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POSSIBLE MECHANISMS FOR THE TRANSFER AND DEVELOPMENT OF TECHNOLOGY

Prepared by UNCTAD Secretariat

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Paper prepared by the UNCTAD secretariat for presentation to the ECWA seminar on "Technology Transfer and Change: the Arab Middle East", to be held in Beirut from 9-14 October 1977.

Introduction

Conceptual and empirical analysis of the transfer of technology process indicates that the forms employed for transferring proprietory and non-proprietory technology as well as the terms and conditions on which the transfer takes place, have had seriously debilitating effects on the economies of developing countries, 1/ more particularly, on their contemporary state of technological dependence. For these reasons, both UNCTAD and ECWA, through the adoption of resolutions 87(IV) and 51(IV) respectively, have underlined the importance of exploring new modalities, or institutional arrangements, for the transfer and development of technology to meet the objectives set forth for the establishment of a New International Economic Order (NIEO).

In this paper an attempt is made to provide a rationale for these new institutional arrangements. It is divided into four main sections. Section I presents selected indicators of the nature and extent of technological dependence of countries of the Arab Middle East; section II analyses heuristically the main consequences, or rather the social cost of such dependence; section III takes up the question of possible institutional arrangements for the transfer and development of technology in the Arab region; and section IV sets out in a summary form the main conclusions.

I. Selected indicators of technological dependence of countries of the Arab Middle East

Technological dependence 2/ arises where the major source of a country's (a region's) technology comes from abroad. This dependence is greater, the greater the extent of reliance on foreign technology, and the more concentrated the sources from which technology is purchased. In some cases sources may be widely dispersed over the economy as a whole, but in each individual industry, the concentration ratio may be high; this too is an aspect of dependence. Technological dependence can also be assessed in terms of the flexibility and extent to which local resources (capital, technology, raw materials, skills, etc.) may be substituted for the foreign ones.

The origins of such dependence and its numerous implications have been extensively discussed. It is generally agreed that one of the principal causes of technological dependence lies in the initial, and usually historically determined, assymetry in the capacity of developing countries to generate technology domestically. Some indicators of this assymetry for the Arab Middle East are set out in table 1 and compared with similar indicators for the developed market economy countries.

1/ See, in particular: UNCTAD, Guidelines for the study of the transfer of technology to developing countries (UN publications, sales No.72.II.D.16); UNCTAD, Major issues arising from the transfer of technology to developing countries (UN publications, sales No.E.75.II.D.2); UNCTAD, Transfer of Technology: report by the UNCTAD secretariat (TD/106 and Corr.1); and UNCTAD, On some implications of technology transfer for trade, growth and distribution in developing countries (TD/B/C.6/5).

2/ For an exhaustive discussion on technological dependence and its implications, see UNCTAD, Transfer of technology: main policy issues (TD/190), May 1976.

Let us first look at the percentage share of R & D in Gross National Product (GNP). While this is a highly aggregative concept and tells us very little about the structure and orientation of research activities, it can nevertheless be helpful as a broad indicator of the readiness, or political will, of countries to develop their indigenous technological potential. Of the Arab countries for which data on R & D expenditure are available, only Egypt (0.83 per cent) seems to have exceeded the target rate of 0.5 per cent for R & D proper, as called for under the UN World Plan of Action for the Application of Science and Technology to Development. Most others were in the range of 0.1 - 0.3 per cent, or just above. On the average the ratio of R & D expenditure to GNP for the Arab region as a whole came to as little as about one-fourth of that recorded for developed market economy countries.

Another indicator we have taken and which highlights the skill assymetry aspect of the region is the ratio of scientists and engineers per 10,000 of population. This ratio for the various Arab countries was found to be highly variable. The significant fact to note, however, seems to be that of the total stock of scientists and engineers in these countries, only a small fraction (see column 3, table 1) were actually engaged in R & D: one per 10,000 of population in the Arab region in contrast to as much as 10 per 10,000 of population in developed market economy countries; or alternatively, only 1.6 per cent of the total stock of scientists and engineers undertook any form of R & D activity. This aspect of technological dependence is placed in even sharper relief if it is considered (see columns 4 and 5, table 1) that on average about 44 per cent of scientists and engineers working in Arab countries can be classified as non-nationals (foreign). 3/ Indeed, in Bahrain, Kuwait, Libya and Qatar non-nationals account for between 80-90 per cent of the total stock of scientists and engineers employed in these countries.

The process of capital accummulation again seems to be heavily dependent on capital-goods imports from developed countries. For the Arab countries as a group, on average, over 40 per cent of gross fixed capital formation (see column 6, table 1) was accounted for by capital-goods imports. In sharp contrast, the observed ratios for the developed countries ranged between 8 - 25 per cent (USA: 8 per cent; Germany: 16 per cent; and UK: 25 per cent). While heavy dependence on such imports cannot per se be taken as reliable index of the degree of dependence, it does nevertheless point to the state of underdevelopment of the regions' capital-goods sector, a sector which by all accounts has played a major role in generating rapid rate of technological growth in the now developed countries. 4/

3/ The figures, however, do not tell us how many of the non-nationals were: non-nationals but Arabs; non-national non Arabs from other developing countries; and non-national non-Arabs from developed countries.

4/ For a discussion of the role of capital goods sectors in generating technological change in developing countries, see Stewart F., Technology and Underdevelopment, Macmillans, England, 1977, Chapter 6.

TABLE I

Technological dependence of Arab countries: some selected indicators: early 1970's

COUNTRY	R & D expenditure as per cent of GNP a)	Scientists & Engineers: Total stock per 10,000 pop. a)	Scientists & Engineers: Engaged in R & D per 10,000 pop. a)	Non-national (foreign) Scientists & Engineers: as % of total stock of scientists & engineers	Non-national (foreign) Scientists & Engineers: as % of total no. of R & D scs & engs.	Share of imports of capital goods in gross fixed capital formation
	(1)	(2)	(3)	(4)	(5)	(6)
	Per cent	Number		Per cent		Per cent
Algeria	0.13	-	0.2	-	-	38.0 a)
Bahrain	-	40	-	78.0 b)	-	-
Egypt	0.83	166	3.0	0.0 a)	0.0 a)	36.0 a)
Iraq	0.25	43	1.4	10.7 c)	7.5 c)	50.0 b)
Jordan	0.31	17	0.6	2.3 a)	-	49.0 a)
Kuwait	0.01	114	1.9	80.0 a)	91.0 a)	56.0 b)
Lebanon	0.40	116	1.1	2.2 a)	23.2 a)	58.0 c)
Libya	-	39	0.2	78.5 a)	80.0 a)	37.0 a)
Qatar	-	157	-	90.3 d)	-	-
Saudi Arabia	-	40	-	-	-	38.0 a)
Sudan	0.33	8	-	-	68.7 a)	46.0 b)
Tunisia	0.30	6	1.0	-	20.0 c)	35.0 f)
Yemen, A.R.	0.25	2	0.1	12.5 e)	37.0 e)	26.0 a)
Arab region (average)	0.31	62	1.2	44.3	46.8	43.0
Developed market economy countries (average)	1.2	112	10.4	-	-	USA: 8.0 f) UK : 25.0 f) Germ.(FR): 16.0 f)

Source: Figures in columns (1) - (5) from: UNESCO, National Science and Technology Policies in the Arab States, No. 38., Science Policy studies and documents, (ISBN 92-3-001367-0, Paris 1976, Tables 12, 13 and 20. Figures in column (6) estimated on the basis of data in: UNCTAD, Handbook of International Trade and Development Statistics, Supplement for 1976, table 6.3; and UN, Yearbook of International Trade Statistics. Vol. 1, 1975.

a) 1973: b) 1971: c) 1972: d) 1974: e) 1975: f) early 1970's; based on Frances Stewart, Technology and Underdevelopment, Macmillans, 1977, Table 5.2, page 121.

These few examples have been given to provide a synoptic profile of the nature and extent of technological dependence. The list could no doubt be enlarged further if other dimensions of technological dependence - such as dependence on foreign consumption patterns or goods with foreign brand-names or trade-marks 5/ - are added to the list, as they should be.

II. Consequences of technological dependence

The main disadvantages of technology to the Third World arises, not so much from the transfer of technology which certainly has many beneficial features, but from the fact that they are technologically dependent on advanced countries and obtain their technology from a relatively weak bargaining position. The undesirable consequences of technological dependence may be classified into four main categories:

(i) Foreign exchange cost;
(ii) Implicit costs associated with restrictive and other types of practices of technology suppliers;
(iii) Loss of control over decisions; and
(iv) Lack of effective indigenous technological capacity.

(i) Foreign exchange cost

As has been shown in previous studies of the UNCTAD secretariat, the foreign exchange cost of technology represents a considerable burden on the balance of payments of developing countries. 6/ However, it is extremely difficult to measure accurately such costs for the reasons that the technology transfer takes so many divergent forms and is paid for in divergent ways, both directly and indirectly.

While no separate cost estimates for the Arab regions are readily available, it is possible to make a rough estimate of the probable orders of magnitude involved on the basis of methodology used in the UNCTAD document. Taking only the direct cost of technology (i.e., royalty payments and management fees) the UNCTAD secretariat estimated that for the developing countries as a group this amounted to nearly US$ 1.5 billion in 1968, 7/ an amount which was equivalent to about 8 per cent of Third World's imports of machinery and capital equipment (excluding passenger vehicles) in that year. A study on Iraq 8/ has shown that the cost of consultative operation

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5/ Detailed analysis of the economic effects of trade-marks is contained in UNCTAD, The impact of trade-marks on the development process of the developing countries, (TD/B/C.6/AC.3/3), Geneva, June 1977. For an analysis of the patent system from a developing country view point, see, UNCTAD, The role of the patent system in the transfer of technology to developing countries (TD/B/AC.11/19, Rev.1).

6/ See UNCTAD, (TD/106 and Corr.1), op.cit., and UNCTAD, Major Issues Arising from the Transfer of Technology to Developing Countries, op.cit.

7/ Figures of direct costs for developing countries are based on UNCTAD, Transfer of Technology - Report by the UNCTAD secretariat (TD/106 and Corr.1), Tables 1 and 2.

8/ Jaafar Abdel Ghany, Transfer of Technology, Its Role and Organs in Developing Countries. A special study on Iraq, 3rd International Seminar on Problems of Development and Struggle for New World Economic Order, Doc.No.11/8.

in Iraq alone ranges between 3 and 11 per cent of the total cost of projects and 7 per cent on the average. It is known that Arab imports of machinery and capital goods amounted to nearly US$7,167 million 9/ in 1973/74. From this it can be estimated, by applying the 8 per cent criteria (see para. above), that the direct cost to the region in 1973/74 must have been, as a minimum, in the order of US$573 million. Moreover, if it is further assumed, as done in the UNCTAD study, that such costs increase at an exponential rate of 20 per cent per annum, one would expect that by the end of 1970's, or the beginning of 1980, the Arab countries would be paying out nearly US$1.7 billion annually in the form of royalty and management fees alone. However, it must be noted that the assumption of a 20 per cent growth rate in direct costs was made at a time when one could not predict the rapid rate of inflation which seems to have engulfed the world economy since the early 1970's. Moreover, since then we have had the co-called OPEC boom, which has been followed-up by a more than average rate of growth in industrial output and technology imports, particularly of the Arab oil economies. Both these considerations would tend to suggest that the actual direct cost should be larger than the estimated one by a factor of about 2 or more: that is, by the end of 1970 or early 1980 it should be in the range of US$3.5 to US$4 billion per annum.

Direct costs, however, constitute a small part of the total. Several empirical studies 10/ have shown that technology suppliers, particularly when technology becomes associated with direct foreign investment as in the case of the oil industry, prefer to take their returns through transfer prices and a host of other tacit or indirect means in order to minimize their global tax liability. For these reasons we would expect the cost of technology to be very much larger than seems visible on the surface. The cost estimates of technology transfers for the Arab region would thus need revising, probably substantial revising, upwards in order to arrive at the "true" foreign exchange cost which takes account of both the direct and indirect components of cost.

(ii) Implicit costs associated with restrictive and other types of practices 11/

In addition to the foreign exchange cost, there are various other well known elements of restrictive practices connected with the packaged transfer of technology that are burdensome and impose implicit costs on technology-importing countries. These practices usually take the form

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9/ Data on the value of total imports of machinery and capital goods computed from UN, Yearbook of International Trade Statistics, Vol.1, 1975. Machinery and capital goods defined as: SITC 7 except 732.1; 661; 67; 68; and 69. Includes data for: Algeria (1973); Bahrain (1974); Egypt (1974); Iraq (1973); Jordan (1974); Kuwait (1974); Lebanon (1973); Libya (1974); Morocco (1973); Qatar (1974); Saudi Arabia (1973); Syria (1974); Sudan (1974); Tunisia (1974 Yemen, A.R.(1973); and Yemen, D.R. (1969).

10/ See, in particular, Vaitsos C.V., Intercountry Income Distribution and Transnational Enterprises, Oxford University Press, 1974; also see UNCTAD, Policies relating to the transfer of technology of the countries of the Andean Pact: their foundations (TD/107 and Corr.1).

11/ An exhaustive discussion on various types of restrictive practices can be found in UNCTAD, A study of the possibility and feasibility of an international code of conduct in the field of transfer of technology (TD/B/AC.11/22).

of restrictions on sources of inputs and access to market outlets; both of which may be part of the formal agreement for the transfer of technology, or may, as with subsidiaries of transnational corporations, be in the nature of an internal arrangement. Among the most common restrictions found in technology contracts is that of tying the purchase of imported inputs - capital equipment, spare parts and intermediate imports - to a particular source. Like tied aid this practice also often has the effect of tying the purchasers of imports to a more expensive source than would be used in the absence of such restrictions; the real cost of the transfer in such cases is usually found to be higher than when technology is purchased in an "unpackaged" form.

Export restrictions constitute another source of implicit cost of the transfer. Depending on the nature of the contract, such restrictions usually occur in one of three main forms: total prohibition on exports; partial restrictions with exports permitted to only certain markets and prohibited to others; and other types of restrictions, such as prior specification of particular products which may be allowed to be exported, including specification of their quantities and prices involved; and the designation of firms who are given exclusive rights to handle the export trade, etc. Of course, where transnational corporations are involved, explicit restrictions may be substituted by tacit agreements to allocate markets. The overall effect of these cartel-type practices is not very different from explicit export restrictions.

One could also mention a number of other aspects of restrictions, or what may be termed as "externalities", which further add to the disadvantages associated with technological dependence. Briefly, these include:

- excessive use of expatriate personnel in key managerial and technical positions;
- the transfer of inappropriate technologies and products;
- prohibitions on the diversification of product lines by domestic firms;
- prohibitions on domestic firms engaging in the manufacture and sale of products other than those covered by the licence;
- limitations of various kinds on competition through the imposition of "barriers to entry" in the domestic market.

The social cost of these measures could indeed be considerable, although many of them are not easily quantifiable and methods for quantifying them still remain to be devised whereby at least their order of magnitude could be given.

(iii) Loss of control over decisions

Loss of control over critical decisions affecting the national economy is another consequence of technological dependence. Clearly, this loss is greatest where technology transfer is associated with the establishment of wholly-owned subsidiaries of transnational corporations. Although countries can and do impose some restriction on the activities of foreign subsidiaries, by the very fact that they have equity and management control such firms are able to exercise considerable influence over the main economic variables. Decisions concerning investment, employment, pricing, profit remittances,

sources of inputs and market outlets may thus be made outside the country, invariably in accordance with the private global objectives of the transnational system.

Alternatives such as: joint venture arrangements, progressive divestment of foreign ownership or outright nationalisation have been variously advocated, at different times and in different places, as possible means of realising greater national control. This trend can be observed not only in modern manufacturing but also, as of late, in the more traditional preserves of transnational corporations: such as mining, notably oil - a sector which has been of singular importance to the Arab economy. Thus, we find that around mid 1970, OPEC for the first time turned its attention, as a group, to the question of obtaining "effective participation" in the concession-holding companies' assets. While initially the preference was in favour of gradual nationalisation, since 1973, however, the emphasis has clearly shifted towards 'accelerated' participation. 12/

The relationship between ownership and control has been a subject of much debate. Recent studies of international firms' behaviour however suggest that, given the wide variety of forms through which modern corporations can and do exercise control, acquisition of ownership rights, though essential, do not by themselves constitute a sufficient index of effective national control. To quote from a case study of joint ventures in India: "the general conclusion emerging from the analysis .... is that foreign firms have managed to dilute ownership-mix in such a way as not to cause any significant diminution in foreign control in individual cases". 13/ To take another example: recent negotiations concerning Saudi take-over of ARAMCO 14/ have clearly shown that the four US oil companies, partners in ARAMCO, were "understood to have been more concerned since the start of the talks with other aspects of the take-over (than ownership issue)" 15/; the 'other aspects' notably being: who retains control over management; the rate and form of payment of management fee (commission), and the share of US partners in the allocation of crude oil quota on a "preferential" basis. After its full take-over ARAMCO, although wholly Saudi owned, would continue to function as an operating company fully managed by US partners. Already, since the negotiations for take-over began, the company has expanded its operations horizontally into other sectors of the economy, whereby, in addition to managing the oil business, it would manage, on behalf of the Saudi government, a wide range of industrialization and construction programmes in the country, amounting to several billion dollars.16/

12/ For an excellent discussion on this, see Adrian D.G. Hill and Jean Devaux-Charbonnel, "Pattern of State Intervention in the Oil Industry", International Business Lawyer, Volume 4(i), 1976.

13/ Quoted from K.K. Subrahmanian, Imports of Capital and Technology: A Study of Foreign Collaborations in India, People's Publishing House, 1977, p.23.

14/ A company in which the Saudi government currently holds 60 per cent of the stocks with the rest held by the four oil companies that were instrumental in forming ARAMCO: Standard of California; Texaco; Exxon and Mobil.

15/ Quoted from a news item entitled "Saudi $1.5 bn.more for ARAMCO", which appeared in Financial Times, Tuesday, December 24, 1976.

16/ Rough estimates are given in a Walter Lippman article, entitled "Through Huge Expansion Program: US Oil Firms, Saudis Strengthen Ties", which appeared in the International Herald Tribune, June 1, 1977.

These few examples have been given mainly as illustrations to emphasize the point that so long as countries remained technologically dependent, external control would continue to be exercised in ways that did not necessitate outright or even majority foreign ownership. Much depends on: who takes management decisions; who controls the marketing and distribution channels; the degree of oligopoly in the market for technology; and the type of clauses found in technology contracts. Even in the 'pure' case of a domestic firm with no foreign equity or foreign management, the power of independent decision-making - at least in certain areas - of local owners and managers may be taken out of their hands through restrictive clauses in technology contracts. These restrictions clearly mean that many of the decisions normally thought to be part of local managerial responsibility are in effect taken outside the country.

(iv) Lack of effective indigenous technological capacity

Technological dependence of course, as discussed in section I, is largely the result of the lack of local technology; but it has also contributed to the lack of an effective technological capability in developing countries. It has done so in two main ways. First, by leading to a structure of productive activity which has tended to make R & D activities of domestic firms and institutions either irrelevant, or a poor image of advanced-country institutions. This tendency has at times been exacerbated by the practice of foreign technology suppliers (notably transnational corporations) placing various types of restrictions on R & D in developing countries. 17/ Thus, we find several examples where technology contracts have either totally prohibited, or prescribed limitations, on domestic firms undertaking "own" research, including the often badly needed 'adaptative-type' research. Such practices have been among the major disincentives to local research.

There has been yet another way in which local capability has been hampered: that is, through inhibiting the important 'learning by doing process' which is regarded as essential for the development of local skills needed for setting up and operating industrial units. The 'learning by doing' process has often been seriously hampered by the insistence at times of foreign technology suppliers to use their own rather than local engineering and contracting firms at various stages of the project. Domestic firms have not been much different and have shown strong preference for foreign engineers and contractors - being unwilling or overtly cautious about using local expertise which they usually seem to regard as inadequatly experienced. Likewise, both domestic and foreign firms have also shown little willingness to use local technologies even where they are available; well-tried foreign technologies which are commercially proven are considered a much less risky proposition, or rather foreign brand names a surer way to capture a larger share of the market. In this environment there have repeatedly been cases where developing-country firms or technological institutions have been able to develop a technology to the point of commercial production only to find that local businesses have licenced similar techniques from abroad.

Thus if developing countries are to build up the human skills, R & D and engineering institutions, conditions would need to be created for coping with the short run costs of learning by doing in their activities in order to benefit from the long term gains of cutting down dependence on foreign skills and technology.

17/ For a comprehensive analysis of restrictions on R & D by developing-country institutions, see UNCTAD, An International Code of Conduct on Transfer of Technology, (TD/B/C.6/AC.1/2/Supp.1/Rev.1), Chapter VIII, pages 34 to 37

III. Possible institutional arrangements for the transfer and development of technology

(i) Background

An attack on the technological dependence of Arab countries would need to be based on two sets of integrated policy approaches: first, one of controlling technology imports and modalities for its transfer, so that the cost and undesirable consequences of such transfer are offset; and secondly, that of making a direct attempt to reduce the extent of this dependence through a strengthening of national (or regional) capability to generate technology indigenously.

The dichotomy between controlling foreign technology and reducing dependence may not however be a straightforward one. Successful policies for screening imports of technology would also have, as an important long-term consequence, reduce dependence on foreign technology as local technological capability is developed through the adaptation of imported technology as well as from the diversion of demand for technology from foreign to domestic sources. Establishment of a technology policy would thus require pursuit of a coherent set of policies in a number of inter-linked areas affecting the transfer and development of technology: ranging from the choice of development strategies to be followed to the attitude towards foreign investment, contractual arrangements related to technology transfer, and research and development priorities, to name only few.

As indeed in the case of policies, it is equally important that instrumentalities for implementing such policies should also be integrally tied together. Thus any revision of the existing legal framework or formulation of new laws and regulations would by itself remain of marginal importance unless it is backed up by an effective institutional machinery at the national and regional level to assist the countries of the region to make the right type of technological choices by giving them direct assistance in the formulation of technology policies and bargaining, and by assisting them indirectly through the collection and dissemination of relevant information on alternatives 18/.

A number of developing countries have already taken steps at the national level to integrate and strengthen their institutional framework for tackling the problems of transfer and development of technology. India, Mexico, Argentina and the countries of the Andean Group are eminent examples where this development has reached a fairly advanced stage. Several other developing countries are also taking steps to examine critically their existing national framework of policies and institutions.

A number of initiatives have also been launched at the regional or subregional level. An Asican Centre for the transfer of technology has been established in India on the initiative of ESCAP, in cooperation with UNCTAD. The Caribbean and Central American countries are exploring forms of technological cooperation in their respective areas, for which purpose they will build on their existing sub-regional institutions. The most advanced subregional grouping so far established for cooperation in the transfer and development of technology is that within the framework of the Andean Pact. There, a subregional centre has not been established but joint policies and specific projects have been developed. An African Centre is in the process of being established on the initiative of ECA, in cooperation with UNCTAD. And more recently ECWA in cooperation with UNCTAD has taken a major step in the same direction by the adoption of resolution 51(IV) which calls upon the secretariat of ECWA to prepare an in-depth feasibility study

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18/ See, UNCTAD, Transfer of Technology - Supporting paper (TD/190/Supp.1), May 1976.

for the establishment of a technology centre for the Arab region as a whole.

This simultaneous spurt of activity across the developing world represents a new perception of the dynamics of the development process. In the economic order created in the aftermath of World War II, and for several years thereafter, it was a shortage of capital that was thought to be the main "bottleneck" to rapid economic growth of the developing countries. Accordingly, much emphasis was placed on creating instituions (such as, the World Bank and its subsidiary regional development banks) which could raise and channel capital funds into the developing economies; interestingly enough technology was not even on the agenda at the Bretton Woods talks, and in fora where it was discussed it was though best to leave the issue to the private sector. By the late 50s, and particularly early 60s, however, this exclusive concern with finance capital was supplemented by concern for industrialisation, typically through import substitution; this too gave rise subsequently to new institutions to meet the new objectives. Yet very soon it was realized that industrialisation, instead of reducing, actually increased the extent of external dependence of developing countries: dependence on both foreign capital and foreign technology. In the past six or seven years, therefore, the question of transfer and development of technology has moved swiftly to the centre of the stage. The move itself coincides with the recognition of the way technological power is exercised by the transnational corporations and the need to create countervailing bargaining power of the developing countries through the establishment and strengthening of new instituional arrangements at the national, regional and sub-regional levels, of the type discussed earlier.

(ii) An Arab Centre for the Transfer and Development of Technology

A major country-study by UNCTAD 19/ reviewing the state of institutional infrastructure dealing with technology policies in Iraq has underlined the importance of, and suggested the framework for, establishing a National Centre for the Transfer and Development of Technology, which will also act as a link with any Regional Centre to be established in the Arab region. A study prepared by ECWA with the cooperation of UNCTAD has noted that although certain dimensions of (technological) planning are taken care of by national R and D institutions or technical ministries, none of the ECWA countries possess as yet an institutional machinery responsible for identifying technological needs or for drawing up technology policies. Selection of projects takes place in a non-institutionalized manner although some countries have taken steps in specific cases (or sectors) to deal with the process of selection and assessment of certain types of technology 20/ Furthermore, it would seem that R and D institutions which function in the region are more in the nature of 'enclaves' and that their integration into the productive sectors of the economy and, in particular, with institutions (such as the various development funds in the region and domestic enterprises), responsible for investment decisions have been minimal. Some countries of the Arab region are, of course, too small and lack the necessary skilled manpower to establish on their own national institutions for the transfer and development of technology.

In view of these considerations, the establishment of an Arab Centre for Transfer and Development of Technology appears to be of critical importance. The preparatory work for the establishment of such a centre has already been initiated as a result of the cooperative effort of UNCTAD and ECWA. The establishment of an Arab regional centre fullly linked and responsive to the needs of the productive sectors, could act as a major catalyst for promoting cooperative action by countries of the Arab Middle East in the field of technology. Among its various advantages one could mention: 'collective' bargaining with foreign

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19/ This study is expected to be released shortly as an UNCTAD document: Transfer and Development of Technology in Iraq, Report by an UNCTAD Mission. The Study has, inter alia, also estimated the cost of technology transfer to Iraq.

20/ See ECWA, Mechanisms for the Transfer and Development of Technology in the ECWA Region, (E/ECWA/50), March 1977, paragraph 20, page 12.

technology suppliers; 'economies of scale' in promoting joint research and development activities, and information collection and dissemination; financial economies in funding larger projects on a regional scale; avoiding duplication in R & D through greater specialization at a regional level; and underwriting of risks involved in using untried indigenous technology. Of no less importance would be the role of the centre in implementing new norms and standards in implementing technology transactions.

The main objectives for the Centre could, as spelled out in detail in the ECWA study, be along the following lines:

a) to assist countries of the region in strengthening their technological capability so that they are increasingly able to promote indigenous technological developments;

b) to improve the terms and conditions governing technology transfer;

c) to promote a greater exchange of technology within the region;

d) to assist the industrialization process of the region through advice on appropriate policies to be followed in the choice and development of technology;

e) to promote regional integration through the harmonization of technology policies in the region;

f) to facilitate access to information and technology;

g) to provide advice and technical assistance on policy issues; and

h) to promote R & D on a collective basis and within individual countries.

At this stage the proposed Arab Centre could only be described in approximative terms. Its eventual shape and feasibility would have to be determined by means of an in-depth analysis of the needs and objectives of individual countries at the macro, sectoral and micro or project level.

A regional or subregional centre will be of little use unless there is at least a nucleus of national institutions. For present purposes it is assumed therefore that national institutions will eventually be established and also that ultimately there will be a variety of linkages among them, in one form or another.

IV. Summary and conclusions

Analysis of this paper suggests that the growth of modern sector in the Arab Middle East has been predominently based on foreign rather than domestic sources of technology. This has been particularly marked in the oil sector which remains dominated by large transnational corporations; some of these corporations through a process of horizontal integration have even begun expanding their activities into other sectors of the national or regional economy.

The technological dependence of the Arab region is reflected, as shown in section I, in the marginalization, in varying degrees, of their domestic research and development capability; it may also be responsible for some of the undesirable consequences associated with imported technology. While this