

FDI and Industrialisation

Why technology transfer and new industrial structures may accelerate economic development

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Introduction*

The impact of foreign direct investment (FDI) on host country economic growth has received much attention over the last decade. The increased attention coincides with expanding FDI flows and a renewed interest in the phenomenon within economic research. Also the unsuccessful attempts to improve welfare levels in the least developed countries through aid, in combination with significant reductions of such economic assistance, may have called for further explanations to economic growth.

The 1999 World Investment Report (UNCTAD, 1999a) points out that FDI is of major importance to economic development.¹ FDI provides financial resources and links to export markets. Furthermore, an inflow of foreign capital may contribute to the upgrading of both managerial and technological effectiveness and improve human capital. This way FDI may trigger industrialisation in developing countries.

Albeit a significant FDI inflow is no necessary condition to economic growth, the theory is borne out by actual facts. Some of the newly industrialised countries in South East Asia, like Malaysia, Indonesia, Singapore, as well as Hong Kong experienced significant economic growth along with relatively high inward FDI levels during the 1990s. The same did Argentina, Brazil and Poland. Unfortunately, the theory is also supported by a lack of growth on the African continent in combination with the lowest of FDI levels.

The South East Asian experience, the lack of growth on the African continent and the 19th century industrial growth in Europe, as well as in the USA, describe industrialisation as a regional phenomenon. The observed pattern of growth in the South East Asian countries is referred to as the “flying geese principal of development” (Korhonen, 1994). Japan experienced rapid economic development and became a leading country in the region. Due to increases in trade, FDI and communication, Japan probably initiated industrialisation in several of its neighbouring countries. The countries in the eastern and southern parts of Asia

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¹ FDI is “capital provided by a foreign direct investor (parent enterprise) to an affiliate enterprise in the host country. It implies that the foreign direct investor exerts significant influence on the management of the enterprise resident in the other economy. The capital provided can consist of equity capital, reinvested earnings or intra company loans” (UNDP, 2000).

followed suit and changed positions, according to economic growth, like flying geese. How does such a regional procedure of industrialisation take place? What is the link between FDI and industrialisation? These are questions motivating this paper.

Impacts of FDI on host economies

This paper explores some of the channels through which FDI may initiate industrialisation. While a host economy is affected by FDI in a number of ways, the following discussion is restricted to only two groups of externalities: Technology transfer and industrial restructuring².

'Technology transfer' due to FDI occurs when local companies or institutions adopt technology applied by a multinational corporation (MNC). *'Industrial restructuring'* takes place if the establishment of an MNC affiliate affects existing competition. Such externalities are referred to as "spillover-effects", and arise "... as a direct consequence of the linkages forged between foreign direct investors and other economic agents in the countries in which they operate" (Dunning, 1993). The spillovers may be connected, and *technology transfer* may depend on the resulting *industrial structure*. These terms are useful to explain a significant part of the consequences of MNC entry into a market - consequences for different kinds of economic agents, such as suppliers, customers, competitors and institutions with which the MNC has direct dealings, as well as other institutions and firms in the economy.

The welfare effects of FDI are not necessarily beneficial. At least in the short run, an MNC that enters a foreign market through acquisitions of existing companies in order to gain a monopolistic position exerts a negative effect on host country market structure. As a part of a global MNC strategy, local export outlets may be closed down. Furthermore, an MNC may introduce products claimed to have a negative influence on local culture. A positive net outcome of inward FDI has proved to be particularly uncertain in developing countries, where skilled labour is less available and markets are smaller. Thus, a focus of this paper is the conditions necessary to

² Accordingly, an *industrial organisation* approach, focusing on externalities, is chosen. This may be seen in contrast to a *trade theoretical* approach with emphasis on factor rewards, employment and capital flows (Blomström and Kokko, 1997).

obtain *favourable* spillovers of FDI. Section 1 describes *technology spillovers* and the channels through which they may occur. Adopting foreign invented technology is generally beneficial for industrial development. Hence, the question is rather *when* the technology is adopted and externalities generated. The topic of *industrial restructuring* is attended in Section 2. An MNC entering new markets generally has *some* influence on domestic industrial structure. The question related to this group of externalities is *how* they may initiate industrial development. While technology transfer is discussed topic by topic, the question of industrial restructuring is approached by describing relevant theories. Section 3 briefly summarises the conditions necessary to trigger industrial development by FDI.

1 Technology transfer

Technological invention is primarily undertaken in a limited number of developed countries. There are seven OECD countries that account for 90% of all expenditures on ‘research and development’ (R&D), the United States alone accounting for as much as 40% (UNCTAD, 1999a). The inventions are transferred to other countries through various channels. Most countries make thus an insignificant contribution to the development of new technology. Adoption of foreign invented technology has proved to be a condition for industrial development. Even though copyright and patent fees are paid to some degree, the countries adopting foreign invented technology “free-ride” on research investments made by others as the costs of innovative research are evaded. In theory at least, this contributes to convergence of growth rates between the technologically leading economies and the free-riding countries, or the ‘followers’ (Barro and Sala-i-Martin, 1997).

MNCs, FDI and technology transfer

Development of technology is expensive. As a consequence it tends to be concentrated among large or specialised enterprises with surplus high enough to finance the R&D, rather than being state funded. This implies that availability of technology often is connected with multinational corporations (MNCs).

One might assume that technological spillovers are more likely to occur when an MNC approaches a market through joint ventures or licensing rather than through

FDI. In such cases a domestic company represents the MNC and applies its technology.

This may be seen in contrast to FDI, where the MNC keeps the control and ownership of human and physical capital within the corporation. However, the international dissemination of technology is connected to investments rather than joint ventures and licensing.

MNCs often prefer to enter a market through FDI rather than less obligatory arrangements (licensing or joint ventures). Due to *asymmetric information* this is particularly the case with technologically advanced products. Markusen (1995) explains that an MNC has incentives not to reveal its process or product technology to a potential licensee. The licensee could reject the contract, copy the technology and become a competitor. Furthermore, it is difficult to write complete contracts as the licensee and the MNC may have contradicting incentives. For instance, the licensee may know more about market demand than the MNC. If demand is high, the MNC might claim a larger share of the rents or produce directly. Hence, the licensee may cause sales to be low even if demand is high. The licensee also has incentive to produce at low cost and minor quality, and thus “free-ride” on the company’s reputation. Accordingly, MNCs with the more attractive technology will generally prefer to approach a new market through FDI.

Supporting this theory, the industrial pattern of FDI has shifted increasingly towards technology-intensive activities. Furthermore, a large share of both licenses sales and sales of technologically advanced products is directed towards MNC affiliates. Based on data for Germany, Japan and the United States, UNCTAD (1999a) suggests that between two-thirds and nine-tenths of international technology flows are intra-firm in nature. Actually, as pointed out by Blomström and Kokko (1997), FDI seems to be more significant for the geographical spread of technologies than sales of technology to unrelated parties. Besides, informal contacts that result in technological spillovers are easier and more important when an MNC affiliate is present in the market than when contacts have to be made across international borders.

Accordingly, technological spillovers are necessary for industrial development *and* FDI by MNCs is important for such spillovers to occur. But *what precisely are* technological spillovers? Through what *channels* do they occur? Some of the more important effects are due to enhanced competition, employment of local workers, demonstration of technology, and improved standards.

Improved competition

Foreign affiliates established by MNCs generally have a firm-specific advantage that enables them to compete successfully with local companies despite the locals' superior knowledge of local markets and culture (Dunning, 1993). MNCs are often characterised by product differentiation and advanced technology. The MNC entry may therefore provoke local companies to protect their profits, and hence increase productivity. An increase in productivity may occur as existing technology and resources are more efficiently exploited, by the use of new and more efficient technology, or through the copying of technology used by the MNC. Spurred by the geographical advantage local providers of intermediate goods may also try to challenge foreign providers of inputs to the MNC affiliate. Hence, the production-increasing spillovers may take place among suppliers, as well as final-goods-producers.

Training of local workforce

Some training is usually necessary when MNCs hire the workforce locally. This training range from on-the-job training to seminars and more formal education locally or abroad, perhaps at the parent company. The instruction depends on the skills needed and the level of employment. Furthermore, working in an MNC affiliate might generate valuable experience for the locals. Skills vary from technological know-how to quality controls, marketing and management. The beneficial spillovers to the host economy take place as the employees move to other firms, or set up their own businesses.

Demonstration effects

Blomström and Kokko (1997) point out that the MNC affiliate may be of importance in terms of technology diffusion as it demonstrates the existence and profitability of new products and processes. Possible scepticism among local companies toward new

innovations may be reduced, making the adoption of new technology appear less risky.

A second demonstration effect is related to *standards*. An MNC may have higher demands according to standards on inputs, quality control, security and labour rights. High standards represent a more indirect way to improve productivity. If this has been neglected by domestic companies, demands and demonstration by MNCs may lead domestic companies to adopt similar standards, or governments to introduce codes according to various standards.

The generation of spillovers is not obvious

The degree of technology transfer and the benefits thereof are difficult to measure, as the effects are both complex and dynamic. As has been mentioned already, FDI may also have negative impacts on the host economy. Also, the beneficial net outcome is stated to be less certain once the host economy is a developing country. In general, FDIs have become more technology intensive, R&D in foreign affiliates has risen and intra-firm flows of technology have increased. However, these are features characterising FDI in *developed* countries. We do not observe the same trends in most *developing* countries. Accordingly, the sophistication of technologies in developing countries is not increasing at the same pace as in the case of developed countries. A reflection of this is that FDI in developing countries first and foremost represents inflows of finance and knowledge of organisational and managerial practices, rather than new or more modern product and process technologies (UNCTAD, 1999).

Hence, the spillovers depend on the *degree* to which technology is actually introduced in the host economy. Technology transfer involves both the transfer of physical goods and the transfer of knowledge. The latter requiring skills and efforts, representing a cost that rise inversely proportional to the level of technological capabilities. The MNC will choose a level of technology transfer that is profitable to the entire company. This implies that if the *educational level* in the host country is low, the technology transferred is less sophisticated. Accordingly, UNCTAD (1999) predicts that: "...globalisation may result in growing inequality in TNC³ technology transfers

³ Transnational Corporation

between countries. Since each affiliate has to compete in world markets, host countries with low capabilities and weak learning systems may be left progressively behind those with dynamic capabilities.”

Furthermore, the level of technology transfer depends on *the aim* behind the FDI. Horizontal FDI, when the MNC affiliate produce to supply a local market in a host country, is supposed to generate more spillovers than vertical investments. However, if the host economy is a developing country, the efforts to match costs and quality to world standards may be limited. In such cases only simple technology, demanding a very low skill base, might be introduced. The spillover effects tend to be weaker for *vertical* FDIs because the aim of the MNC primarily is to apply cheap labour and export the goods. Most likely the production technology that is sourced out has to fit with the existing capabilities of local labour, instead of upgrading the labour force.

The spillovers also depend on the *links* between the MNC affiliate and the rest of the economy. For instance, MNC production in “export processing zones” (EPZs, established to attract FDI by offering special advantages, often tax holidays and duty free imports), seems to create few positive spillovers to the host economy. Production in such zones is mainly vertical, applying imported intermediates, aimed at export. The know-how transferred to local workers tends to be generated through on-the-job training, and the learning effects are limited. On the other hand, technology-transferring links between the MNC and the rest of the economy tends to be stronger if some industry already exists within the relevant sector. In general, they will also be stronger if the affiliate adds to existing competition, local supplied intermediates are applied, the geographical distance between MNC affiliate and other industry is small, and production aims at the local market as opposed to export (Bjorvatn, 2000a).

Furthermore, to be able to efficiently take advantage of the technological expertise of foreign MNCs, some *host country policy implementations* are recommended. A governmental technological strategy has to be developed in order to upgrade the level of human skills. Rather than create EPZs and similar incentives to attract FDI, governments should accumulate location-specific assets and develop well-functioning institutions (Nordås, 2000). Accordingly, Dunning (1993) points out that the host country has to provide “... the scientific and communications infrastructure that high

technology MNCs regard as the *sine qua non* for their full participation in the countries in which they invest”.

2 New industrial structures

Technology transfers may improve the efficiency and hence the profitability of local firms. However, both technology and welfare spillovers depend on domestic markets. There is a risk that MNCs *crowd out* local business rather than enhance competition. Crowding out occurs if a 1\$ investment by a foreign affiliate leads to an increase of the *total* investment level by *less* than 1\$. On the other hand, if foreign affiliates stimulates new investment in downstream or upstream production, total investment may increase by *more* than 1\$, the FDI thus resulting in a ‘*crowding in*’ effect. This may be the case once the foreign affiliate increases the demand for locally produced inputs. Production of a greater variety of specialised inputs may be initiated, thus generating a positive externality to other final-good producers. This is the concept of *backward* linkages. If a result is commencement of local production of more complex goods at competitive costs, *forward* linkages have been materialised and industrial development may occur⁴.

Under which circumstances are favourable industrial linkage effects expected to materialise in a developing country? How and when will they commence industrial development? These questions are approached by the presentation of three theories: (1) *Puga and Venables (1999)* describe industrialisation of one country as an interplay with countries exhibiting different levels of industrialisation, (2) *Rodriguez-Clare (1996)* explains the generation of linkages by MNCs, while (3) *Markusen and Venables (1999)* go more deeply into the changes of industrial structure due to FDI. The three theories explain development as a result of industrial links generated by foreign enterprises, though at different levels. While differences in human and physical resources are still deemed important, these three theories represent abstractions from the notion of comparative advantages.

⁴ The definitions of ‘crowding in’ and ‘crowding out’ are provided by UNCTAD (1999a). The explanations of backward and forward linkages stem from Rodriguez-Clare (1996).

Diffusion of industrial development across countries

Puga and Venables (1999) explain forces conducive to the stepwise spread of industries from one country to another. The forces in focus are differences in initial level of industrialisation and in demand for manufactured goods. Considering a group of countries in the paper, the model operates with two countries. There are transport costs or trade barriers between these countries. The presence of industrial linkages, as well as the costs of international trade, motivates companies to agglomerate. Manufacturing companies operate in a market characterised by monopolistic competition. Experiencing increasing returns to scale, these companies are profit maximising on where to locate production. The two countries are assumed to be similar in underlying characteristics. They have the same amount of capital and land per unit labour, and are featured by the same institutional structure. Roughly retold, the industrial diffusion from one country (A) to another (B) takes place as follows:

- i) All manufacturing is concentrated in country A. World demand for manufacturing rises relatively more than demand in other sectors, resulting in economic growth for country A. This increases the *wage differences* between country A and country B, implicating that country B-production costs decline relatively.
- ii) Agglomerated production in country A generates externalities, like upstream and downstream *linkages*, between producers. Such connections may imply that a move of production to low-wage countries is not necessarily profitable (*linkage effect*). Transport costs and barriers to country B-import of intermediate goods make production in country B even less profitable.
- iii) The two forces in operation are contradictory. For investments and industrialisation to be initiated in country B, the wage effect has to exceed the linkage effect. The profit associated of moving production increases the larger is the wage gap between the two countries. It will also increase should barriers to trade be reduced, as intermediates would have to be imported for country B production. Finally, the return on FDI depends on local demand for industrial produced goods, consumer goods as well as intermediates. Initially this demand is low in country B, however it is expected to increase with industrial development. Puga and Venables simulate the model extended to four countries. Simultaneous industrialisation of all the countries is not found to be a stable equilibrium. If one country got slightly ahead of the others then

its lead would cumulate. As a result, only one of the other countries gains manufacturing, country B.

iv) By the presence of some manufacturing, backward and forward linkages are created in country B. Country A experiences a loss of manufacturing. The wage gap narrows and the two countries become more similar in economic terms.

v) Continuing growth and demand for industrial goods raise real wages in country A and B relative to the other countries. Industrialisation spreads to the rest of the group if the wage effect of moving out production is stronger than the linkage effect.

The generation of industrial linkages

Rodriguez-Clare (1996) bases his theory on three assumptions: (1) A variety of specialised inputs enhance productivity; (2) the proximity of supplier and user is necessary for production of intermediate goods; and (3) the size of the market limits the available variety of specialised inputs. He applies a two-country model. Country A is more developed, producing complex goods with a variety of specialised inputs and at high wage levels. In country B simple goods are produced and wages are lower. There is monopolistic competition in the intermediate goods market. Intermediate goods are non-tradable, and only MNCs have access to input from both countries. In order to reduce marginal production costs, companies in country A have incentives to become international, locating headquarter in country A and production in country B, applying inputs from both countries.

The impacts of MNCs on the developing country depend on the linkages generated by MNCs compared to the linkages that *would be* generated by domestic firms. Rodriguez-Clare aims at measuring these effects through the labour market, defining a linkage coefficient. This coefficient is defined as the ratio of employment generated in upstream industries, through demand for specialised inputs, to the labour hired directly by the firm. A positive linkage effect implies an increase of intermediate goods production, which is the case when the MNC has a higher linkage coefficient compared to domestic firms. A negative linkage effect, to the contrary, would imply a decrease in the productivity of domestic firms and a consequent decrease in wage levels.

Whether the effect is favourable or not in a country B-perspective, depends on MNC demand for locally produced inputs. This demand is determined by several factors. High transportation costs between the countries enhance incentives to apply locally produced intermediates and decrease the import of inputs from country A. Consequently, the linkage effect of MNCs is increasing in transportation costs, and MNCs headquartered at distant locations will generate more linkages than MNCs originating in neighbouring countries. Communication costs between headquarter and production plant is thus also of importance, as a significant share of specialised inputs is information.

Furthermore, the industrial linkage effects are determined by the *technology* applied in the MNC production process. A complex technology may demand a greater variety of inputs, and more favourable spillovers are generated. A third factor is *the level of development* in both of the countries. A host country that already provides a certain variety of intermediates would probably attract linkage-creating FDI despite high transportation costs. However, when local supply of intermediates is poor, it is more likely that the host country will attract MNCs with low transportation costs or MNCs that apply less specialised intermediates. Linkage effects due to multinationals locating in poor regions may therefore be limited. Rodriguez-Clare also finds that the demand for country B inputs is decreasing in the country A variety of specialised inputs. As a result, MNCs from more developed countries may benefit the host economies *less* than MNCs from less developed countries.

The impact of industrial linkages

Rodriguez-Clare focuses on the share of locally produced intermediates in MNC production and the importance of this share to the generation of linkage effects. Assuming a certain share of locally produced intermediates in MNC production, Markusen and Venables (1999) describe more thoroughly the changes in industrial structure due to inward FDI. The changes are determined by the interaction between two effects, the *competition* effect and the *linkage* effect. The establishment of one or more MNCs increases *competition* in domestic markets, reducing the profits of local producers. However, the increase of consumer market producers may increase total

demand for locally produced inputs (*backward linkages*), resulting in lower production costs for local companies, as well as for multinationals (*forward linkages*).

These effects are described in a single-economy model comprising a downstream and an upstream industry. MNCs, foreign (exporters) and domestic firms are represented in the final goods market, characterised by imperfect competition. Intermediates are produced by domestic firms only. Profit in the intermediate goods market is affected by demand, as the firms experience increasing returns to scale. Demand for an *intermediate* good is determined by a price index for inputs relevant to the industry, the price for the specific good, product differentiation, as well as total local demand for intermediates. The price index falls when a company enters the industry. Demand for *consumer* goods is domestic only and, similar to the upstream industry, determined by the degree of product differentiation, prices, a price index, but also by the elasticity of demand with respect to the price index and the position of the domestic demand curve. Input requirement and an efficiency parameter are included in the downstream industry profit functions, representing impacts of technology on linkage effects. Input requirements may vary between multinationals and local companies.

The magnitude of the *linkage* effects depends on the increase of input producers *due to* MNC entry. This is determined by domestic demand for MNC produced goods and the share of locally produced inputs that are applied in production. Increases in demand for goods produced by *domestic* firms and inputs applied in *domestic* firm production are factors that also increase the intermediate goods demand. However, linkage effects *due to* FDI are reduced by these factors.

The substitution of domestic final goods producers, the *competition* effect, is determined by the resulting profit in the final goods market. A common result of an MNC entry is a reduction of this profit. Perhaps the MNC produces goods at lower costs, or a surplus of goods supply may reduce prices. The reduction of profit may force domestic industry to leave the market. Domestic producers will probably be more protected the higher is the degree of product differentiation. The competition effect is also reduced if MNC entry replaces imports, or if a large share of the production is exported.

Whether the effects of FDI is favourable or not, depends on the proportional magnitudes of the linkage effect versus the competition effect, as well as how these effects are connected. An MNC presence that crowds out all existing domestic companies would result in monopoly and the competition effect would fail to appear. Furthermore, multinational production based on a large share of *imported inputs* could actually decrease local intermediate goods demand, thus inhibiting favourable linkage effects. However, in a case where *several* MNCs enter a market, linkage effects can be generated *in spite of* a complete crowding out effect. And if MNC entry leads to an increase of *intermediate goods* production, the profits of domestic firms may increase, resulting in a rise in the number of domestic producers. This forward linkage increases demand for inputs even more, and a larger variety of inputs becomes available. The entry conditions for domestic (and multinational) companies improve and may result in a “crowding in” effect. Accordingly, FDI may act as a catalyst for industrial development.

3 Summary: When do beneficial spillovers occur?

The subject of the previous sections is whether FDI may serve as a force towards industrial development of the host economies. This section serves as a summary that aims at identifying the more relevant factors in the discussion.

The generation of backward linkages is one of the beneficial effects of FDI. These spillovers are manifested in terms of increased demand for locally supplied intermediates. However, the use of domestically produced inputs in MNC production depends on several factors, such as the requirement of inputs in the specific FDI project. Also, necessary inputs have to be produced locally, quality must be satisfactory, and prices must be competitive as compared to import. This is the case for services as well as for goods. Furthermore, the local share of inputs may increase gradually. Both local industry and the MNC affiliate need some time to adjust to new conditions.

Import of intermediates is dependent on trade barriers and costs of transportation. Barriers to import increase the price of imported inputs, making it profitable to use

local suppliers. However, if local suppliers are unable to offer required inputs or if export of final goods is important, low trade barriers might be a necessary condition for FDI. This is also in accordance with the observed growth of FDI that takes place concurrently with reductions in trade costs.

The impact on technological capability, as well as managerial and organisational competence in the host economy, depends mainly on characteristics of the FDI project, the spread of a local network, employment of local labour, and local skills. These factors are interlinked. The establishment of highly advanced production (of goods or services) demands a skilled workforce. If host country level of education is low the cost of training is higher, and the investment may not take place. The need for skilled labour is generally lower if the FDI is vertical, in contrast to production of a complete product. Furthermore, technology transfer depends on the quantity of goods and services bought locally and hence employment generated in upstream industries. This network tends to be more significant if MNC production is horizontal and is aimed at host country markets, compared to vertical production established for exports.

Generally, the establishment of MNC affiliates will affect host economy industrial structure. Increased competition is believed to enhance productivity and thereby economic development. However, it is also in the interest of host countries to protect existing industry. The number and size of local firms in the market, their present and potential economic performance, as well as their innovatory capacity determine the competition effect. Furthermore, local producers are protected by the degree of product differentiation and protectionistic policies, such as subsidies. If FDI replaces imports the competition effect is less significant, compared to introduction of new goods. The resulting competition does also depend on market strategies of the MNC and the type of investment. Greenfield investment tends to improve competition, while mergers and acquisitions may reduce the number of firms, thus hampering competition.

Finally, beneficial spillover effects and enhancement of industrial development are dependent on governmental strategies. Such strategies are diverged: Governments may determine a range of entry conditions in order to *protect* domestic industry and

culture. Alternatively, a strategy may be developed to *attract* FDI, for instance by fiscal incentives and export processing zones. Developing countries, aiming at capital inflows and industrial development, often choose the latter. This has resulted in “FDI competition” where countries try to offer the best policy conditions to attract MNCs. This competition has been labelled “a race to the bottom” as countries, contrary to their objectives, competitively reduce the possibilities of obtaining capital inflows and beneficial spillover-effects due to FDI. Cooperation across borders in the development of investment strategies seems to be the way out of this fruitless “competition”.

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Summary

Countries within a region often experience a similar rate of industrial development. Do foreign direct investments have any influence on this aspect of industrialisation? This paper describes how technology transfer and new industrial structures may accelerate industrialisation, with particular focus on the conditions for beneficial spillovers.