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Technology Network for Machine Tools in

Vietnam

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Abstract

When Vietnam joined the WTO, it accepted foreign direct investment and started to grow. Technically, it was then greatly influenced by the enterprises that entered the country through direct investment. This report shows that the technology network for machine tools is formed via direct investment and subcontracting.

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1. The demand for machine tools has increased since Vietnam decided to join the WTO (World Trade Organization).

Foreign direct investment (FDI) in the manufacturing industry, which uses machine tools for its equipment, increased after Vietnam decided to join the WTO. Vietnam revised the civil law to abide by WTO rules in order to receive the approval of the committee. It negotiated and concluded bilateral agreements with WTO member nations. FDI began to enter Vietnam from these nations after this. FDI also began to enter Vietnam from existing WTO member states with which Vietnam had not concluded bilateral agreements. Although WTO participation is thought, in general, to promote economic growth through exports, it promotes FDI and economic growth through FDI. The reason for this can be explained by the WTO rules. The WTO provides regulations on the acceptance of direct investment in manufacturing and service industries. It also prohibits various restrictions through which the host country can regulate the activities of foreign enterprises. For example, the WTO prohibits local content requirements in the purchase of domestic products in the host country in order to foster domestic industries and it prohibits requirements regarding the balance of trade. Because WTO member countries do not impose restrictions, such as on local content, enterprises intending to engage in FDI in manufacturing prefer to enter WTO member countries without fear of there being a technology leakage. Since the host country cannot impose a fixed balance between export and imports, foreign enterprises can invest for the purpose of selling in the local market and can expect to expand the market.

So the WTO has a rule, for example, that if a country applying for membership concludes bilateral agreements with one member country of the WTO after another, there is a high chance that FDI will enter from WTO member countries. FDI carried out under WTO rules can invest in a wide range of industries, not only manufacturing but also the real estate, retail finance, insurance and other service industries. FDI can rapidly increase the number of employed and bring in a large amount of foreign currency (dollars). When a host country receives a lot of FDI at one time, there is a simultaneous increase in demand for real estate, construction, and electricity. This demand leads to rapid expansion in various markets and the births of a stock market and a real estate market. Either a bubble or a financial crisis may happen if dollars are exchanged for the local currency and circulate in large quantities, and if mass direct investment enters all at once, this may result in a totally new experience for the country.

With FDI, machinery is, of course, necessary for manufacturing and almost all of this machinery is imported, because Vietnam does not have the technology, or a high enough level of technology, to produce the machines that foreign enterprises use. Foreign enterprises in Vietnam want to use familiar machines which are used in their home firms or a new version of the same type of machinery, if this is possible. Japanese subsidiary enterprises import mostly Japanese capital goods, e.g. machine tools. Similarly, Taiwanese subsidiaries import mostly capital goods made in Taiwan, and if Taiwan cannot supply the capital goods they are supplied by Japan or Europe. Because a machine tool industry has not yet developed in Vietnam, local Vietnamese enterprises use imported machine tools, or buy those produced by foreign firms in Vietnam for the local market, or machine tools which a local enterprise has produced with foreign technology from a foreign firm. Furthermore, when local parts makers that supply parts to foreign firms are established, there will be some demand for machine tools that can process machine parts.

If this happens, where will the local parts makers buy their machine tools from? This report will suggest that local parts makers buy machine tools according to a technology network. This means that if the order and technology come from a Japanese subsidiary the local enterprise will buy machine tools made in Japan.

This report describes the technology network for machine tools in Vietnam.

2 . The present situation of machine tools imports in Vietnam

According to the trade statistics "Comtrade" of the United Nations, imports of capital goods into Vietnam have increased since 2002. Particularly in 2007, the volume of imports was 3 times that of 2002 and it increased by approximately 40% compared to the previous year. In fact, this volume was influenced by the conclusion of bilateral agreements and Vietnam joining the WTO. These increases have occurred because foreign firms entered Vietnam through direct investment and imported capital goods to invest in facilities. Vietnam concluded a trade agreement with U.S.A. in December, 2001, and an investment agreement with Japan in December, 2004. It joined the WTO in January, 2007.

On FDI in Vietnam and the import of capital goods, let us try to confirm the situation by looking at the statistics. Direct investment increased steadily from 2004 and suddenly grew in 2007. Though small, from the trade data of the "World Trade Atlas" about Machining Center (MC) machine tools, the volume of imports of machine tools hit a peak in 2003 and 2006, and the main exporting country was Japan. Because

an investment agreement with Japan was concluded in November, 2003, and took effect on December 19, 2004, the increase in the import of capital goods in 2003 was connected to the direct investment of Japanese enterprises. In 2006, the next peak may have been an effect of WTO participation. The second biggest exporter was "other Asian countries".

The "World Trade Atlas" showed the amount of imports of turning center (TC) machines and numerical control (NC) lathe machines by country. In 2006, there was a peak in imports, with the main exporting country being Japan and the next biggest "other Asian countries". The trend is the same as with MC. The specific countries referred to as "other Asian countries" are unclear. In reality, Vietnam's local firms equipped themselves with many used machine tools made in Japan which were brought into Vietnam from Thailand and Malaysia. It is thought that these machine tools were reported as machine tools from "other Asian countries". Even though there were used machine tools, this report shows that local Vietnamese firms want to buy machine tools made in Japan, as is also shown in the results of an investigation in 2008. The reason will be sought using the concept of a "technology network".

3. The technology network for machine tools

Japanese subsidiaries going into Vietnam are, of course, equipped with machine tools made in Japan, but what kind of demand for machine tools will there be among local enterprises? The research team investigated the situation for machine tools in Vietnam in 2008 on the hypothesis, firstly, that state-owned enterprises mainly used machine tools made in Germany, secondly, that local capital enterprises used machine tools made in Japan or new machines made in China, Taiwan and Korea, and, thirdly, that advanced Japanese enterprises use machine tools made in Japan.

However, according to IMI Group Holdings¹, a state-owned enterprise, the demand situation for machine tools has become clear. In the case of state-owned enterprises, they still use the conventional machine tools made in the Czech Republic and Russia. Currently, only key parts are imported. It seems that these are parts for the repair of the machine tools which have already been installed. On the other hand, the NC machine tools are made in Germany, Switzerland and Japan, but these are for big state-owned enterprises, especially the military, because NC machine tools are

¹ The holding company of the IMI Group, employs 200 persons, including 180 engineers. It has 17 affiliates solely engaging in manufacturing, and the IMI Group as a whole employs 2,000 workers. In the past, its primary product was machine tools, but at present it has three pillars: (1) CPD (Continuing Professional Development) for engineers and training of undergraduate students; (2) R&D; and (3) machining.

expensive. On the other hand, private enterprises built with local capital do not purchase machine tools made in China any more, because the quality is not so good, and they have begun to buy used machine tools made in Japan, or have begun to purchase new machine tools made in Taiwan. This shows that their financial situation has improved. At the same time, the demand for quality in processed parts has increased. Therefore, enterprises with financial room have recently and quickly pushed for the introduction of NC machine tools. The evaluation of Japanese goods is highest in terms of after-sales service. Next comes Taiwan. China has a very bad reputation. Ito Yoshimi (2010,38) points out that this will be one of the reasons why Vietnamese enterprises, where the use of machine tools is new, do not purchase product made in China.

There are more questions about why Vietnamese enterprises purchase Japanese machine tools. This report suggests the reason lies in the technology network for machine tools.

Before discussing the results of our investigation, the nature of this technology network for machine tools should be explained. Introducing the notion of a technology network for machine tools by using the example of the Soviet Union and former communist countries, we can understand how a technology network is built.

Since its birth in 1922, the technology for machine tools was introduced into the Soviet Union from all over the world, including Germany and the U.S.A. The Soviet Union brought German engineers to the Soviet Union in order to force them to develop machine tool technologies. After that, the Soviet Union handed the developed technologies, which it had assumed from German sources, to communist states, such as Vietnam, China and North Korea, and formed a Soviet Union technology network supplying products made in the Soviet Union to Communist bloc countries. In other words, other communist countries have been on the same technology network as the Soviet Union. The origin of the Soviet Union technology network is assumed to be Germany, because it was developed by many engineers from East Germany who came and lived in the Soviet Union. The Soviet Union needed to supply capital goods, produce goods and foster engineers, because the technology for machine tools was provided by the Soviet Union. As a result, the markets in the receiving countries were occupied by products made in the Soviet Union. This phenomenon was not limited to the machine tools industry as the countries who introduced these technologies became a market for the country which provided the technologies. If the countries receiving the technology did not import capital goods, industrial supplies and so on from the providing country, the receiving countries could not produce products with the technology. The countries receiving the technologies had to utilize the technology network of the providing country

even if it hoped that the imported goods would become domestic products in the future.

As for the methods for transferring the technology, there are several types: (a) a licensing agreement, (b) FDI, (c) a division of labor through subcontracting, (d) OEM business, and (e) study abroad and the movement of engineers. Let us explain (a), (b) and (c).

(a) Licensing agreements. Licensing agreements focus on the transmission of technology. Sometimes this needs capital participation. There are two kinds of licensing agreement. One is a simple exchange of technology, because the partner enterprise does not want to exchange anything except the technology. The other is to buy the technology because there is a big technological gap. These two types are different. Where the enterprise receives the technology from the partner enterprise because there is a big technological gap, the receiver should use the technology network established through the offer. In other words, the enterprise that bought the technology from the developed enterprise receives blueprints, trains engineers and has to buy industrial supplies and capital goods in order to produce.

(b) The formation of a technology network through FDI is carried out as follows. The technology network is formed by a local subsidiary which is established as a joint venture or as a single company in the developing country when a local subsidiary imports capital goods and industrial supplies from the mother country and buys or orders some industrial supplies for the local enterprise. At first, the volume of capital goods imported from the mother country increases, because the local subsidiary needs to use the same capital goods it used in the mother country, so it needs to transfer used goods or buy new models of the same type. If the advanced enterprise is Japanese, because it imports facilities from Japan, a Japanese technology network is formed, and the market will be occupied by equipment made in Japan. If the advanced enterprise is German, a German technology network is formed, and the market will be occupied by equipment made in Germany.

(c) The division of labor through subcontracting

Capital ties between a local subsidiary and a local subcontractor are not necessarily required for subcontracting, but production technology is handed down to the local subcontractor because the local subsidiary has allowed the local subcontractor to make its products. The local subsidiary provides a blueprint of the products, sometimes capital goods, industrial supplies, and know-how in some cases. Because the

local subsidiary must guarantee the quality of the completed products, the contract includes the obligation to keep the technology secret to prevent a technology leak in cases where there are no capital ties. The OEM business relationship is the same in this respect. When a local subsidiary places an order with a local subcontractor, if it is a Japanese enterprise, the local subcontractor often uses Japanese capital goods, machine tools, to process the parts. As a result, a Japanese technology network is formed and a capital goods market for Japan is created.

Now the above-mentioned hypothesis will be examined using fieldwork results.

4. Case study

VINAPPRO is an example of a licensing agreement and FDI.

VINAPPRO (Vietnam Power Products Mfg.)

VINAPPRO is a state-owned enterprise that produces a range of 6 to 10 hp farm diesel engines, with an annual production of 3,000 units². The enterprise began production after acquiring a plant constructed by Yanmar in the 1960s, and it continues to purchase licenses from Yanmar.

The following three features may help to understand the specific dimensions of the enterprise's machine tool installation:

- (1) Fuel injection nozzles and pumps, as well as piston rings, are imported from Yanmar Diesel Engine Co.
- (2) The enterprise began production after acquiring a plant originally constructed by Yanmar, and continues to purchase licenses from Yanmar. For this licensed production, it should be noted that the enterprise basically employs Yanmar's processing facilities and methods, but with modifications better suited to the local conditions in Vietnam. For instance, in creating its manufacturing system, the enterprise buys second-hand Japanese machines from specialized vendors and modifies them in-house before incorporating them into its manufacturing system. Very few NC machines have been installed.

² The demand for diesel engines in Vietnam is 100,000 a year. A product made in China occupies 70% of this market. The product of VINAPPRO aims to suit the moist soil of the southern Mekong Delta.

- (3) As a strategy to reduce costs and improve production efficiency, the enterprise uses some 100 subcontracting firms, among which 70 employ four to five workers each and engage in rough milling. The remaining 30 firms employ 30 to 40 workers each and engage in intermediate finishing work. It is worth noting that these subcontractors all use second-hand Japanese machine tools. For rough milling, they use conventional and semi-automatic machine tools, and for intermediate finishing, they use semi-automatic and NC machine tools.

According to observations from the factory tour, Ito Yoshimi (2010,45) points out that VINAPPRO's machine tool facilities have the following characteristics:

- (1) Its plant adopts a Group Technology (GT) cellular layout, which became popular in the 1970s. Based on a historical survey of installed machines, as will be touched upon later, this plant layout can be interpreted as being essentially the same as the original designed by Yanmar.

- (2) The cells are comprised of groups of lathes, drilling machines and gear-cutting machines, and there are many conventional Japanese and German machine tools in operation. A survey of the history of the machines installed, through an examination of the production numbers and dates of manufacture, was carried out on some of the machines. In August 2008, the author made inquiries to Okuma Corporation regarding the LS-type engine lathe made by Okuma (production number 4509-2625) and found that the machine had been directly delivered from Okuma to Yanmar Vietnam in 1970.

Japanese technology and management methods have been adopted until now because VINAPPRO introduced Japanese technology genes from the beginning.

The next cases provide examples of subcontracting.

CATTHAI (CATTHAI Plastic Co., Ltd.)

CATTHAI was established in 1999 by a group of people who had worked together at Mutoh Vietnam, VMEP, and other Japanese and Taiwanese firms in Vietnam, along with others with business experience in Singapore and Malaysia. At present, the enterprise produces moulds and injection molded plastic parts. Currently, the enterprise employs some 450 people (including 100 engineers and 30 persons engaged in mould and die manufacturing). It enjoys such a high reputation for its proven product quality that it makes up 50% of Mutoh Vietnam's total output, including parts supplied to Canon and SONY. Incidentally, CATTHAI's use of its workforce and equipment supports the understanding that "the mould and die industry is a process industry"

(Junko Mizuno [2003]).

CATTHAI uses both NC and conventional machines, with most of the machines being second-hand Japanese machine tools. For example, all ten of its MCs are products from Makino Milling Machine Co. Ltd., Okuma Corporation and Kiwa-Seisakusyo Co. Ltd. It has seven NC lathes and machines built by Sodick Co. Ltd. and Okamoto Machine Tool Works Ltd. in its fleet of machines. Decisions on machine purchases are made by the enterprise's president, Mr. Le Tuan Anh, based on information gathered from personal sources and from second-hand machine vendors

PTM (The Precision Tools & CNC Machine) J.S.C.

PTM is an affiliate of IMI Holdings. It employs 67 persons (including 27 engineers), produces moulds and dies for firms, including Japanese subsidiaries, and processes sheet metal parts and machine parts. Its products are manufactured by a mixture of old and new machine tools made in the Soviet Union, Germany, U.K., Japan, and Taiwan.

Ito (2010.44) pointed out the following interesting features during a factory tour:

- (1) PTM has recently introduced secondhand Japanese-made conventional machine tools, including a 20-year old planer built by the Marufuku purchased by the enterprise 4 or 5 years ago.
- (2) Early MCs (made by Hitachi Seiki and TOS) have been retrofitted and used. For retrofitting, PTM's indigenous technology allows high operability (ease of use), and NC units are mostly made by the Heidenhain of Germany.

TAN HOA

This firm was established in the 1980s as a joint venture and was incorporated in 2000. In 2008, the enterprise had plants in two locations in the Hanoi region, employed some 400 workers, and made motorcycle parts (pressed products), such as mufflers and bolts. These parts and components are supplied to Honda Vietnam and Italian-subsidiary motorcycle makers. At present, most of its presses and machine tools are second-hand and made in Japan, but the enterprise has been replacing them in phases with new machines, such as a ¥40 million Amada CNC turret punching press that will soon be introduced into the plant.

Let us look at the machine tools installed at the Tan Hoa plants. These machines are used to process machine parts and punching dies, and there are many conventional second-hand Japanese machine tools. However, the enterprise is planning to replace these machines with the most advanced models shortly, and, in fact, the enterprise introduced a wire electrical discharge machine (AQ327L model) built by the Sodick in

2007.

Incidentally, the lathe operators at this enterprise are quite skilled, so they “improvise the shape of the cutting edge for high-speed steel bits, i.e. they set up a protruding stop on the rake face of the blade, and let the chips fall at a right angle to the worked surface.” On the other hand, the enterprise has difficulties with management techniques regarding product quality, manufacturing, costs, delivery deadlines and materials. The enterprise is actively introducing 5S and Kaizen in order to reduce costs.

5. Conclusion

It is common knowledge that direct investment and subcontracting have a big influence on technology formation in developing countries. This report points out that a plant's machine tools play an important role. Furthermore, the market is occupied by the first gene introduced. We will report on the issue of genes at a different opportunity.

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