

2C1 The Effectiveness of the Indonesian Industrialization Strategy for the Development of Industrial Technology

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INTRODUCTION

This is a study of the acquisition of industrial technological capabilities in manufacturing sectors in Indonesia. It analyzes the influence of policy and environment in that process. Each country has its own strategy to develop its industrial technology capabilities. Indonesian industrial technology development has been carried out through two mainstream strategies that were applied in parallel: (1) *Export-Oriented Industrialization Strategy* - Export promotion of products based on a broad spectrum technologies, basically those transforming natural resources into manufactured goods for exports utilizing domestic manpower; and (2) *Technological development Industrialization Strategy* - A step-wise strategy aiming at acquiring industrial skills by nurturing the technology in selected strategic industries and national research laboratories. Indonesia introduces the later strategy in the 1970s and it is challenging the wisdom of conventional development theory, and the experience of Newly Industrialized Countries like South Korea, that countries should initially exploit their existing comparative advantage in labor-intensive manufactured-goods. In this research both strategies are empirically examined to clarify their effectiveness and impact. In addition to assessments at the national and sectoral level, particular industries have been selected as a case study: Autoparts, Automobile, Aircraft, Rollingstock, Shipbuilding¹. These industries were chosen due to their similarity in terms of relative importance to the national economy and their level of technology. In addition, they representing different cases under each strategy. The automotive and autoparts industries enjoy to a large extent protection as 'infant industry' through monetary and fiscal policies designed for export oriented industrialization. On the other hand aircraft, rollingstock and shipbuilding are strategic industries owned by government, they fall therefore under the influence of the technology development industrialization strategy.

THE INDUSTRIALIZATION PROCESS IN INDONESIA

The Indonesian industrialization process can be divided into three phases. First, in the mid-1970s, import substitution of consumer goods came to temporary saturation and the import substitution of mid-stream industries started. Second, in the first half of the 1980s the import substitution process in mid-and up-stream industries was accelerated considerably. A third period began in 1987 when investment in export-oriented industries started on a large scale. Protectionist policies were replaced by deregulation policy and several devaluation of the Rupiah took place to fit the above stages of industrialization during which the Indonesian government promoted growth from an oil and gas-dependent economy to a non-oil and non- gas export led economy. The manufacturing

sector is a recently becoming more important in the Indonesian economy. Exported manufactured goods recently surpassed oil and gas as a source of revenue. The manufacturing sectors that have further potential development could be grouped into three: high-technology, resource-based and labour-intensive industries. The high technology sectors includes electronics, metal components and transportation equipment. The resource-based sectors includes pulp and paper, rubber products, leather, ceramic and food. Labour-intensive industries encompass such products as footwear, sporting equipment and toys, as well as handicrafts. The overall Indonesia manufacturing sectors lags behind, it has been recalled however that as late as the mid 1960s Indonesia had little indigenous manufacturing experience outside simple consumer products, had only small government factories for processing natural products². Basically, Indonesia has relied all along on foreign companies to make up for its technological deficiency. To catch-up with the development of technology it is necessary to obtain the technology from foreign countries since indigenous production technology is underdeveloped.

STRATEGY FOR THE DEVELOPMENT OF INDUSTRIAL TECHNOLOGY

1. Export-Oriented Industrialization.

Indonesia has different options to develop its industries, depending on which may adopt different policies toward foreign investment. The attractiveness of Indonesia to foreign investors includes factors such as: politically stable environment, comparatively high returns on investment, a free foreign exchange environment, abundant and cheap labor force, a large and diversified domestic market, and abundant and diverse natural resources.

A wide range of policy measures are being implemented to promote the export-oriented industries centered on fiscal, monetary and investment policies. In attracting foreign investment some of the facilities offered are among others: *Import duty exemption* - 100% for main equipment, spare parts, raw material, 50% for supporting equipment; *Incentives for Export* - Restitution of value added tax paid by manufacturing exporters on the purchase of goods and materials for the manufacturing of export products; export credit at subsidized rates; *Industrial estate and Free Trade Zones*: The government of Indonesia plans to combine characteristics of free trade zones and industrial estates in several bonded areas. So far, two duty-free zones have been established, one in Jakarta and the other on Batam Island which is located twelve miles south of Singapore. Similar zones are being planned for Surabaya (East Java), Cilacap (Central Java), Ujung Pandang (South Sulawesi) and Medan (North Sumatra). There are several other completed industrial estates now in full operation. The biggest industrial estates are found in Jakarta, Cilegon, Surabaya and Medan. Under existing regulations, all types of goods may be processed, stored and received in a bonded zone, and restitution of import duties and supplementary import duties are granted; *Liberalization on land legislations* - Indonesian land legislation does not recognize the concept of freehold land rights. Instead, the various rights attached to land are divided into separate elements and are subject to separate title. To the foreign investor the following three main rights are significant; the right of exploitation, the right of building and the right of use.

The most significant regulation for industrial technology acquisition is the so called deletion program which falls under category of monetary and fiscal policies. The deletion program was initially stipulated in a ministerial decree in 1976, and has been applied in the automotive and electrical appliances industries. The program aimed at enlarging the local content of a production by imposing the compulsory use of locally manufactured components. This program sets a schedule for the components that are to be deleted and those that should be made locally. At the beginning the mandatory program applied to commercial cars on non-essential components such as paint, tyres, batteries. Then gradually it was applied to essential component such as the engine, transmission, axle and propeller shaft, steering system etc. A leading Indonesian economist noted in April 1992 that the automotive and related industries enjoy various forms of protection such as tariffs, taxes and a ban on car imports, with the effective rate of protection is reaching nearly 600%³. Recently, in June 1993, the government lifted the ban on car imports, replacing it with tariffs of 200% if the brand is available in Indonesia and 300% if it is not. The government also extended incentives to companies supplying parts and components for export products. Promoting the use of local component was also further enhanced by reducing the property tax depending on the percentage of local components used.

2. Technological Development Industrialization Strategy.

The Indonesian industrialization through technology policy, is a step-wise strategy aimed at acquiring industrial skills by starting from the end, so to speak, that is by producing under license and ending with the beginning namely basic research. Industrialization is stepped up in four phases: *First stage*: production under license; progressive manufacturing by full mastery of processes; *Second stage*: Integration of existing technology to make a new product; *Third Stage*: Innovation, design, development and manufacturing of new products to fulfill future needs; *Fourth Stage*: basic research, which according to the experience in developed countries, usually comes first.

To implement this strategy ten industries were selected as vehicles for this industrial transformation process; They are being supervised by the Agency for Strategic Industries chaired by the Indonesian Minister of Research and Technology. The ten industries include: iron and steel production; aircraft assembly; shipbuilding, foundry and heavy machinery; telecommunications; diesel engines and industrial equipment; explosive, weapon and ammunition; electronic components, and rollingstock. Some of these selected industries have a long history dating back to Dutch colonial period, others used to be owned by military subsequently transformed for civilian uses.

2.1.Science and Technology Manpower Development Program.

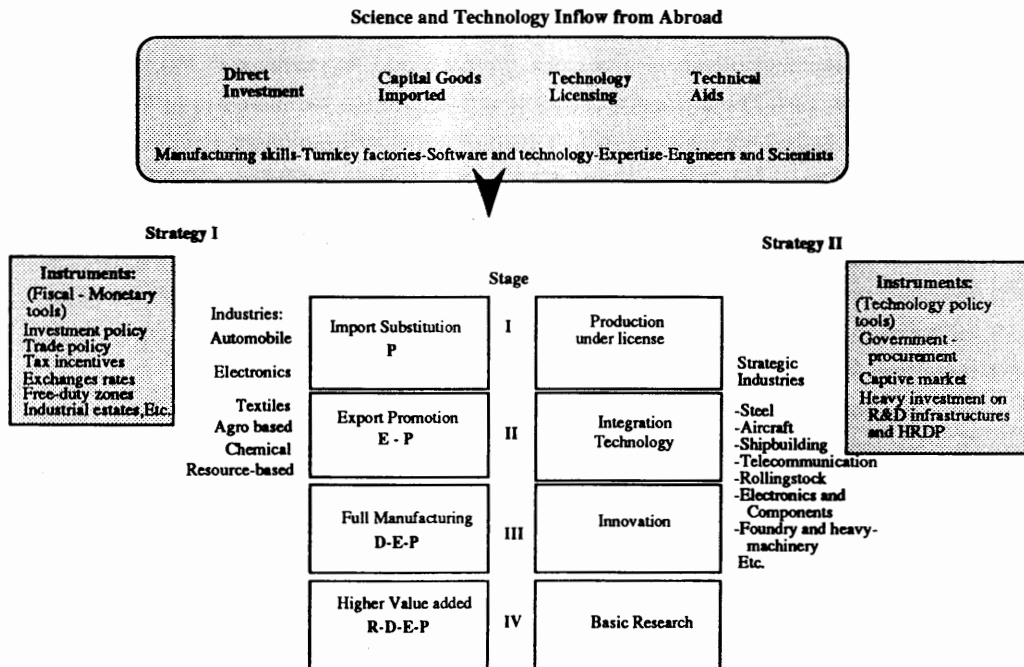
The huge investment for R&D infrastructure and manpower development programs was carried out partly come from foreign loans. A manpower development program utilizing money from Japanese ODA through the Overseas Economic Cooperation Fund (OECF) and the World Bank loans, provides for a great number of engineers and scientists to be sent abroad for training. This manpower development

program is designed to upgrade the science and technology capabilities of the six national research institutes and ten strategic industries. This Program run from 1985 to 1992 was and was partially supported by a World Bank loan. After this program was successfully under way, a second, complementary program, was conceived and funded by an OECF loan .

2.2. Government Intervention on Procurement and Marketing.

The IPTN an aircraft industry is used here as an example, it sells its products to the local civil and military markets. At present it employs more than 15,000 people, of which 1,500 are engineers and 1,200 managers. This industry is still in the "infant stage" and is under heavy protection. The Indonesian government uses this industry not merely as a manufacturing operation but a technology development laboratory. Despite criticisms such as the investment on it being too expensive and the fact that few linkages have developed between the industry and the rest of the Indonesian manufacturing sectors, development on technology-intensive industries continued. A clear example of government intervention is the procurement military aircraft from General Dynamics. The government asked General Dynamics to subcontract certain parts to IPTN. Similar arrangement for subcontracting work for IPTN was made when the government procured twenty four Hawk Fighter airplanes from British Aerospace. Further, in many government bids for large public infrastructure projects such as telecommunications and power plants, certain parts of the work is to be given to corresponding strategic industries.

The two strategies above and the flow of foreign technology is summarized in the following diagram:



EMPIRICAL FINDINGS

Indonesian industrialization through 'export-oriented industrialization' policy soon showed fruits. The manufacturing sectors grew rapidly and recently surpassed the role of agriculture in national economy. The Indonesian open policy toward foreign investment steadily increased the number and value of foreign investment. The export-oriented industrialization policy has been instrumental in achieving a shift from the export of natural resources to that of manufactured goods. The study has examined the export-import performance from various industries during the last decade.

Figure 1: RCA of Indonesia's Main Export Commodities 1980-1990

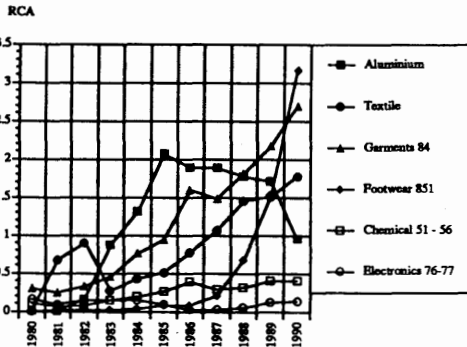
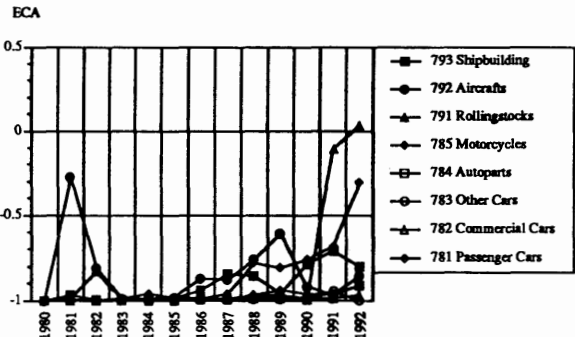


Figure 2: Export Competitiveness Index of Selected Industries 1980 - 1992



Selected Indonesian products have increased their competitiveness in the world market as measured by the RCA⁴. In the case of plywood, its RCA rises very fast with Indonesia already controlling 30% of the world market. The competitiveness of textiles, garments and footwear also increased. For more value-added products such as electronics, chemical and aluminium the increases in RCAs are much slower (see figure 1). In high-technology products such as automobile, autoparts and the products of the fore determined ten strategic industries, we used the Export Competitiveness Index (ECI)⁵ instead of the RCA in consideration to their productions which to a large extent still rely on the domestic market. It is found that in both groups of industries the ECI changes slowly; This implies that Indonesia remains heavily dependent upon foreign sources in fulfilling its need on those products (see figure 2). However, in aircraft, rollingstock and shipbuilding where the government fully controls the market, the growth of ECI is much better than for the other industrial products.

The mandatory deletion program is a prominent policy in the automobile industry. It focuses on pursuing trading activities toward the assembling, semi-manufacturing and the full manufacturing stages as the case may be. However, the implementation of the deletion program is not as smooth as planned. As an example, the commercial car deletion program was planned to be completed in 1986, and the establishment of the full manufacturing industry is to be achieved in 1990. In reality the target could not be reached on time. At present there are two hundred components industries, and Indonesia has been able to produce domestically 139 out of 178 automobile's part components. Passenger cars in general have

reached a 15-20% local procurement level, but certain specific types already reach 40% of local content. For small trucks and mini van the local content reaches from 42 to 47%⁶.

A similar situation is also found in the strategic industries although the processes of acquiring industrial technology capabilities already reach the third stage. That means they have already mastered the capability of innovation, design, development and manufacturing of new products. Their production is not economically viable yet, being characterized by its dependency on foreign sources and heavy protection. Further, their capacities are still under utilized.

It is expected that the high-technology industries create upward and backward linkages to other domestic industries. That process could then trigger out-sourcing or subcontracting thereby becoming a major pillar of the manufacturing system as in Japanese manufacturing industries. However, the study found little evidence of spillover or subcontracting to domestic firms. Linkages to the local economy, such as subcontracting, are still limited for two reasons: 1) The industries are facing a sluggish domestic market and still operate under capacity, 2) The local supporting industries are underdeveloped in terms of meeting the higher standards of quality control, reliability, and speed of delivery required by such high-technology industries. The motivations for subcontracting are either to procure lower-cost components or raw materials or, in some cases, to meet local contents requirements imposed by host countries.

DISCUSSION

The export-oriented policy of Indonesia led to immediate positive results becoming the primary engine of economic growth and played an important role in bringing in foreign capital and technology. Considering that exports have to face foreign competition and meet international standards, an increasing quantity of equipment and intermediate products through licensing arrangements should be obtained. Increasing technological inputs has helped to accelerate the transfer of technology and management practices. The presence of the joint-venture firms are important for skill formation through on-the-job training. Current developments in the international economy might trigger a new phenomenon that would force the foreign direct investment participants to transfer their up-to-date technology to their manufacturing units abroad to make them competitive in the world market. Our survey shows that two third of Japanese Direct Investment in Indonesia (JDI) participants considered the machines used for production in those units are outdated, therefore their efficiencies is also lower. Field interviews revealed that JDI participants faced fierce competition with new foreign investors from Taiwan, South Korea and Hongkong as well as domestic firms which as late comers in the field have the advantage of investing on much newer technology. Thus, increased competition from foreign and domestic firms spur JDI participants to increase efficiency. Even in the labor-intensive industries JDI participants might not continuously rely upon cheap labor, and if necessary they would be willing to upgrade the machines. This is shown by the latest technology in a textile factory installed in a JDI firm in Indonesia. In assessing the RCA of main Indonesian products exported, the following conclusions can be drawn. The competitiveness of Indonesian products relied on two comparative advantages these being abundant

and cheap manpower, and a wealth of natural resources. Supply of cheap labor is regarded as a mean to compete decisively in market where labor is more expensive. Indonesia has exploited this advantages as has been shown in the cases of textile, garments and footwear. However, in the fields where the technology is essential, as in the case of electronics and chemicals the role of foreign firms is crucial. In resources-based products for example, the domestic firms have fully exploited their advantages only in the case of quasi-monopoly such as that of hardwood, where Indonesia has been able to build a powerful plywood industry. However for more upstream industries that extract and process natural resources and require large amounts of capital and technology, in as the case of **Asahan Aluminum Smelters**, the foreign firm's role is indispensable.

In the case of technology-intensive industries, even if they have been under heavy protection for more than ten years, they are still uncompetitive in the world market. Both their RCA and ECI are much lower than for labor-intensive and certain natural resource-based products. Automotive and related industries that started as import substitution industries in the early years of industrialization, have failed to become export-oriented industries, except for the motorcycles indutry that has shown a rising of their competitiveness. A long time is required to transfer technology and management skill.

The domestic market is important for nurturing potential industries by taking advantage of the "late comer effect". Indonesia must exploit its huge domestic market and then export already tested and partly or fully amortized products (as was the case for textile), rather than manufacturing only for export as South Korea did in the 1960s. This twofold strategy is necessary to deepen the industrial structure. The export orientation remains necessary to match the falling oil income and to pay foreign debts.

Today however, cheap labor is no longer an absolute advantage in a time of automation and robotization, so that industrialization based only on the export of labor-intensive product is more unlikely to be successful. Given a large and controllable domestic market it would be unwise for Indonesian companies to implement manufacturing programs without any relation to this market. Unlike some smaller countries which have no option but to enter the world market directly, countries like Indonesia can and should orient themselves to the demands of their own domestic markets in defining and implementing the most appropriate programs for their industrial transformation.

CONCLUSION

Our study shows that the indigenous technology base is still very small. Both strategies have relied extensively upon foreign sources on technology. Foreign firms provide technological links, management and technical skill, market access and access to finance. In the last ten years, manufacturing grew fastly due to the inflow of foreign technology in various forms. The export-led strategy has helped attain the take-off state for industrialization. However, local efforts to assimilate, adapt and improve foreign technology and eventually develop one's own technology are crucial to augmenting the transfer of technology and the acquisition of technological capabilities. This could be better done if there is an advanced R&D infrastructure. There are numerous efforts under the technological development strategy to

cultivate domestic technological capabilities but much few efforts are being devoted to this aim with regard to the export oriented strategy. To achieve sustainable industrial development efforts in technological development should be adopted industry-wide.

Despite many criticisms such as investment being too expensive and too few linkages having been made between strategic industries and the rest of Indonesian manufacturing sector, development on basic and technology-intensive industries continued. Some possible impact such as spillover or subcontracting to wider sectors has hardly occurred mainly because the strategic industries themselves still operate under-capacity. Immediate problems are how to integrate the export-oriented firms with the strategic industries so that they can benefit each other strengths and promote further development. Collaborative arrangements between them are necessary to strengthen international competitiveness in the face of increasing pressure from other developing countries.

Footnotes:

1. These industries' commodities are grouped under SITC: 781, 782, 783, 784, 785, 791, 792, 793.
2. Hill, Hal (1988), Foreign Investment and Industrialization in Indonesia, Singapore: Oxford University Press, pp. 8-27.
3. Sjahrir, Astra International: Transisi dan Transformasi, in Tempo, April 1992, p.36.

4. The Revealed Comparative Advantage (RCA) is defined as follows:

$$RCA_{ij} = \frac{\frac{X_{ij}}{X_i}}{\frac{X_{wj}}{X_w}}$$

Where,
 X_{ij} = country *i*'s export of commodity group *j*.
 X_i = country *i*'s total exports.
 X_{wj} = world exports of commodity group *j*
 X_w = world total exports.

5. The Export Competitiveness Index is defined as follows:

$$ECI = (X_i - M_i) / (X_i + M_i) \quad \text{Where,}$$

X_i : The value of export of commodity *i*, M_i : The value of import of commodity *i*

6. Tempo, September 18, 1993.