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# Joining Pre-existing International Production Networks:

## Implications for India's Economic Integration to East Asia

Jeongmeen Suh and Jong Duk Kim

KIEP Korea Institute for International Economic Policy

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## Executive Summary

This study provides a conceptual framework to explain what kinds of difficulties a late-follower will suffer from when it tries to join pre-existing International Production Networks (IPNs). We consider the total production cost minimization problem by a multinational company (MNC) in allocating locations of fragmented production processes across borders. From the clarification of IPN-related costs, we draw out what structural disadvantages late-follower countries have and provide several policy implications to overcome these disadvantages with more targeted efforts. Especially we put India's case in the conceptual framework of the IPNs and then look at the hurdles that make India's participation in the East Asian IPNs hard and sluggish. Relevant data are provided in order to support the theoretical explanations.

**Keywords:** Multinational Corporations, International Production Networks
**JEL Classification:** F23, F12, L22

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# Joining Pre-existing International Production Networks: Implications for India's Economic Integration to East Asia

Jeongmeen Suh* and Jong Duk Kim**

## I. Introduction

International production networks (hereafter, IPNs) in East Asia (typically, ASEAN, China, Japan and Korea) are known to be the most developed in the world in their significance to each economy in the region, their extensiveness covering a number of countries in the region (Ando and Kimura 2009). During the global financial crisis, East Asia's trade showed V-shaped recovery within the regional production networks. It is often argued that the existence of dense industrial clusters and IPNs helps the East Asian economy remain relatively stable in the face of external shocks (Ando 2010). The volume of trade in the world has increased significantly through vertical specialization which explains the gains from trade (Yi 2003). Especially for developing countries, there are gains from expanded trade through production networks. In general, labor abundance allows

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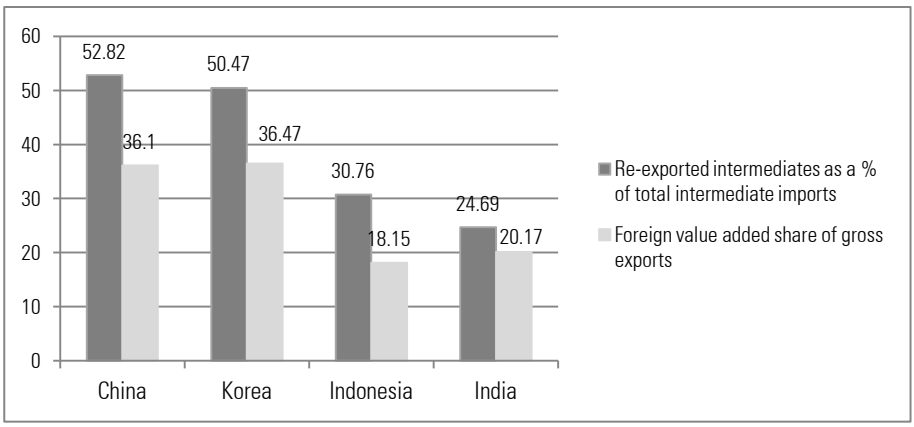
a developing country to break into labor-intensive manufacturing exports, which attract capital through FDI and hence improve employment, infrastructure, and institutions, which induces fast economic growth at a certain stage of development. From this respect, plugging into East Asian IPNs for manufacturing seems an attractive economic strategy for neighboring other Asian countries to get on to sustainable development paths.

Though it is typical that developing countries in their early stage of development grew by exporting labor-intensive manufactures, India has relied to a greater extent on services.[1] The Indian economy was left out of the global division of labor in the 1980s, particularly with regard to parts and components production. Though the gap became narrower, India still remained far behind, compared to East Asian countries. The increasing share of trade in parts and components of East Asian countries was fuelled by an export-led, outward-oriented growth strategy in the 1980's. During the same period, India followed a different economic growth strategy from East Asian countries (Rajan and Sen 2002). Especially in contrast with China, India has not become a manufacturing powerhouse in labor-intensive goods. Processing trade accounts for half of China's overall trade, while it is negligible in India. [Figure 1] shows the contrasted involvement in intermediate goods trade among four Asian countries in 2005, China, Korea, Indonesia, and India. Re-exported intermediates as a percentage of total intermediate imports are lower than 25% in India, while it is greater than 50% in China and Korea. Foreign value-added share of gross export is also much lower in India than in China or Korea.

[1] The share of services increased from 30 percent of GDP in 1950 to 57 percent in 2008-09 (Eichengreen and Gupta 2011).

**Figure 1. Participation in Intermediate Goods Trade, 2005**

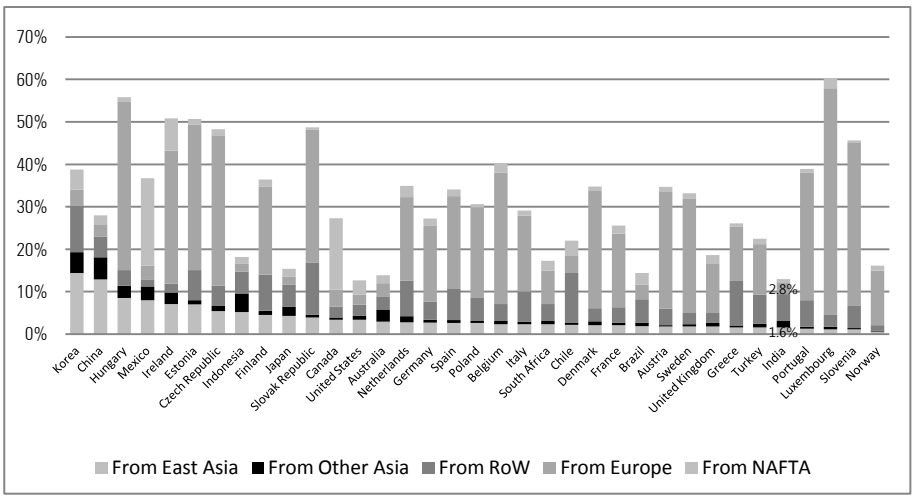



Source: OECD-WTO Trade in Value-Added (TIVA).

Foreign direct investments in India mostly serve the local market rather than export production. In contrast, in China and other East Asian countries, much of FDI is linked to processing trade to serve global markets. India's trade volume with East Asian countries is small as shown in [Figure 2]. Exports from East Asia accounts for only 1.6 % of India's import content. It is true that European countries also have built even bigger production networks than East Asian production networks. As Europe's fragile economic situation has been prolonged, however, the East Asian IPNs have now become an attractive option to countries that want to participate in production networks. To establish the sustained economic development, it seems a natural policy direction for Indian government to foster IPN-favorable conditions.

In spite of substantial attentions on IPNs, there still remain lots of questions which have yet to be fully answered due to its sophistication in subtle combinations of intra-firm and arm's length (inter-firm) transactions, especially for East

**Figure 2. Import Content of Exports from Various Regions, 2005**




Source: OECD Economic Globalization Indicators 2010.

Asian IPNs. The reason mainly comes from the difficulty in getting data on disaggregation of production. Feenstra (1998) pointed out the drastic changes in trade patterns towards production fragmentation. Much of current empirical work is focused on understanding global trade structure by analyzing intermediate goods trade. Gross exports and imports currently used have a problem of double counting as pointed out by Leamer (2006). For example, gross final goods imports from a foreign country that uses intermediate goods from the importing country is amplified by counting value of the intermediate goods two times. World input-output analysis allows us to accurately measure the net value added of imports and exports. The influential paper by Hummels, Ishii and Yi (2001, hereafter HIY) suggested a way to measure the vertical specialization of an individual country. Koopman, Power, Wang and Wei (2010) refined the vertical spe-

cialization measure of HIY. Daudin, Rafflart and Schweisguth (2010) and Johnson and Noguera (2010) also suggest an improvement of the vertical specialization measure of HIY. Regarding the location choices of multinational firms and vertical FDI decisions, empirical literature does not consistently support a specific theoretical model such as knowledge-capital model by Carr, Markusen and Maskus (2001). Evidence on the positive relationship between country-similarity and cross-investment in the data is weak or, in some cases, contradicting.[2]

In theoretical explanations on IPNs, there have been several approaches. For instance, Kimura and Ando (2005) suggest a conceptual framework of two-dimensional fragmentation; *distance* and *uncontrollability*. In their categorization, they emphasize the tension between the cost of a service link that connects remotely located production blocks and the benefit of outsourcing that enables an MNC (Multi-National Corporation) to save its production costs. The source of such benefits may come from not only wage level or resource availability, but also the existence and quality of infrastructure and its services, and the policies of the host country's government. A more analytical model is provided by Grossman and Rossi-Hansberg (2008) which describes production in terms of a continuum of tasks and draw out the general equilibrium implications for trade and for wages. Helpman (1984) explains how the trade pattern and the share of intra-industry trade in the context of IPN, with concentrating on the emergence of MNC as a result of the tendency of factor rewards to differ across countries. Grossman *et al.* (2003) studies the determinants of integration strategy when firms face an array of choices especially when firms differ in their productivities. The common feature of the literature, however, is that it is less emphasis on the fact that IPNs

[2] Blonigen, Davis, and Head (2003), Braconier, Norback and Urban (2005).

experience a sequence of production activities consisting of upstream and downstream. Though vertical FDI literature (e.g., Helpman 1984, Grossman *et al.* 2003) consider such properties, the focus is not how to link a sequence of production process. Baldwin and Venables (2010) is an exception. They pay attention that offshoring may occur in two different configurations, *spider* and *snake*. Spider type, which most previous studies have focused on, describes production activities with multiple parts coming together to form a body, which may be the final product itself or a component. Snake type focuses on a 'sequence' of IPN-related production activities, the good moving in a linear manner from upstream to downstream with value added at each stage. Moving from a location of part production (upstream) to its assembly location (downstream) in spider (snake) type incurs corresponding offshoring costs. Our model is close to Baldwin and Venables (2010) with focus on the fact that most production processes are complex mixtures of the two configurations. In our model, however, we combine the two types of production activities into a single framework. We identify the IPN-related cost components an MNC faces through a production process. And then, we draw out what structured disadvantages that late-follower countries getting involved in a pre-existing IPN must bear; and provide several policy implications to overcome those disadvantages with more targeted efforts. Especially, we focus on the disadvantages a late-follower may experience from a smaller agglomeration effect and a weaker alignment with upstream or downstream production process, compared to its counterpart countries which have already been in a part or a stage of a given IPN. Furthermore, we have tried to put India's case in the theoretical framework of the IPN and then look at the possible problems that make India's participation into the East Asian production network difficult and slow. Whenever possible, relevant data are provided in order to support the theoretical

explanations.

The remainder of this paper is organized as follows. In Section 2, we develop our model of firms that must choose where to produce parts and to assemble them. In Section 3, we analyze how a country can host MNCs, especially when the country is a late-follower in pre-existing IPNs. In Section 4, we assess the current situation of India with our theoretical model. Section 5 concludes.

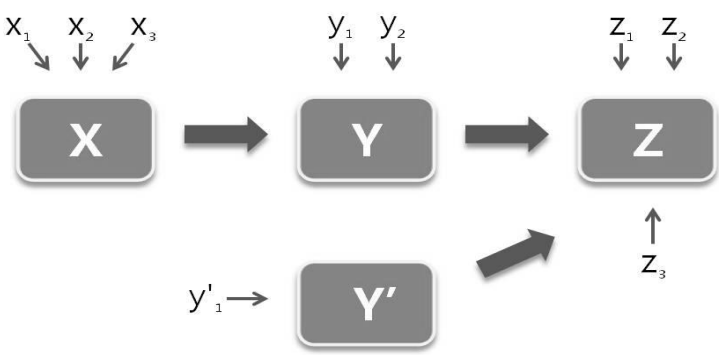
# II. An Economic Model of International Production Networks

## 1. An Introduction to Our Approach

Our modeling strategy is to describe a production network as a sequence of production stages and each stage is a sum of several parts production and their assembly activity. Once a group of parts are assembled, it subsequently becomes either a component for the next stage or a final good. A possible example is illustrated in [Figure 3].

Each cell is a stage at which value is added to a good that ends up as final consumption. Specifically, a small letter represents a production activity for a part or a component and a capital letter does the assembly activity of all the parts in its

**Figure 3. An Illustrative Example of IPNs**



current stage. Each arrow is a physical movement of a part or an assembled component or the good itself. That is, each part $x_1, x_2, x_3$ is sent to X to be assembled, its immediate downstream activity Y receives X to assemble with part $y_1$ and $y_2$, and so on. In production processes like those illustrated in the diagram, the location of any element depends on the location of others, regardless of whether it is for part production or assembly. In this respect, it seems we do not need to distinguish capital letter (assembly activity) from small letter (a part production). However, there is an essential difference between these two. A part production activity does not have its upstream while an assembly activity receives at least two activities.3 Thus, a choice for assembly location (e.g., X) affects several other location decisions ($x_1, x_2, x_3$,Y). Certainly, the location of part production ($x_1$) also affects the choice of (i) other parts production location and a assembly location, however, only indirectly through the assembly (X) or in a collective manner with other activities.

Suppose that offshoring costs are incurred if an arrow on the figure crosses an international boundary. They are likely to be made up of costs of coordination and management as well as direct shipping costs. As Baldwin and Venables (2010) explained, these offshoring costs create centripetal forces binding related stages together. Firms seek to be close to other firms with which they transact, but the form of this depends on how the production process looks like. It is more important especially when the activities are linked to an upstream and a downstream stage. But there are also centrifugal forces that encourage dispersed production of different stages; for example, different stages have different factor intensities

3 There are three possible types of assembly activity: (i) all 'received's are parts, (ii) all are assembled components from different upstreams, and (iii) some 'received's are parts while others are components from different upstreams.

which create international cost differences and incentives to disperse. There is a tension between comparative costs creating the incentive to unbundle, and co-location or agglomeration forces binding parts of the process together. Moving forward, we clarify the cost minimization problem an MNC considers by itemizing types of cost in the context of IPNs. And then, we analyze how each type affects the interaction of centripetal and centrifugal forces and show how they determine the location for different production activities.

## 2. Basic Elements

The production cost of part $i \in I$ is denoted by $b_{ir}$ when it is produced in region $r \in R = \{\mathbf{E}ast, \mathbf{S}outh\}$. $a_r$ denotes the assembly cost for the stage in question. When the location of part production $i$ and that of assembly are different, it incurs a unit offshoring cost $\tau_i(r_o, r_d)$ where $r_o$ is for the origin and $r_d$ for the destination of offshoring. Obviously, there is no offshoring cost if $r_o = r_d = r$; $\tau_i(r,r) = 0$.[4] To distinguish the offshoring cost of assembly for the next stage from that of a part in a stage, we omit a subscript i; $\tau(r_o, r_d)$. $\bar{r}$ and $\underline{r}$ represent the immediate upstream or downstream location of $r$, respectively.

The objective of an MNC is to minimize its total production cost over the whole chains of production by choosing locations of part production and assembly for every stage. That is, we look at the efficient location of production stages when decisions are taken by a single cost-minimizing agent, rather than when each stage is controlled by independent decision makers.

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[4] We consider all the costs as variable one to focus on a single MNC's location choice problem. Our model can be extended to considering a case with fixed costs when research questions are related to either scale of economy effect or market entry/exit decision.

## 3. Costs Related to Parts-production Location Choice

To consider a location choice problem for part production, first fix the assembly location. Suppose the assembly occurs in a given region $\hat{r}$. Then, an MNC will choose region $r$ to produce part $i$ as long as

$$b_{ir} + \tau_i(r, \hat{r}) < b_{ir'} + \tau_i(r', \hat{r})$$

where $r' \neq r$. When the assembly location is different from $r$, it is simplified into

$$\tau_i(r, r') < b_{ir'} - b_{ir} \tag{1}$$

A region r will be chosen as long as the region can provide high enough cost saving in production compared to when the part is produced in the same location as the assembly location. In other words, if part $i$ requires a high offshoring cost, it is not necessary for region $r$ to host the FDI for part $i$ even when the region has production cost advantage for the part. From this relationship between offshoring cost and production cost, we can see why abundant labor force may be neither a sufficient nor a necessary condition for involvement in an IPN.

In each stage of production, a group of parts are usually involved. When related parts are produced in (physically or institutionally) the same location, there can be some positive co-location effects. Once industrial agglomeration starts working, it becomes an important element of location advantages, and subsequently induces more part production in the location. Ando and Kimura (2009) showed that agglomeration effect is more important for parts and components

than for final machinery products or other products in intra-East Asian trade patterns. The agglomeration effect acts as disavantage to a late-follower which is willing to get involved with pre-established IPN. To capture this feature, we extend part production cost $b_{ir}$ into $B_{I_r}(\hat{r})$ which represents total production costs of the set $I_r$ (all the parts produced in region $r$) when the assembly occurs in region $\hat{r}$. Note that the subset $I_r$ of $I$ may be different in equilibrium depending on where the assembly place for the stage, that is, it can be $B_{I_r}(r) \neq B_{I_r}(r')$. When there is the agglomeration effect, $B_{I_r}(r)$ should satisfy a condition that average cost gets smaller as more parts are produced in the same place. That is, for any part $i$ and any given $I_r$,

$$\frac{B_{I_r \cup \{i\}}(r)}{\#(I_r \cup \{i\})} \leq \frac{B_{I_r}(r)}{\#(I_r)}$$

where $\#(J)$ is the number of elements in set $J$. Define the marginal contribution of part $i$ on agglomeration effect in region r for given $I_r$,

$$\Delta B_{I_r \cup \{i\}} \equiv \frac{B_{I_r \cup \{i\}}(r)}{\#(I_r \cup \{i\})} - \frac{B_{I_r}(r)}{\#(I_r)}.$$

Note that, though the number of parts production is the same, the marginal contribution can be different depending on which part or the initial location we consider. That is, it can be $\Delta B_{I_r \cup \{i\}} \neq \Delta B_{I_r \cup \{j\}}$ for a pair of parts $(i, j)$ or $\Delta B_{I_r \cup \{i\}} \neq \Delta B_{I_{r'} \cup \{i\}}$ when $\#(I_r) = \#(I_{r'})$. Considering the agglomeration effect, we can replace (1) with (2). That is, an MNC chooses region $r$ for the production location of part $i$ as long as

$$\tau_i(r,r') < \left| \Delta B_{I_{r'} \cup \{i\}} - \Delta B_{I_r \cup \{i\}} \right| \tag{2}$$

Basic implication is similar to (1) except one thing. Rather than the simple difference in production costs $b_{ir'} - b_{ir}$, it is important whether the difference in the marginal contribution to agglomeration effect of part $i$ on total cost saving is large enough to overcome the additional offshoring cost if it is produced in region $r$. In sum, for a part requiring low offshoring cost, the marginal contribution determines its production location. On the contrary, for a part requring high offshoring cost, the place where the assembly occurs is a critical factor which affects its production location because the assembly location incurs offshoring costs for its relevant parts.

## 4. Costs Related to Assembly Location Choice

Now suppose an MNC chooses region $r$ for its assembly location for a certain stage. The total production cost for the stage is given by

$$c(r) = a_r + B_{I_r}(r) + B_{I_{r'}}(r) + \sum_{i \in I_{r'}} \tau_i(r',r) \tag{3}$$

As we discussed in the above, a choice for assembly location both affects and is affected by decisions on part production locations. However, the choice of $r$ is directly influential on not only assembly cost itself $a_r$ but also all the costs related to parts production, $B_{I_r}(r) + B_{I_{r'}}(r)$, and offshoring costs for parts $\sum_{i \in I_{r'}} \tau_i(r',r)$. For the choice of assembly location, there is another distinctive characteristic which should be considered in the context of production chains. The assembly location is the end point of a stage. At the same time, it is also the

bridging point for its subsequent stage. In this respect, the location immediately upstream or downstream should be considered into choices for current assembly location. When there exists a higher offshoring cost between two locations, this type of cost (i.e., trade costs, tariff etc.) will be greater. For each stage, the cost the MNC is concerned with will be

$$C(r;\bar{r},\underline{r}) = c(r) + \tau(\bar{r},r) + \tau(r,\underline{r}) \tag{4}$$

And the MNC chooses a location $r$ for its assembly activity when

$$C(r;\bar{r},\underline{r}) < C(r';\bar{r},\underline{r}) \tag{5}$$

Combining (3) and (4), we can rewrite (5) in greater detail. For given $(\bar{r},\underline{r})$, MNC chooses region $r$ for assembly activity when

$$a_r + \sum_{\tilde{r}\in R} B_{I_{\tilde{r}}}(r) + \sum_{\substack{i\in I_{r'}}} \tau_i + \tau(\bar{r},r) + \tau(r,\underline{r}) < a_{r'} + \sum_{\tilde{r}\in R} B_{I_{\tilde{r}}}(r') + \sum_{j\in I_r} \tau_j + \tau(\bar{r},r') + \tau(r',\underline{r}) \tag{6}$$

With (2) and (6), now we are ready to analyze the location choice problems.

# III. Analysis

In this section, we examine how a bundle of cost components in (6) affect an MNC's location choice decision and how a region can attract the MNC's investment by introducing proper policies. Based on characteristics of IPN-related costs, we divide policy implications into four categories. The first two are generally applicable to any offshoring problem in that it focuses on the tension between cost saving motive and offshoring cost in offshoring decisions. The last two focus on what the disadvantages are for a region which is not in an IPN but willing to join a pre-established one and how to overcome them with some targeted policies.

## 1. Utilizing Production Cost Advantages

A prompt conclusion from cost comparision may be the factor price advantage argument. A region which can provide a lower cost to use a factor than other regions hosts MNC's investment and can be a part of the IPN. It may include all the relevant incurred costs when a firm uses the factor, besides the market price of the factor itself. The typical variables relevant to this point will be wage or quality of labor. Policy recommendations from this perspective focus on how to make $a_{r'} - a_r$ or $b_{ir'} - b_{ir}$ greater. Enacting a flexible labor law may be a typical example. Because saving factor costs are the most fundamental reason for offshoring, the costs have several other aspects related to other cost components. We will discuss them in each of the related components below

## 2. Lowering Offshoring Costs

Now turning to offshoring costs which are another main concern of offshoring. The costs can be decomposed into two parts, $\tau_i = \alpha\boldsymbol{\tau}_i$ and $\tau = \alpha\boldsymbol{\tau}$ where $\alpha$ captures the overall level of offshoring costs and bold letter does so for part-specific element costs as Baldwin and Venebles(2010). Then, (6) can be rewritten into

$$\alpha\left[\sum_{i\in I_{r'}}\boldsymbol{\tau}_i + \boldsymbol{\tau}(\bar{r},r) + \boldsymbol{\tau}(r,\underline{r})\right] - \left[\sum_{j\in I_r}\boldsymbol{\tau}_j + \boldsymbol{\tau}(\bar{r},r') + \boldsymbol{\tau}(r',\underline{r})\right] < (a_{r'} - a_r) + \sum_{\tilde{r}\in R}\left[B_{I_{\tilde{r}}}(r') - B_{I_{\tilde{r}}}(r)\right]$$

From this decomposition, we can observe that production cost determines the location as $\alpha \to 0$ and offshoring costs are decisive as $\alpha \to \infty$, and at intermediate values of $\alpha$ there is tension between these forces (Baldwin and Venables, 2010). A decrease in $\alpha$ can be achieved when the region r improves its customs procedure or relaxes regulations about foreign investment. A typical way to lower part/component specific offshoring costs $\sum_{i\in I_{r'}}\boldsymbol{\tau}_i$ is a tariff cut on the part/component through FTA or unilateral measures. The other way to reduce the cost is to lessen the number of parts imported from $r'$, which is more closely influenced by the agglomeration effect and related with assembly location choice.

## 3. Overcoming Disadvantage from the Agglomeration Effect

Even when $a_{r'} > a_r$ and $\alpha\sum_{i\in I_{r'}}\boldsymbol{\tau}_i < \sum_{j\in I_r}\boldsymbol{\tau}_j$, region $r$ may not be competitive

against *r'*. One possibility is due to the agglomeration effect which acts as a disavantage against the late-participant into the IPN. To focus on the effect, we consider an extreme case where all the parts but part *i* have been produced in E. In this case, it is clear that

$$\sum_{\tilde{r}\in R} B_{I_{\tilde{r}}}(S) = B_{I_E}(S) > B_{I_E}(E) = \sum_{\tilde{r}\in R} B_{I_{\tilde{r}}}(E).$$

The policy for region S to alleviate this inequality is enlarging the set of parts produced in region S, $I_S$. To do this, a policy needs to be targeted. As we saw in 3.2, giving support to the parts industry is helpful in attracting part production to the home region. Examples of such policies may be tariff cut on the part or tax cut on factors used for the part. When such a policy is costly to the host region, however, which part should have priority and enjoy a greater favor? A possible answer might be a part having a greater marginal contribution on the agglomeration effect. Once such a part is produced in region S, it becomes easier to attract other parts. At the same time, it helps region S to mitigate the disadvantage region E had from the agglomeration effect. Another strategy which can be considered as a long-term policy is to favor a part which the MNC is indifferent between two regions because the part has small externality. This strategy has merit in that it is a feasible start-up for a region in an early stage of involving an IPN. Among such 'indifferent' parts, a part having greater externality on parts with a large marginal contribution must be the one in priority. The first strategy can be more effective when the collection followed by the second strategy reaches a critical mass. For example, auto parts have been identified as a thrust sector in India's trade policy, and have been granted several fiscal incentives in order to be competitive globally. However, the focus needs to be not just on the specific products

that have a current low-cost advantage in production, but also on the specific areas that can provide a more sustainable advantage. A policy suggestion by Srinivasan and Sen (2011) is in line with our analysis. That is, there is a need to adopt an industrial cluster approach to this sector and provide export incentives for the same, with adequate infrastructural supports.

## 4. Aligning with Immediate Upstream and Downstream Locations

When above three cost components are equal between two regions, the remaining cost an MNC considers is the difference in offshoring costs of assembly activity which is incurred by the locational coordination with its upstream and downstream producers, that is, whether or not $\tau(\bar{r},r)+\tau(r,\underline{r})<\tau(\bar{r},r')+\tau(r',\underline{r})$. Note that for a country which newly joins an IPN, it is typically $r\neq\bar{r}$ and $r\neq\underline{r}$. For example, in the South/East Asia context, (6) is given by

$$a_S+b_S+\sum_{j\in I_E}\tau_j+\tau(E,S)+\tau(S,E)<a_E+B_I(E)+\tau_i$$

As discussed in 3.2, lowering $\alpha$ can be a way to overcome this disadvantage. Another quick answer is to have additional and deeper FTA with countries immediately upstream and downstream of the production stage region S becomes interested in. When we consider offshoring cost structure over the production process, we can draw out more specific policy implications. When other cost components are neglible, a stage requring more offshoring cost becomes decisive regarding its immediate upstream and downstream locations and subsequently all the production activities. From this respect, protection over an industy in the

stage negatively affects FDI hosting not only for the stage but also for all activities in the line of production process. An example can be the case where a product gets significantly heavier over production process so requires more transportation cost. Automobile industry is a closer case than electronics. Suppose offshoring cost kept increasing for a later stage convexly. That is, the marginal offshoring cost increase over stages. If it is the case, imposing on higher tariff on final goods has a greater impact on FDI in all the related upstream industries.

# IV. Economic Interpretations on India's Weak Involvement in East Asia IPNs

## 1. Matching Theoretical Variables with Actual Data

In our theoretical development, we have seen that the high opportunity costs of including India in East Asian production networks may be the reason why India is not well-involved in the networks. In other words, there are better opportunities in other East Asian countries so that including India in the East Asian production networks may be relatively costly. In the conceptual model suggested in this paper, the total costs of MNCs' building IPN can be summarized as three main costs; assembly-related cost ($a_r$), parts production costs ($b_{ir}$), and trade costs ($\boldsymbol{\tau}$). Then, there are factors that amplify or reduce these underlying costs; coordination costs ($\alpha$) and agglomeration effects. The firm's objective of building a production network is to minimize the overall production costs, which is closely related to finding locations that have the best cost-competitiveness or comparative advantage in each stage of production. In the following sections, we would like to try matching theoretical factors that would affect the location choice decisions with proxy data representing those factors. We acknowledge that this matching and categorization of data are not complete or flawless.

As the first step to assessing the current situation of India with our theoretical model, we look up wage statistics and education level in India. And then, we consider networking costs among assembly and parts production at different locations, which is typically known as offshoring costs ($\alpha\boldsymbol{\tau}$). Offshoring costs in our

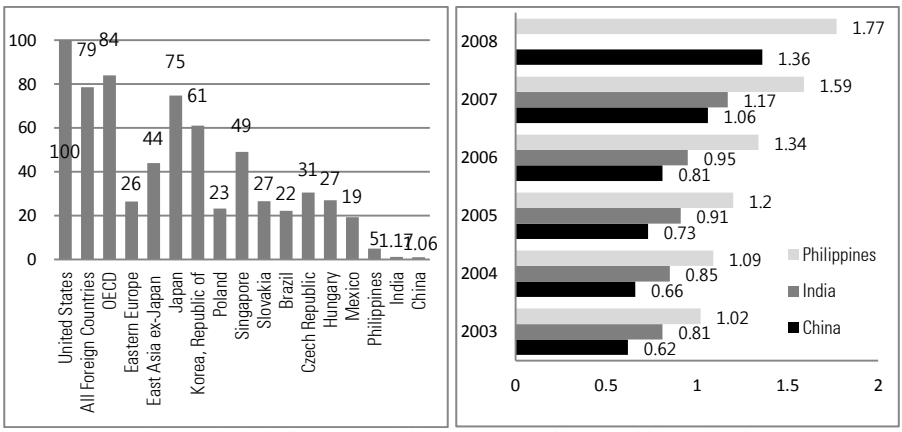
model are composed of coordination costs ($\alpha$) and trade costs ($\boldsymbol{\tau}$). In terms of data, import tariffs, and import and export costs are provided as a measure for trade costs. Then, we consider factors that can be amplified or reduced given trade costs; business environment, logistics performance, and trade openness through FTAs. As for agglomeration effects, the level of industrialization using revealed comparative advantages (RCA) and the composition of imported goods are provided. In addition, volumes of trade with major trading partners from 2001 to 2009 are provided to show the overall involvement of India in the Asia region. The degree of horizontal integration between India and other East Asian countries may be a good indicator that can predict the vertical integration between them.

## 2. Costs Related to Assembly and Parts Production

Even though assembly costs $a_r$ and parts production costs $b_{ir}$ in section 2 are different processes and so treated differently in the theoretical framework, the distinction is not very definitive in terms of data. As East Asian production networks form mostly in sectors that do not require high technology or high-skilled workers, the cost saving comes from the low wages of unskilled labor. Thus, assembly and low-tech parts production related costs are linked with wages in India. One of the reasons that many people in economic policy and business expect India's active role in production chain is the relatively low wages.

However, in this subsection, what we are trying to show is that low wage is not India's strength in East Asian production networks compared with China and other competitors, but the low-wage advantage in these competitors is declining and hence India can take actions to become the location replacing and fill up the

**Figure 4. Index of Hourly Compensation Costs in Manufacturing Employees**




Note: Compensation costs include direct pay, social insurance expenditures, and labor-related taxes. Index, U$ 32.07 = 100 in 2007 (left).
Source: U.S. Bureau of Labor Statistics, December 2011.

competitors' empty spots as they lose their low-wage advantages. At the same time, the accumulation of human capital seems an urgent matter in India regarding economic development.

Left-hand side graph of [Figure 4] provides the labor cost index (United States=100) in 2007. It says that the average hourly compensation cost for all employees in manufacturing was about 3.1 in India when that in the U.S. was normalized to 100. This index shows that the labor cost in India was fairly low compared to Mexico, East European countries, or Philippines. However, as a competitor in East Asian production networks, China has stronger cost-competitiveness in wage rates. Hourly compensation cost in China in recent years has been the lowest among most East Asian countries. However, these gaps are declining. [Figure 4] compares hourly wage rates among China, India and Philip-

pines from 2003 to 2008. In 2003, the hourly compensation cost of manufacturing employees in China was only 76% of India's. The wage gap between China and India has decreased and so hourly compensation cost in China was about 90% of India's in 2008. At the same time, compared with hourly compensation for manufacturing employees in the Philippines (a member of ASEAN), in 2003 hourly compensation in the Philippines was 1.02, which is about 26% higher than that of India. The gap has widened and in 2007 hourly compensation in the Philippines was about 36% higher than that of India. For the same tasks, India may become a more attractive location than before as a participant in production networks.

However, if we look at the quality of the labor force and the education level in India, attraction soon turns into doubt. [Table 1] compares tertiary education enrollment rates among selected Asian countries. As we can see, India shows the lowest enrollment rate. If the level of education represents the productivity of workers, then India can be deemed relatively low productivity. Especially, considering labor compensation shown in [Figure 4], on average employers in India pay more for less educated workers than in China. Compared to other ASEAN countries, it is not very clear. In the context of production networks, some stages of parts and components production require skilled labor rather than just cheap,

**Table 1. Educational Attainments**

| Country | year | India | China | Indonesia | Malaysia | Philippines | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|---|
| School enrollment, tertiary (% gross) | 2010 | 17.87 | 25.95 | 23.12 | 40.24* | | 46.17 | 22.29 |
| | 2005 | 10.82 | 19.41 | 16.52 | 29.31 | 27.47 | 43.90 | 15.69 |
| | 2000 | 9.37 | 7.95 | 14.72 | 25.74 | | 34.88 | 9.73 |

Note : * 2009 for Malaysia.
Source: World Bank WDI.

unskilled labor. According to the data, India seems to have fewer opportunities to earnestly move into parts and components production due to its lack of skilled labor.

In all, India may gain some cost-competitiveness in cheap unskilled-intensive assembly processes as other competing Asian countries that experienced fast wage growth. However, as seen in the education level data, India may lose its ground in parts and components production as the education gaps between India and other competing Asian countries widen up. This can be problematic if India thinks of fast development through production networks.

## 3. Offshoring Costs: Trade Costs $\tau$ and Coordination Costs $\alpha$

Offshoring costs ($\alpha\tau$) are related to trade costs ($\tau$) and coordination costs ($\alpha$) of production facilities in different locations in section 3.2. The concept of offshoring has not reached a general consensus, though.

Trade costs such as costs related to export and import, and tariffs caused by the production disintegration are straightforward and relatively easier to reduce, while coordination costs ($\alpha$) of production facilities in different locations such as a wider set of communication, and production coordination are vague and hard to reduce. This paper uses tariff rates; and export and import costs as trade costs ($\tau$). For coordination costs ($\alpha$), logistics performance index and business environment index in India are compared with China and some ASEAN countries.

[Table 2] provides tariff rates on intermediate goods categorized by the BE code. The countries imported by India are China, Japan and South Korea.[5] In-

[5] The reason we include Japan and South Korea is to see the tariff rates on intermediate products from upstream countries in the production network. China, on the other hand, represents a downstream country.

termediate goods tariffs in 2001, 2005 and 2009 and the changes of tariffs between 2001 and 2009 are also reported. Average tariff rates on intermediate goods from all three countries have experienced a modest drop.[6] Standard deviations of tariff rates in 2009 are larger than in 2001. We interpret larger standard deviations across

**Table 2. Tariff Rates on Intermediate Goods in India**

| BEC | Product | Product type | partner | Weighted Average | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2001 | 2005 | 2009 | Change, % |
| 21 | Primary | intermediate | China | 14.38 | 11.37 | 7.11 | -50.6 |
| 22 | Processed | | | 33.46 | 15.92 | 8.24 | -75.4 |
| 31 | Primary | | | 25 | 15 | 5 | -80.0 |
| 42 | Parts and accessories | | | 21.57 | 8.03 | 7.1 | -67.1 |
| 53 | Parts and accessories | | | 34.56 | 14.99 | 9.82 | -71.6 |
| 111 | Mainly for industry | | | | 30.14 | 30 | |
| 121 | Mainly for industry | | | 36.94 | 30.97 | 19.86 | -46.2 |
| 322 | Other | | | 15.01 | 15 | 9.96 | -33.6 |
| | | | **avg** | **25.85** | **17.68** | **12.14** | **-53.0** |
| | | | **St.dev** | **9.35** | **8.36** | **8.50** | |
| 21 | Primary | intermediate | Japan | 30.34 | 15.95 | 5.75 | -81.0 |
| 22 | Processed | | | 31.23 | 16.21 | 7.41 | -76.3 |
| 31 | Primary | | | | 15 | | |
| 42 | Parts and accessories | | | 25.04 | 12.09 | 7.5 | -70.0 |
| 53 | Parts and accessories | | | 34.16 | 14.48 | 9.29 | -72.8 |
| 111 | Mainly for industry | | | 35 | 30 | 30 | -14.3 |
| 121 | Mainly for industry | | | 50.55 | 33.3 | 31.16 | -38.4 |
| 322 | Other | | | 19.73 | 15 | 8.35 | -57.7 |
| | | | **avg** | **32.29** | **19.00** | **14.21** | **-56.0** |
| | | | **St.dev** | **9.66** | **7.95** | **11.24** | |
| 21 | Primary | intermediate | Korea | 23.11 | 12.6 | 4.68 | -79.7 |
| 22 | Processed | | | 31.73 | 16.36 | 7.13 | -77.5 |
| 31 | Primary | | | | | | |
| 42 | Parts and accessories | | | 22.21 | 11.8 | 8.04 | -63.8 |
| 53 | Parts and accessories | | | 35 | 15 | 9.89 | -71.7 |
| 111 | Mainly for industry | | | | 92.05 | 30 | |
| 121 | Mainly for industry | | | 44.02 | 30.2 | 27.05 | -38.6 |
| 322 | Other | | | 35 | 14.92 | 7.85 | -77.6 |
| | | | **avg** | **31.85** | **27.56** | **13.52** | **-57.6** |
| | | | **St.dev** | **8.21** | **29.10** | **10.40** | |

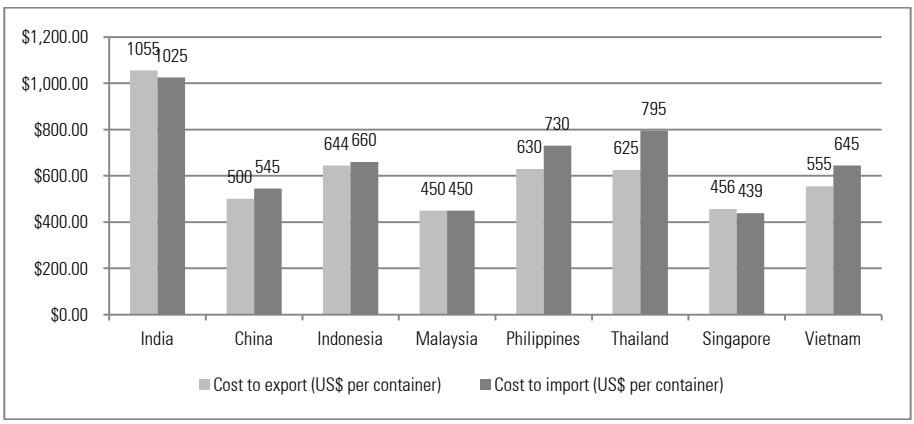
Note: Classification follows BEC.
Source: WITS.

[6] In Appendices 1 and 2, tariff rates on consumption goods and capital goods from China, Japan and Korea are also provided as a comparison.

products over time as an indirect indicator that shows that the Indian government has been strategic in its trade policy. India still holds tariff rates on intermediate goods categorized in 'mainly for industry' (111, 121) as high as around 30% in 2009. The changes in import tariffs on these intermediate goods are much slower. The last column in [Table 2] shows the percentage change in tariff rates from 2001 to 2009. In all three countries, changes in 'mainly for industry' products are the smallest. Tariffs on primary products have dropped almost 80%, while those on mainly for industry products dropped by less than 40%. The data do not describe the entire picture of India's trade policy. However, the changes in tariffs can be interpreted as evidence of *import substitution trade policy* in India.

Another part of trade costs ($\tau$) is export and import cost. [Figure 5] compares export and import costs of India with those of other competing Asian countries and China. Both import and export costs are the highest in India by a wide margin. Both of them cost more than $1,000 per container. From the perspective

**Figure 5. Trade Costs, 2010**




Source: World Development Indicators, 2010.

of multinational firms, including India in their production network is not practical at all with other things being equal.[7]

Tariffs and trade costs are relatively clear and obvious obstacles to regional economic integration. There are other unclear and hard-to-remove obstacles for further economic integration or participating in existing production networks; they are, coordination costs ($\alpha$) of production facilities in different locations. [Figure 6] provides logistics performance of India compared with ASEAN members and China. [Figure 7] provide measures for business environment and ease of doing business in India.[8] Overall, India imposes high management costs on multinational firms that wish to run production networks in India.

Right-hand side graph in [Figure 6] compares the overall logistics performance of India with those of selected ASEAN members and China (1=low to 5=high). Among competing countries, India shows the lowest performance except for Indonesia. Left-hand side graph in [Figure 6] breaks down the overall logistics performance and compares China with India. India is not competitiveness in any of the six categories.

[Figure 7] introduces 'ease of doing business' index, which shows the regulatory stringency in business (1=most business-friendly regulations), which also does not show a favorable result to India. Singapore has the most friendly business environment, whereas India is positioned at the other end.

The table provided in Appendix 5 shows that business-related regulations in India are complicated and restricted compared to Malaysia, Thailand and Singapore. Contract-enforcement-related regulations are especially unfriendly to business. Furthermore, overall tax rates are high and the tax system seems inefficient.

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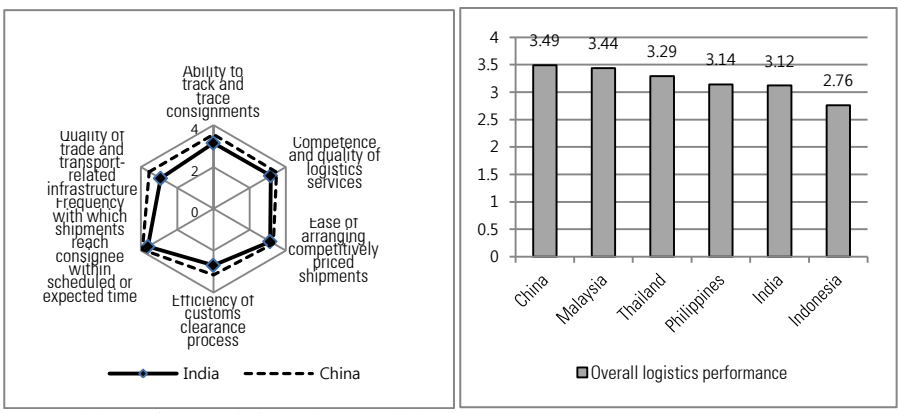
[7] For other detailed trade-related cost data, see the appendices 3 and 4.

[8] See Appendix 5 for more detailed information.

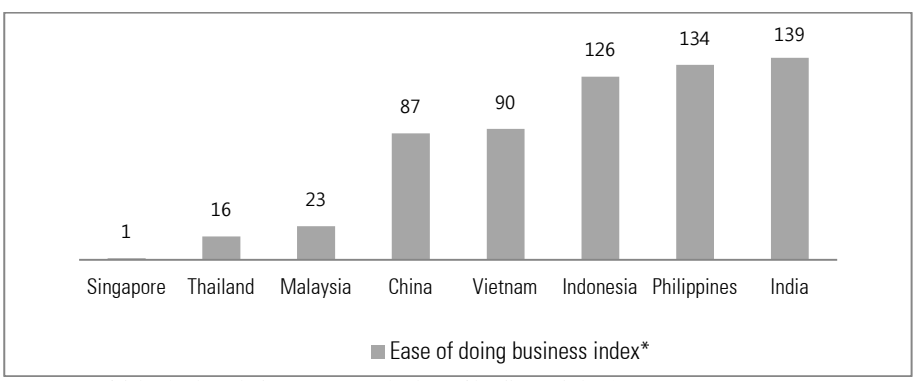
Another variable we can use as a measure for the offshoring costs is the level of regional trade agreements such as FTAs India has made a deal with. Regional trade agreements (RTAs) not only reduce tariff rates but deal with trade-related

**Figure 6. Logistics Performance Index, 2010**



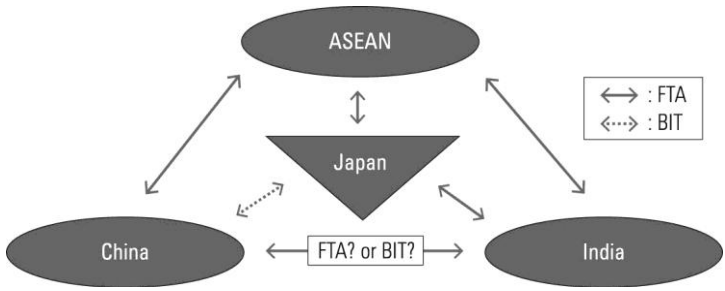

Note: Logistics performance index: 1=low to 5=high.
Source: World Development Indicators, World Bank 2010.

**Figure 7. Ease of Doing Business Index, 2010**




Note: Ease of doing business index (* : 1=most business-friendly regulations).
Source: World Development Indicators, World Bank 2010.

**Figure 8. FTAs or BITs with India**




costs, business environment and regulatory issues as well. Overall offshoring costs within the region are expected to decrease significantly once regional trade agreements strike a deal. As discussed in section 3.4, aligning with immediate up-stream or downstream become much easier within the RTA regions and hence offshoring costs can drop significantly. What is interesting in the data is that both India and China concluded free trade agreements (FTAs) or bilateral investment treaties (BITs) with ASEAN, Japan and South Korea but not with each other as shown in [Figure 8]. [Appendix 6] provides detailed information about the FTAs made by ASEAN, China and India.

Regarding offshoring costs, India does not seem very favorable or attractive to multinationals. First of all, the tariff rates are still high and changes are slow in coming. Second, export and import costs are relatively very high compared with other Asian countries. Third, business environment in India is less than friendly. Fourth, India has a loose economic linkage with China, where enormous amount of intermediate goods trade happens.

## 4. Agglomeration Effects

Along with low labor costs and efficient business system in a country, level of industrialization in manufacturing sectors may be another important factor for production networks. For example, Silicon Valley or Hollywood do not form IT industry or entertainment industry in the immediate area because of the tax system or labor costs. Co-location of cluster industries has its own benefits. Manufacturing industries may also have clustering benefits, known as agglomeration effects. Multinationals may have incentives to use existing agglomeration benefits of a country, which is not yet in their production networks. We believe that one of them is the level of industrialization. Countries that have primary industries only may not be well-equipped with infrastructure for manufacturing. Then, regardless of their low wages or efficient tax system or business environment, it is hard for them to be a part of production networks. In the perspective of multinational firms, what is required for the production networks is the capacity to perform a certain role in a production network. The level of industrialization in a country offers clues for that potential.

There are several ways to quantify the level of industrialization of a country. One way to do that is to see the levels of (revealed) comparative advantage in overall sectors. If we can see that a country has comparative advantage in many high-tech industries that require high capital-intensity, then we may say that a country is well-industrialized. [Table 3] compares revealed comparative advantage (RCA) of manufacturing goods between China and India in 2009. They are calculated based on gross exports (second and third columns) and on domestic value added embodied in gross exports (fourth and fifth columns). Both countries show relatively high comparative advantages in the textile industry. Industry that

Table 3. Revealed Comparative Advantage in Manufacturing Goods, 2009

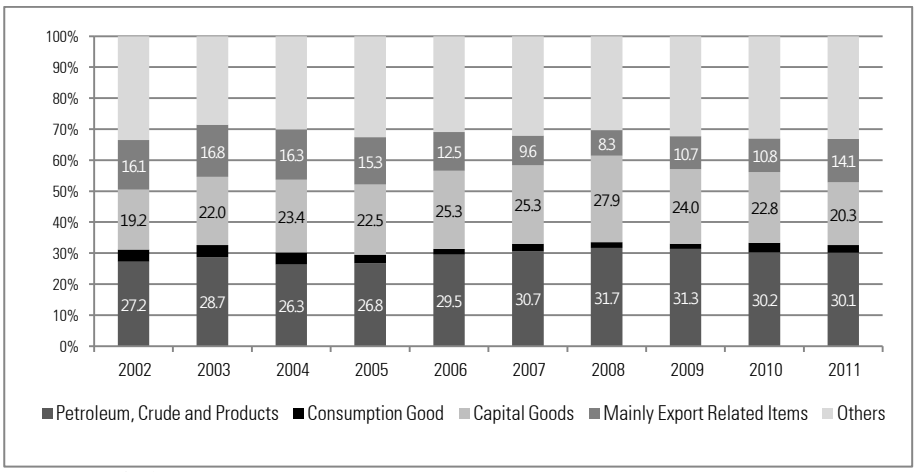
| Industry (ISIC rev. 3) | RCA based on gross exports | | RCA based on domestic value added embodied in gross exports | |
|---|---|---|---|---|
| | China | India | China | India |
| 15T16: Food products, beverages and tobacco | 0.3725 | 0.6784 | 0.373 | 0.7282 |
| 17T19: Textiles, textile products, leather and footwear | 2.7035 | 2.0169 | 2.9616 | 2.1354 |
| 20T22: Wood, paper, paper products, printing and publishing | 0.7079 | 0.4026 | 0.6285 | 0.433 |
| 23T26: Chemicals and non-metallic mineral products | 0.4695 | 0.7901 | 0.4526 | 0.8745 |
| 27T28: Basic metals and fabricated metal products | 0.7863 | 0.8063 | 0.7707 | 0.8819 |
| 29: Machinery and equipment, nec | 0.8206 | 0.4274 | 0.7744 | 0.4434 |
| 30T33: Electrical and optical equipment | 1.8189 | 0.8227 | 1.7769 | 1.0096 |
| 34T35: Transport equipment | 0.2909 | 0.5035 | 0.2948 | 0.5525 |
| 36T37: Manufacturing nec; recycling | 1.7352 | 6.1271 | 1.8896 | 3.9064 |

Source: OECD-WTO.

shows distinction in RCA measure between China and India is electrical and optical equipment. Textile industry is the only industry that India that shows clear comparative advantage other than recycling. Even though textile industry can form extensive production networks, it is not one of the industries where East Asian production networks are strong.

Another way to evaluate the level of industrialization is to see the commodity composition of imports. [Figure 9] shows that the large share of imports are explained by energy-related consumption and capital goods. Large share of energy consumption may be coming from the abrupt rise in the price of crude oil in the late 2000's. Export-related imports have been relatively small. Furthermore, most items in export-related imports are not manufactured goods. This phenomenon

**Figure 9. Import Composition by Commodity in India**




Source: CEIC database.

can be evidence that India has imported substantial amount of capital goods, which are mostly intermediate goods, but they are not efficiently led toward exports. This economy seems to have focused more on domestic investment rather than participating in production networks.

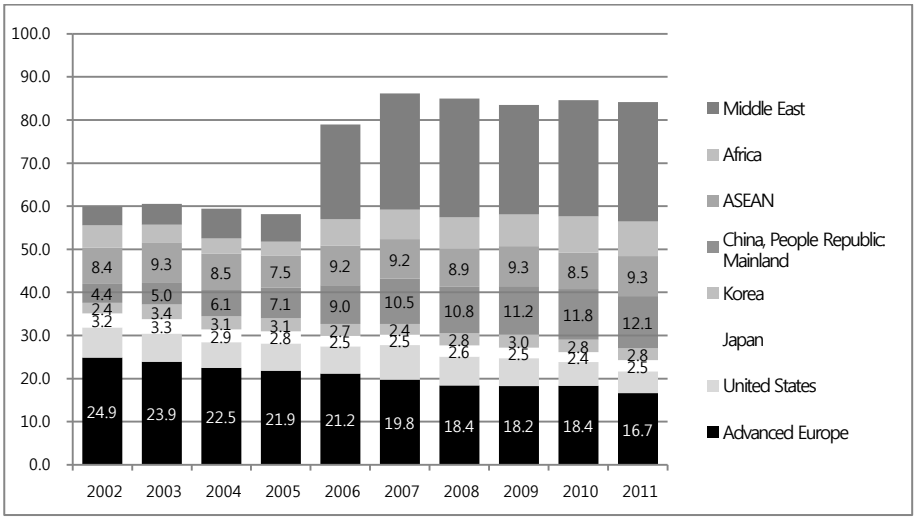
From these observations, we can conclude that the industrial structure of the Indian economy seems to suffer from disadvantages by agglomeration effects as we have seen in 4.3. One or two industries related to parts production can bring multinational corporations to India and accelerate industrialization and globalization of production networks in India. To do so, the focus should not be limited to specific products with cost advantage, but on specific industries as a whole that can provide more sustainable advantage. Then the agglomeration effect can attract more international firms and foster the participation in international production networks.

## 5. Others: Historical Relationship

As a final argument, longer historical economic linkage with Western countries than other Asian countries might be the reason that is holding India back in terms of full participation in East Asian production networks. Even though India started its "Look East" policy in 1992, the noticeable improvement in economic and commercial integration has been made only recently. This relatively loose historical bond with East Asian economies seems another factor in India being unable to easily break the agglomeration effects built up in the East Asian region and become involved in the East Asian production networks. In a slightly different perspective, we can interpret loose historical relationship as another factor that may increase the cost of aligning immediate upstream and downstream in East Asian countries with industries in India. [Figure 10] provide a picture of India's major trading partners from 2002 to 2011. [Figure 10] shows that India used to trade more with advanced economies, especially European countries approximately prior to 2005. Before that point, the trade volume with ASEAN, China, Japan and Korea was smaller than that with advanced European countries. Even in 2011, the trade volume with advanced European countries is three times larger than that with Japan and Korea.

Japan and Korea are the most upstream countries in East Asian production networks. In other words, many multinationals which decide the locations of offshoring are located in those two countries. Trade with these two countries can be stepping stones to vertical production linkage. Therefore, building a firm economic relationship through trade with these two countries is one of the issues India has to resolve in order to achieve greater engagement with East Asian production networks.

**Figure 10. Changes in India's Major Trading Partners by Region (as % share of overall trade)**




Source: CEIC database.

As we saw in [Figure 8], India does not have any regional trade agreement in place with China. Thus, it seems that India's overall economic linkage with East Asian countries has not yet deepened enough.

# V. Concluding Remarks

We investigated how a country can involve in pre-existing production networks effectively as a late-follower. Especially, we took a look at the case of India which can be understood as a typical late-follower to the IPN-oriented Asian economy. From our theoretical framework, we highlighted what structural disadvantages late-follower countries have to bear in order to get involved with a pre-existing– IPN. And then, we draw several policy implications to overcome these disadvantages with more targeted efforts.

Traditional suggestions for facilitating a country's involvement can be summarized into the following two solutions. First, strengthening the competitiveness in factor price: lowering $a_r$ or $b_{ir}$. If home country can provide a cheaper labor force than countries which already participated in an IPN, for instance, it may induce FDI by MNCs which would lead to more IPN-involvement opportunities. Having a more flexible labor law is an example along this line (e.g., Sinha *et al.* 2008). We could not find clear evidence, however, that cheap and high quality labor is India's strength compared to its East Asian counterparts, in spite of its large population. Second, lowering offshoring costs itself: lowering $\boldsymbol{\tau}$ and $\alpha$. The policy recommendations from this approach are to conclude FTAs with major trading partners or facilitate customs. ASEAN countries have deeper and more thorough FTAs with China and Japan while India does not. This puts India in a disadvantagous position. Note that these suggestions are not IPN-specific ones in that they are not distinguished from the answers for how to host FDI in general. Moreover, they do not provide implications for a late follower in IPNs.

Our theoretical model enables us to observe other aspects of IPN-related obstacles a late-follower may have to surmount. First, we focused on the fact that a whole process of IPN is a chain-type consisting of a sequence of upstreams and downstreams. For a given stage of production, if the production location of immediate upstream or downstream producer is different from the current assembly location, it incurs offshoring cost. When every stage of production takes place in the same region, using a new region would incurring such additional costs from an MNC's point of view. In this respect, the late follower faces a significant disadvantage in entering the middle of a well-established IPN. Second, even after aligning the upstream and downstreams, a disadvantage to a late-follower may still remain due to the pre-existing co-location effect.

We can conclude from the above that India needs to take a more strategic approach to improving the conditions for participating in an IPN with some directed policies. Related to the first type of disadvantage, not just having FTAs but concluding comprehensive and deeper FTAs with countries within the IPN will be a more effective approach. There can be a unilateral effort to consider, as well. With other things being equal, the upstream location has a predetermined influence on its immediate downstream location choice, and the next stage downstream, and so on. Thus, protection of upstream industry may affect involvement of downstreams negatively. Given a choice, greater favor and support to upstream industries can be the most effective unilateral open policy. Recently, the government of India allows companies to get around sectoral caps on foreign equity, which enables an Indian holding company with up to 49 percent of foreign equity to invest in "downstream" companies without counting the holding company's foreign equity (Sally 2011). If the policy priority is on IPN involvement, it will be worthwhile to consider allowing similar measures on upstream

companies as well. A policy implication for the second type of disadvantage is as follows. For the part having a greater marginal contribution to total cost reduction, the government may provide a more directed support. Such part production location can become the axis to attract other parts production subsequently and to mitigate the disadvantage from the agglomeration effect. For further study, it will be the first step needed to be taken in developing proper measures for marginal contriubtion to the agglomeration effect by industy.

# References


Ando, M. 2010. "Machinery Trade in East Asia, and the Global Financial Crisis." ERIA Discussion Paper Series 2010-10.

Ando, M. and F. Kimura. 2009. "Fragmentation in East Asia: Further Evidence." ERIA Discussion Paper Series 2009-20.

Baldwin, R. and A. J. Venables. 2010. "Spiders and Snakes: Offshoring and Agglomeration in the Global Economy." NBER Working Paper No. 16611.

Batra, A. and Z. Khan. 2005. "Revealed Comparative Advantage: An Analysis for India and China." ICRIER Working Paper No. 168.

Blonigen, B. A., R. B. Davis, and K. Head. 2003. "Estimating the Knowledge-capital Model of the Multinational Enterprise: Comment." *American Economic Review,* 93, 980-994.

Braconier, H, P. Norback and D. Urban. 2005. "Multinational Enterprises and Wage Costs: Vertical FDI Revisited." *Journal of International Economics*, 67, 446-470.

Carr, Markusen and Maskus. 2001. "Estimating the Knowledge-capital Model of the Multinational Enterprise." *American Economic Review*, 91, 693-708.

Daudin, G., C. Rafflart and D. Schweisguth. 2010. "Who Produces for Whom in the World Economy?" OFCE Working Paper. Sciences Po Paris.

De Backer, K. and S. Miroudot. 2012. "Mapping Global Value Chains." OECD TAD/TC/WP(2012)6. OECD.

Eichengreen, B., & Gupta, P. 2011. "The Service Sector as India's Road to Economic Growth." NBER Working Paper No. 16757.

Feenstra, R. C. 1998. "Integration of Trade and Disintegration of Production in the Global Economy." *Journal of Economic Perspectives*, 12, 31-50.

Johnson R. and G. Noguera. 2010. "Accounting for Intermediates: Production Sharing and Trade in Value-Added." NBER ITI Program Meeting.

Grossman, G. M., Helpman, E., & Szeidl, A. 2003. "Optimal Integration Strategies for

the Multinational Firm." NBER Working Paper No. 10189.

Grossman, G. M. and E. Rossi-Hansberg. 2008. "Trading Tasks: A Simple Theory of Offshoring." *American Economic Review*, 98, 1978-97.

Helpman, E. 1984. "A Simple Theory of Trade with Multination Corporations." *Journal of Political Economy*, 92, 451-471.

Hummels, D., J. Ishii and K-M. Yi. 2001. "The nature and Growth of Vertical Specialization in World Trade." *Journal of International Economics*, 54, 75-96.

Kimura, F. and M. Ando. 2005. "Two-dimensional Fragmentation in East Asia: Conceptual Framework and Empirics." *International Review of Economics & Finance*, 14(3), 317-348.

Koopman, R., W. Power, Z. Wang and S-J. Wei. 2010. "Give Credit Where Credit is Due: Tracing Value Added in Global Production Chains." NBER Working Paper w16426.

Leamer, Edward. 2006. "Analyzing the US Content of Imports and the Foreign Content of Exports." National Research Council, National Academy of Science, National Academies Press, Washington DC.

Rajan, R., and R. Sen. 2002. "A Decade of Trade Reforms in India: How It Compared with East Asia." *World Economics,* 3(4), 1-14.

Sally, R. 2011. "Indian Trade Policy after the Crisis." *ECIPE Occasional Paper*, (4).

Sinha, S. S., Kent, D. H., & Shomali, H. 2007. "Comparative analysis of FDI in China and India." *Journal of Asia Entrepreneurship and Sustainability*, *3*(2), 1-19.

Sincavage, J. R., C. Haub and O. P. Sharma. 2010. "Labor Costs in India's Organized Manufacturing Sector." *Monthly Labor Review*.

Srivastava, S., and R. Sen. 2011. "Is Production Fragmentation Emerging in India's Manufacturing Trade?" *ASCI Journal of Management*, 40(2), 73-100.

Yi, Kei-Mu. 2003. "Can Vertical Specialization Explain the Growth of World Trade?" *Journal of Political Economy*, 111, 52-102.

# Appendix

## Appendix 1. Tariff Rates on Consumption Goods

| BEC | Product | Product type | Partner | Weighted Average | | |
|---|---|---|---|---|---|---|
| | | | | 2001 | 2005 | 2009 |
| 61 | Durable | consumption | China | 34.09 | 15 | 9.83 |
| 62 | Semi-durable | | | 34.1 | 10.69 | 10 |
| 63 | Non-durable | | | 34.32 | 15.24 | 10.28 |
| 112 | Mainly for household consumption | | | 36.4 | 38.25 | 41.2 |
| 122 | Mainly for household consumption | | | 68.09 | 39.05 | 38.91 |
| 522 | Non-industrial | | | 58.52 | 21.41 | 57.78 |
| | | | avg | 44.25 | 23.27 | 28.00 |
| | | | stdev | 15.09 | 12.39 | 20.73 |
| 61 | Durable | consumption | Japan | 29.59 | 15 | 8.55 |
| 62 | Semi-durable | | | 29.99 | 5.96 | 10 |
| 63 | Non-durable | | | 34.64 | 15.02 | 10 |
| 112 | Mainly for household consumption | | | 74.4 | 31.1 | 30 |
| 122 | Mainly for household consumption | | | 63.58 | 58.15 | 105.3 |
| 522 | Non-industrial | | | 11.08 | 11.17 | 32.76 |
| | | | avg | 40.55 | 22.73 | 32.77 |
| | | | stdev | 23.71 | 19.28 | 37.13 |
| 61 | Durable | consumption | Korea | 34.9 | 15 | 9.3 |
| 62 | Semi-durable | | | 34.39 | 12 | 10 |
| 63 | Non-durable | | | 34.45 | 14.99 | 11.71 |
| 112 | Mainly for household consumption | | | 35 | 27.74 | 39.28 |
| 122 | Mainly for household consumption | | | 40.32 | 59.22 | 42.8 |
| 522 | Non-industrial | | | 36.36 | 15 | 11.4 |
| | | | avg | 35.90 | 23.99 | 20.75 |
| | | | stdev | 2.28 | 18.12 | 15.78 |

Note: Classification follows BEC.
†: the formula is (2001~2009)/2001.
Source: WITS.

## Appendix 2. Tariff Rates on Capital Goods

| BEC | Product | Product type | Partner | Weighted Average | | |
|---|---|---|---|---|---|---|
| | | | | 2001 | 2005 | 2009 |
| 41 | Capital goods (except for transport equipment) | capital | China | 18.31 | 5.29 | 6.65 |
| 521 | Industrial | | | 34.06 | 15 | 10 |
| | | | avg | 26.19 | 10.15 | 8.33 |
| | | | s.d. | 11.14 | 6.87 | 2.37 |
| 41 | Capital goods (except for transport equipment) | capital | Japan | 24.02 | 13.48 | 7.78 |
| 521 | Industrial | | | 26.23 | 15 | 10 |
| | | | avg | 25.13 | 14.24 | 8.89 |
| | | | s.d. | 1.56 | 1.07 | 1.57 |
| 41 | Capital goods (except for transport equipment) | capital | Korea | 18.1 | 3.21 | 7.54 |
| 521 | Industrial | | | 34.68 | 15 | 10 |
| | | | avg | 26.39 | 9.11 | 8.77 |
| | | | s.d. | 11.72 | 8.34 | 1.74 |

Note: Classification follows BEC.
†: the formula is (2001~2009)/2001.
Source: WITS.

## Appendix 3. Trade Cost: Trade Facilitation Indicators, 2010

| Country | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| India | 8 | 9 | 2.34 | 5.31 | 17 | 20 | 1055 | 1025 |
| China | 8 | 5 | 2.77 | 2.56 | 21 | 24 | 500 | 545 |
| Indonesia | 4 | 7 | 2.12 | 5.35 | 17 | 27 | 644 | 660 |
| Malaysia | 6 | 7 | 2.64 | 2.75 | 17 | 14 | 450 | 450 |
| Philippines | 7 | 8 | 1.82 | 5 | 15 | 14 | 630 | 730 |
| Thailand | 5 | 5 | 1.59 | 2.62 | 14 | 13 | 625 | 795 |
| Singapore | 4 | 4 | 2.17 | 1.78 | 5 | 4 | 456 | 439 |
| Vietnam | 6 | 8 | 1.41 | 1.73 | 22 | 21 | 555 | 645 |

Notes: 1. Documents to export (number) 2. Documents to import (number)
3. Lead time to export, median case (days) 4. Lead time to import, median case (days)
5. Time to export (days) 6. Time to import (days)
7. Cost to export (US$ per container) 8. Cost to import (US$ per container)
Source: World Bank (2010), World Development Indictors.

## Appendix 4. Trade Costs: Logistic Performances in India, 2010

| Country | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| India | 3.14 | 3.16 | 3.13 | 2.7 | 3.61 | 2.91 | 3.12 |
| China | 3.55 | 3.49 | 3.31 | 3.16 | 3.91 | 3.54 | 3.49 |
| Indonesia | 2.77 | 2.47 | 2.82 | 2.43 | 3.46 | 2.54 | 2.76 |
| Malaysia | 3.32 | 3.34 | 3.5 | 3.11 | 3.86 | 3.5 | 3.44 |
| Philippines | 3.29 | 2.95 | 3.4 | 2.67 | 3.83 | 2.57 | 3.14 |
| Thailand | 3.41 | 3.16 | 3.27 | 3.02 | 3.73 | 3.16 | 3.29 |
| Singapore | 4.15 | 4.12 | 3.86 | 4.02 | 4.23 | 4.22 | 4.09 |
| Vietnam | 3.1 | 2.89 | 3.04 | 2.68 | 3.44 | 2.56 | 2.96 |

Notes: Logistics performance index: 1=low to 5=high
1. Ability to track and trace consignments 2. Competence and quality of logistics services
3. Ease of arranging competitively priced shipments 4. Efficiency of customs clearance process
5. Frequency with which shipments reach consignee within scheduled or expected time
6. Quality of trade and transport-related infrastructure 7. Overall
Source: World Bank, World Development Indicators.

## Appendix 5. Trade Cost: Business Environment, 2010

| Country | 1* | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10** | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| India | 139 | 34 | 227 | 46 | 1420 | 5 | 44 | 12 | 29 | 8 | 56 | 258 | 63.3 | 7 |
| China | 87 | 34 | 311 | 34 | 406 | 4 | 29 | 14 | 38 | 6 | 7 | 398 | 63.5 | 1.7 |
| Indonesia | 126 | 13 | 158 | 40 | 570 | 6 | 22 | 9 | 47 | 3 | 51 | 266 | 37.3 | 5.5 |
| Malaysia | 23 | 22 | 260 | 30 | 585 | 5 | 48 | 9 | 17 | 10 | 12 | 145 | 33.7 | 2.3 |
| Philippines | 134 | 30 | 85 | 37 | 842 | 8 | 39 | 16 | 36 | 4 | 47 | 195 | 45.8 | 5.7 |
| Thailand | 16 | 8 | 157 | 36 | 479 | 2 | 2 | 7 | 32 | 5 | 23 | 264 | 37.4 | 2.7 |
| Singapore | 1 | 11 | 26 | 21 | 150 | 3 | 5 | 3 | 3 | 10 | 5 | 84 | 25.4 | 0.8 |
| Vietnam | 90 | 10 | 200 | 34 | 295 | 4 | 57 | 9 | 44 | 8 | 32 | 941 | 33.1 | 5 |

Notes: 1. Ease of doing business index (* : 1=most business-friendly regulations)
2. Procedures to build a warehouse (number) 3. Time required to build a warehouse (days)
4. Procedures to enforce a contract (number) 5. Time required to enforce a contract (days)
6. Procedures to register property (number) 7. Time required to register property (days)
8. Start-up procedures to register a business (number) 9. Time required to start a business (days)
10. Strength of legal rights index (** : 0=weak to 10=strong)
11. Tax payments (number) 12. Time to prepare and pay taxes (hours)
13. Total tax rate (% of commercial profits) 14. Time to resolve insolvency (years)
Source: World Bank, World Development Indicators.

## Appendix 6. The Progress of RTA Talks in ASEAN, China, and India by February, 2010

| | FTAs signed | Under negotiation | Under review |
|---|---|---|---|
| ASEAN | Australia-New Zealand, China, India, Japan, South Korea | EU | EFTA, Taiwan, U.S. |
| China | ASEAN, New Zealand, Taiwan, Macao, Singapore, Chile, Pakistan, Peru, Hong Kong | GCC, SACU, Norway, Iceland, Costa Rica, Australia | Korea, MERCOSUR, South Africa, Switzerland, India, China-Japan-Korea |
| India | South Korea, Japan, ASEAN, MERCOSUR, Nepal, Bhutan, Sri Lanka, Singapore, Afghanistan, Chile | EFTA, EU, GCC, SACU, Malaysia, Thailand, BIMSTEC, Mauritius | South Africa, New Zealand, Taiwan, Russia, Switzerland, Uruguay, Iran, Israel, Egypt, Indonesia, China, Canada, Pakistan, Australia, IBSA |

Source: Korea International Trade Association.

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# 국문요약

본 연구는 기존의 생산 네트워크(international production networks)에 후발주자로서 참여하게 되는 국가의 애로점을 설명하기 위한 이론적 제시를 목적으로 하고 있다. 본 연구는 또한 다국적 기업이 국경간 생산시설의 분화를 통해 어떻게 총생산비용을 줄이는 의사결정을 하는지 연구하고 있다. 저자들은 생산 네트워크와 관련된 주요 비용을 분석 제시하고 후발주자로서 부딪치게 되는 불리함(disadvantages)을 규명한 후, 이러한 점을 극복하기 위한 정책적 시사점을 도출하였다. 특히 현재 눈에 띄게 부상하고 있는 인도를 분석의 대상으로 삼았다. 인도의 경우를 제시된 이론적 구조안에서 바라보고 다양한 관련 데이터를 제시하여 이론적 설명을 보완하였다. 먼저, Baldwin and Venables(2010)을 발전시킨 모형을 바탕으로 다국적 기업이 생산기지 분화를 위해 지불해야 하는 비용(offshoring costs)을 크게 교역비용(trade costs)과 관리비용(coordination costs)으로 나누고 각각의 비용을 구체적으로 분석하였다. 이렇게 분석된 변수들을 바탕으로 인도와 다른 국가들을 비교함으로써 인도의 경쟁력이 어떤 부분에서 어떻게 다른지 구체적으로 제시하였으며 관련된 정책적 시사점을 도출하였다.

**핵심용어**: 다국적 기업, 글로벌 생산 네트워크, 동아시아, 지역통합

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