necessary condition for VFDI to generate higher welfare vis-à-vis outsourcing is

\[
\zeta < \frac{\theta_t^B}{\theta_s^B}
\]

(14.2)

Thus, VFDI 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. Combining conditions (14.1), (14.2), and assuming that, the skill intensity of foreign sector activity in the south is higher than the domestic production of good \( y \), that is, \( \frac{\theta_t^B}{\theta_s^B} < \frac{\theta_t^S}{\theta_s^S} \), we get that, a necessary condition for VFDI to generate higher welfare vis-à-vis outsourcing is

\[
\zeta < \frac{\theta_t^S}{\theta_s^S}
\]

Figure 2: Welfare enhancing mode of offshoring and absorptive capacity

With VFDI, the demand for skilled labor is not high. If high skill availability in the host country is matched with VFDI, the low demand for skills pushes the wages of skilled labor to lower levels and hence reduces welfare since a greater proportion of labor earns this lower level of skill premium. Moreover, outsourcing may still lead to higher welfare vis-à-vis VFDI even if it is matched with lower skill abundance in the host country provided the rise in skill premium is not too high to crash the unskilled labor wages.

This result indicates some lesson for the developing countries that compete blindly for VFDI offering subsidies and attractive package incentives to the sourcing firms. It makes sense for the host country to attract VFDI only if they have low level of skills relative to domestic sector absorption in the host country. However, the

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19 This assumption is equivalent to assuming that outsourcing partner technology is like a technological progress over subsidiary technology, such that unit resource requirement falls for all the inputs used. Using the corollary to Stolper-Samuelson and Rybezynski theorem, return to the factor used intensively by the foreign sector rises, that is skill premium rises.
results also indicate that even if the host absorptive capacity, \( \zeta \), is low, then under certain conditions, 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.

Our result also mirrors Antràs (2005) result on organizational cycles. In his model, FDI always precedes outsourcing because only when a product’s headquarter intensity falls such that it standardizes to a greater degree can the sourcing firm afford to lose control over its production process. He shows that with time the degree of standardization of the product increases and the product’s governance goes from FDI (firing the subsidiary and appropriating the output) to outsourcing (no control over output if the supplier leaves) exhibiting organizational cycles. Our results show that this kind of organizational cycle is also what the host country desires. At near the ground level of development of a host, with low levels of human capital, it benefits the south to have FDI. With time, as the absorptive capacity of the host grows then it can afford to host outsourcing relationships.

Section 5: Conclusions

In this paper foreign sourcing in the form of either FDI or outsourcing is taken as an exogenous event and the focus of interest lies on analyzing their affect on welfare in the host country. The approach that we choose runs as follows. We develop a product life-cycle model that focuses specifically on the events in the host country. The empirical and theoretical differences between FDI and outsourcing helps us support our assumption that a subsidiary activity is relatively less skill intensive vis-à-vis an outsourcing partner’s production technique. This proposition drives a number of results\(^{20}\). It is found that under certain conditions, depending on the absorptive capacity of the host country and the relative demands generated by FDI and outsourcing for the two factors of production, outsourcing may lead to a higher level of real GDP. 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 domestic 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.

Acknowledgement

I am deeply indebted to Prof. Partha Sen for guiding me through this paper and motivating me to think innovatively.

References

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\(^{20}\) 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. (2004). 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.


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