2D7 Technology Transfer to Developing Countries

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It is often suggested that the economic development of less developed countries (LDCs) can be greatly accelerated by technology transfer. This is true. Since the 1960's,certain countries in Asia and Latin America have been exploiting technology transfer to build national economies, and have gradually entered into the arena of international economic competition as a new power. However, at the same time, most LDCs have sunk to such a position that their further economic development depends on developed countries (DCs). The dilemma of LDCs pushes people to rethink the function of technology transfer. As a result of this rethink,some scholars have proposed that LDCs should pay attention to reducing their dependency on external technology and, instead, go down the track of developing an indigenous technological capability. It is clear that this viewpoint contains some merit,although there are also disadvantages. In fact,the problem for LDCs is not whether the technology from abroad should be adopted. The problem is concerned instead with how to take advantage of the technology from abroad,and how to employ a suitable strategy of technological accumulation which fits in with each country's own situation.

The LDCs' Dilemma

The distribution of the world's technological resources, like the distribution of minerals, is quite different depending on different countries. According to statistics, DCs possess respectively 98% and 94% of the sum of inventions and patents in the world. Owing to such a unbalanced distribution of R&D resources in the world,the majority of LDCs have to start their industrialization on the base of dependency on technology from DCs. As we know, multinational corporations (MNCs) play a decision role in technology transfer from DCs to LDCs. Therefore, LDCs' technological dependency on DCs is embodied on the dependency on MNCs. The experience of industrialization in some LDCs after World War II showed that economic development without the participation of MNCs is difficult if the country's technological base is weak. It should be recognized that MNCs have been a positive impetus to the industrialization of some LDCs. In fact, countries that have rapidly developed their economy and expanded their manufacture export after the war are, on the whole, the countries that have taken the most advantage of direct investment and technology transfer from MNCs. However, on the other hand, it is the low technological capability of the majority of LDCs, that determines these countries' technological dependency on MNCs. According to their global goals and economic strategies, it is quite possible that MNCs will actively transfer some technology to LDCs. Yet,the original impetus for MNCs to transfer technology was not the aim of promoting LDCs' economic development, but rather one of serving their own needs and interests.For this reason, if we admit that LDCs have benefited a lot from technology transfer, we

should also admit that, at the same time, they have paid a heavy cost in the process.

Firstly, the development of industry and growth of an economy can not been achieved without the application of technology. In other words, an economy must be built on the basis of technological accumulation. As we have demonstrated above, there is a great technological gap between DCs and LDCs. The existence of this gap, combined with the eagerness of LDCs to acquire state-of-the-art technology, provides an opportunity for MNCs to use direct investment and technology transfer to control LDCs' economic activities. It is easy to understand that if LDCs' economic development is under the control of MNCs, the speed of their economic development, their industrial structures, and their levels of imports and exports can be influenced by the decisions of MNCs which are taken on the basis of their global economic strategies. For this reason, it is possible that LDCs actual tracks of economic development might diverge from their expected target, or even go to the opposite direction. A meeting of experts held by Unesco in April 1978 concluded that the activities of MNCs is one of the forces causing the lag observed between LDCs' governmental development goals and actual results. In this respect, external forces conflict or interfere with a process of endogenous development.

Secondly, technological dependency weakens LDCs' power in negotiations about technology transfer. In the business of international technology transfer, most technologies do not have a clear price. The price is settled by consultation and negotiation between the trading partners. When the negotiation powers of both parties are almost the same, the conditions attached to the use of technology are often reasonable, so the technology transfer among DCs generally takes place under a rather reasonable conditions. Yet, if the buyers are enterprises from LDCs and the sellers are MNCs from DCs, things will be quite different. It is clear that the technological gap between the two sides inevitably causes the gap in their ability to negotiate. In addition, it is entirely possible that LDCs buyers do not possess any bargaining counters which can be used to exchange for advanced technology, and that they can also lack necessary technological information, experience of technology negotiation and even qualified negotiators. Naturally, the conditions attached to the technology transferred may be unfavorable to LDCs.

Thirdly, as we have pointed out above, almost all of innovation resources in the world are amassed by MNCs, therefore, technology imported by LDCs may not fit in with their conditions of resources, production, consumption, and etc.. However, LDCs which are in the position of technological dependency can only exploit the technology developed in the DCs, which is usually in connection with DCs' own social and economic environment and needs, so it is entirely possible that the technology transferred does not suit to LDCs' technological base. Also, the low technical capability of LDCs prevents them from making adjustments to the technology. In reality, LDCs enterprises usually use the foreign technology mechanically. Their speed for digesting and adjusting

the technology imported is rather slow. While MNCs have the ability to adjust technology, they lack the incentive to improving their own technology because of the narrowness of the market in LDCs and the difficulty in making a return on the investment made in adjusting the technology. From many experiences, it seems that although some MNCs sometimes adjust their manufactures and techniques according to the specific environment of LDCs, such adjustments are rather limited and adjustments to core techniques are very rare.

Forth, generally speaking, when MNCs export their technology, they tend to hold back the advanced and core parts and only give LDCs the standard parts. Therefore, most of the technologies imported to LDCs are standard and out of date: the case of manufacturing equipment, which is the most common type of technology transferred to LDCs, illustrates this point. Taking China as an example, during the period 1952-1985, more than 10,000 technology items were imported at the cost of over 300 billion dollars. Most of this was manufacturing hardware. Software technology only accounts for about 6% of the total. According to an investigation of approximately 20,000 items of equipments imported in Guangdong Province, only 7 % of the equipments that had a value which was greater than in the country of origin, whereas 92% of the equipments the same level as the similar types at home. Another 1% of the equipments' level was of even lower value. Of the equipments investigated, 95% was simple processing equipment.

Fifth, in LDCs, the development of a local technological capability has often been retarded by the preceding of imported technology. Since there is a large amount of foreign industrial technology that could be chosen and applied, LDCs may develop a tendency to import technology instead of developing their own. According to Patel, the former chief of UNCTAD's Transfer of Technology Division, the total annual value of technology imported in LDCs was between 30,000 million dollars and 50,000 million dollars during the 1970's and 1980's. By comparison, these LDCs were spending only 2000 million dollars on R&D a year at that time. In consequence, these LDCs have to follow the process "backwardness, importation, re-backwaredness, re-importation".

Advantage and Disadvantage for LDCS

The dilemma of LDCs pushes people to rethink the function of technology transfer. According to some experts, even the idea of technology transfer can do harm since it inhibits scientific and technological creativity within LDCs' and places these countries in a position where they can only mimic, copy and ape: thereby condemning them to absolute and permanent dependence. These experts instead propose that LDCs should pay attention to reducing their dependency on the technology from outside, and go down the track of developing their own technological capability. However, a complete rejection of foreign technology would deprive LDCs of the positive benefits that can arise from the appropriate transfer of foreign technology. In other word, the danger is that the baby may be thrown out with the baby water.

It is necessary for us to notice the kinds of problems caused

by technology transfer.At the same time,we should also admit that there are benefits and opportunities that come with technology transfer, since follower countries can develop an industrial society which is based on relatively advanced technology. In this respect, late developing LDCs can actually benefit from access to a far larger range of technologies and might be able to short-circuit some of stages involved in catching-up with best-practice technology. In the words of Gorce Chaklen, 'Assuming an adequate endowment of usable resources,and assuming that the great blocks to industrialization had been removed, the opportunities inherent in industrialization may be said to vary directly with the backwardness of the countries'. In fact,according to statistics, between 1950 and 1975, the average annual growth rate of national income in the third world was 5%,which was about twice the average that of the advanced countries in the 19th century. As a result, the per capita national income had been doubled within the those 25 years. It would at least spend 40 years for DCs at the early stage of development to achieve such growth with the fastest increase speed at that time. After the war the rapid increase happened in the third world countries, and this should be mainly attributed to technology transfer, the efficiency of which was seen as saving time and cost. In general condition, the time and cost for digesting the technologies imported are always less than that for developing new technologies.

It is worthy of note that the technological gap can provide some potential advantages to LDCs while, at the same time, the technological gap reduces LDCs to a disadvantageous position in the international division of production and the international trade. Some scholars think that it is technology that makes LDCs dependent on MNCs. Yet, we must have a clear understanding of that the dependency is not the cause but the result of economic backwardness. A backward nation's dependency on foreign technology seems to be a stage if that country's long-term intention is to overtake DCs. In this respect, the challenge to LDCs is to obtain relevant foreign technology, on acceptable terms, and integrate this into the development of an indigenous technological capability. However, LDCs have their own disadvantages that are hard to overcome. Because of the dependency on DCs' technology and economy, they have to submit to various pressures from external forces and accept unreasonable conditions attached to the technologies imported from MNCs. It is the co-existence of advantages and disadvantages that determines the nature of the problem that LDCs are facing.

Challenges and opportunities

After the war, the world has experienced a series of remarkable technological innovations, which have changed the picture of the human society and created a lot of opportunities for economic development. Today, the high technology revolution in microelectronics, life sciences and so on has become one of the basic factors influencing industrial development and economic growth: thereby providing an important opportunity for LDCs to promote their own technological capability and economic prosperity.

First of all, one of the important characteristics of our age

is the organic combination of traditional and modern technology. This makes it possible for LDCs to get the advanced or appropriate technology from DCs, since new invention and innovation constantly reforms the structure of industrial technology. Now even if in the most traditional industries, complicated and creative technology, which used to be difficult to get for LDCs, may be used. On the other hand, since modern industry is more or less related to traditional technology, even in the most modern industries, there is some technology that LDCs are capable of absorbing and adopting. Furthermore, with the progress of local R&D, accumulation of technological capability, and development of technology transfer, some LDCs' enterprises' ability to assimilating and adjusting the technologies imported will be strengthened. It is easy to understand that LDCs might benefit a lot from this change.

Next, the continuous development of the international division of production within an industry is a remarkable characteristic of the current international division of production. Of the computers in the world market, 80 percent is said to be made in the United States. In fact, the value achieved in USA is very slow. For example, the IBM's personal computer's production cost is about 860 dollars per station, which needs to use the parts from LDCs and others DCs at the expense of about 600 dollars. Therefore, the international division of production within an industry supplies the best pattern to LDCs of participating into international economic competition. By this mean, LDCs can constantly get in touch, until they later participate into the high technological industry. In fact, the newly industrialized countries and regions (NICs), which have been appearing as the power rivals of DCs in many industries, have been benefiting a lot from the international division of production.

Thirdly, along with the development of high technological revolution, the production life cycle will further becomes shorter, and the speed of alternating new technology will further increases, so MNCs might increase their speed of technology transfer to NICs. This can strengthen NICs' function as "bridge" for technology transfer from DCs to LDCs. Comparing with LDCs, NICs have more powerful R&D strength, so they are in a more advantageous position in terms of receiving, digesting and applying new technology from DCs. These countries have recently started to transfer technology to LDCs, and LDCs consequently get a new route to the import of advanced technology. In addition, there are some great countries among LDCs, such as China, India and Brazil. These countries have the experience of long-term industrial development, and are playing a unique role in technology transfer to LDCs. To be different from NICs, these countries do not depend too much on DCs' direct investment and technology transfer, and their technological resources are mainly derived from their long standing efforts. Sometimes, the technologies of these countries probably suit the LDCs' situation very well.

Of course, the high technological revolution is not always favorable to LDCs. In fact,LDCs are now facing a series of severe challenges in technology transfer.

Firstly, the high technology revolution, which centers around microelectronics, greatly weakens the LDCs' advantage of having cheap manpower. Microelectronic technology rapidly increases productivity, and at the same time, also decreases the labor requirements. The loss of the advantage associated with cheap manpower in LDCs puts DCs in a position where they can cut down their new investment on exploiting labor advantage in LDCs; and they even can withdraw their original investment. Moreover, Dcs recently start to take protectionism against the products out of labor-density pattern from LDCs. It is clear that the change has an unfavorable impact on LDCs' technological importation and economic growth.

Secondly, MNCs have cut down the amount of their direct investment in LDCs, although they have increased the investment in NICs. Since the breakout of debt crisis in Brazil and Mexico in the early 1980s, the accumulation amount of debt in LDCs has been increasing. These countries occupy a large proportion in the total accumulation of debt in the world. So the increase for DCs to invest in LDCs will remain low. This is a negative factor for LDCs in terms of importing and absorbing new technology from DCs, since direct investment is one of the main channels that LDCs obtain advanced technologies from DCs.

Thirdly, the technological protectionism of DCs against LDCs prevents the latest technology from moving towards LDCs. Perhaps the United States and other western countries restrict technology transfer to eastern countries, such as China and Russia, for military and political reasons, while their restrictions to other countries are primarily within the consideration of economic. DCs worry that they may train a another group of NICs as their competitors if they sell LDCs advanced technology. At the same time, they also worry that the export of technology to LDCs may move the production of goods from home to abroad; and that the domestic employment is probably affected. It is not difficult to imagine that, on the technology transfer problem, the contradictions between DCs and LDCs will be enlarged in the near future.

Conclusion

An understanding of how technology is successfully transferred is important for any organizations which participates in a technology transfer partnership. For LDCs, it has become clear that importing and adapting foreign technologies,as well as inventing new ones, is no less technically demanding. However, it is only by correctly handling the relation between indigenous development and technological importation LDCs can strengthen their own technological capability.

Peter Drucker once said there are no undeveloped countries,only undermanaged countries.This has been proved by the historical process of technology transfer for the last 40 years. We hold that if all LDCs can effectively "manage" technology transfer as the Japanese have done, then, in the near future there will no longer exist LDCs in our globe.Therefore, to LDCs,technology transfer means opportunity and still more, challenge.