Foreign Direct Investment and International Technology Transfer to Egypt

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Abstract

While technology has been gaining importance as a vital factor of competitiveness in the world economy, intra-firm technology transfer through foreign direct investment (FDI) has become the predominant channel of international technology transfer (ITT), with other non-FDI forms of ITT losing impact. Though it comes second to contractual licensing, as a viable tool of domestic technological development, FDI can have important technological spillovers in host economies, especially if it takes a joint-venture form subject to local control. Unfortunately, due to dire need for capital finance and/or absence of appropriate national technology policies, most host developing countries focus on maximising the quantity of their FDI inflow, while underestimating the importance of the quality of technologies transferred through FDI. However, competitive technology has become a basic prerequisite for economic development and growth, and developing countries such as Egypt should try to achieve the best possible technological gains from FDI.

تلخيص

مع تزايد أهمية التكنولوجيا كعامل حيوى للقدرة التنافسية فى الإقتصاد العالمى، صار انتقال التكنولوجيا بين الشركات، من خلال الإستثمار الأجنبى المباشر، هو القناة الرئيسية لإنتقال التكنولوجيا الدولية. وفى نفس الوقت فقدت الأشكال الأخرى لإنتقال التكنولوجيا الدولية (عن غير طريق الإستثمار الأجنبى المباشر)، أهميتها وتراجع أثرها. وبالرغم من مجيئه فى المرتبة الثانية بعد التراخيص التعاقدية، كأحد الأدوات الفعالة للتنمية التكنولوجية المحلية، فإن الإستثمار الأجنبى المباشر بقدم وفورات_تكنولوجية هامة فى الاقتصادات المضيفة، خاصة إذا ما جاء فى شكل مشروع مشترك يخضع للسيطرة المحلية. إلا إنه للأسف، ونظراً للحاجة الملحة للتمويل الرأسمالى و/أو غياب السياسات الوطنية الملائمة فى مجال التكنولوجيا، تقوم معظم الاقتصادات النامية المضيفة بالتركيز على تعظيم حجم تدفق الإستثمار الأجنبى المباشر لديها، مع التقليل من أهمية جودة التكنولوجيات المنقولة من خلال الإستثمار الأجنبى المباشر. ومع ذلك، فقد صارت التكنولوجيا التى تحظى بالقدرة على المنافسة، شرطاً أساسياً للتنمية الإقتصادية والنمو. ويجب على الدول النامية، مثل مصر، أن تسعى لتحقيق أفضل المكاسب التكنولوجية الممكنة من الإستثمار الأجنبى المباشر

I. Introduction:

Today, technology has become the most important source of economic growth, competitiveness, wealth, power, prestige, and even independence. For a long time, capital and labour were considered the principal factors of production. With the increasing globalisation of business activities, knowledge and information have been gaining importance as vital elements of any firm's success in today's global economy. In fact, we are moving from an industrial age to an information age, in which technology has become the most decisive factor of competitiveness (Drucker, 1997). Factors such as technological leads and lags, product differentiation, and economies of scale and scope play an ever-increasing role in comparative advantage building (Howells, 1998). In addition, rapid advances in science and technology and increasing accessibility to the fruits of new knowledge both lead to rapid obsolescence, and thus to enhancing the role technology plays in every day's life of the business world. Personal computers, for instance, may be an extreme example of rapid obsolescence of technologies. In brief, one could say that the Ricardian theory of comparative advantage might have "passed away" (Gutterman and Erlich, 1997). Rather, the current state of world economic affairs should be described by a "neo-technology" version of the theory of comparative advantage. In effect, knowledge has vigorously destabilised the composite of land, labour, and capital as the chief economic resources.

FDI has become a more dominant ITT channel than ever. Although non-FDI forms of ITT have been growing since the 1960s, FDI forms have become dominant since the 1980s and are expected to become even more dominant in the foreseeable future. Factors accounting for this shift include, among others, the ongoing global trend of FDI liberalisation, large-scale abolition of international trade barriers, increased globalisation of economic activities, and the growing need for technological competitiveness in order to survive and grow economically. Although most FDI takes place in the North, an increasing amount is moving to the South. While admitting the importance of the level of FDI inflows, developing countries could, and should, make better technological exploitation of these inflows.

From the economic viewpoint, FDI is an inferior form of ITT, compared to contractual licensing. Although it is typically a better source of state-of-the-art technologies, it tends to offer less domestic externalities. In addition, the existence of MNCs in developing economies tends to be associated with anticompetitive dominance and predatory practices by these firms. However, FDI can be very beneficially directed to build domestic technological capabilities, provided that host countries give due attention to the technology component of FDI, and especially if it takes a joint-venture form. The major determinants of the extent of technological benefits reaped from FDI include the macroeconomic environment, the regulatory environment, host-country technological absorptive capacity, the system of protection of intellectual property rights, and the availability of ITT incentives. Actual technological spillovers from FDI can take place through a number of channels: linkages with local firms, training of local manpower, and demonstration effects. Assuming that the determinants and channels of technological spillovers from FDI are appropriately framed in an accurate overall ITT policy, FDI can be a major source of technological and economic gains in the South.

The international FDI setting offers a number of opportunities to host developing countries. These opportunities include, first, the ongoing trend towards FDI liberalisation and the associated relaxation of ownership restrictions on foreign investors. Actually, the significant demolition of ownership restrictions is considered the most important driving force behind the recent resurgence of global FDI flows. As for developing countries, their FDI inflows have been increasing, which have entailed more and more advanced ITT to these countries. Second, the macroeconomic environments in most host developing countries have radically improved. A particularly favourable macroeconomic development is the significant eradication of international trade barriers. Foreign trade liberalisation tends to reinforce the trend of increasing global FDI flows, as it facilitates the importation of production inputs by foreign firms, and so enhances ITT. Third, developing countries have largely shifted their focus from the mere transfer of technology to the deeper objective of domestic absorptive capacity building, where an ITT policy acts as only one tool of holistic national technology systems. The focus on technological capacity building improves the functioning of the dynamic mechanism of technological development. According to this mechanism, ITT should enhance domestic technological capacity, which in turn should lead to more ITT inflows. Finally, the TRIPs Agreement has established an almost global minimum level of IPRs protection. Although of no substantial evidence, stronger IPRs protection may encourage FDI and ITT inflows. Domestically, however, a reliable IPRs environment is a necessity for creating an environment conducive to innovation and R&D investment.

In view of the absence of a multilateral agreement on investment, the international legal FDI environment is still significantly loose. The existing international legal instruments leave, among others, the use of ITT requirements, local employment requirements, and investment incentives unregulated. In addition, these international instruments allow local content requirements, as long as they are confined in their effect to local markets. On the positive side, this implies a large room of movement for host countries with respect to the

technological manipulation of FDI. Unfortunately, Egypt and most other developing countries do not make appropriate use of this room of movement, and as such are far from achieving the best technological exploitation of FDI. Rather, host developing countries, such as Egypt, should make the best possible technological use of FDI, through inducing foreign firms to undertake more and better ITT activities.

2. Purpose of the Study:

The purpose of this case study is to test the hypothesis that there exists a strong potential for improving the ITT component of FDI in Egypt through:

(i) Enhancing local technological capacity,
(ii) Introducing new local content requirements,
(iii) Using ITT requirements,
(iv) Offering investment incentives,
(v) And strengthening the protection of intellectual property rights (IPRs).

The discussion of the case covers the local regulatory environment (Investment Law No. 8/1997 and Commerce Law No. 17/1999), the institutional environment [the General Authority for Investment and Free Zones (GAFI)], and the policy environment [National Technology Policy (NTP) of the Academy of Scientific Research and Technology (ASRT) and National Strategy for Technological Development (NSTD)]. Then, actual technological impact of FDI in Egypt is analysed.

To qualify the discussion of this case, input from a group of representative MNCs' active in Egypt (20 in 7 different lines of activity) was sought through a questionnaire and, as far as possible, interviews with the relevant officials. Such technique should be of valuable practical insights as to what are the major areas of recommended action in order to make the best technological use of FDI in Egypt.

3. The Local Regulatory Environment:

Until the adoption of Law No. 43/1974, which set into action an open-door economic policy, Egypt used to highly regulate FDI and ITT. This law established a more favourable environment towards ITT through authorising the government to selectively approve of foreign investors' applications to form joint ventures with local firms (UNCTAD, 1990a). Law 43/1974 introduced ITT as one of the major criteria for admitting FDI proposals. This criterion was then carried over to other investment laws, though applying to green-field FDI as well. Under the increasing pressure of the global trend of FDI liberalisation, two other investment laws were issued. They gradually limited government intervention and largely left ITT to market forces, while confining the role of the government to providing an accommodating domestic environment. These two laws are Investment Law No. 230/1989 and Investment Law No. 8/1997. Expectedly, the second law repeals the preceding two laws, and as such the study only analyses the ITT implications of Law 8/1997.

Investment Law 8/1997 uses a positive list approach, in which FDI is automatically admitted in listed areas. The Prime Minister is empowered to list new areas by issuing ministerial decrees. Thus, Law 8/1997 has significantly relaxed previous ownership restrictions on FDI and confined the discretionary powers of the relevant authorities with respect to FDI admission to unlisted areas. Unlisted areas, particularly, include sensitive investments, such as in natural resources, energy, marine transportation and others. Most importantly, Law 8/1997 contains no performance requirements or conditioning of any privileges on technology transfer, R&D activities, or training of domestic workforce (UNCTAD, 1999a). This sounds inconceivable when we consider the fact that, in the ongoing discussions within the WTO, Egypt calls for complete discretion to developing countries as to the use of performance requirements and investment incentives. However, the Egyptian government has been known for its policy of genuine interest in local employment, especially in privatised firms, and requiring foreign firms to keep, or otherwise develop, high local employment shares, even sometimes at the expense of overall investment efficiency. In addition, only recently, the government has started to condition tax holidays offered for investment in new cities on local content requirements. This practice escapes the Trade-Related Investment Measures Agreement (TRIMs), as long as it is confined to local production and does not distort international trade. Law 8/1997 largely incorporates the same ITT screening mechanism of Law 43/1974. However, as implied by the automatic admission system, even this screening mechanism has become confined to the unlisted areas of Law 8/1997. In addition, Law 8/1997 incorporates investment incentives (tax holidays), only as a tool of promoting FDI in new cities and remote areas. Otherwise, Law 8/1997 contains no specific ITT provisions, which may reflect an exaggerated degree of flexibility on the side of the Egyptian legislature.

Until the issuance of Prime Minister's Decree No. 740/2000, with amendments and new activities entitled for the same protection and incentives provided for in Law 8/1997, this law made no distinction whatsoever between high-technology and obsolete-technology investors, and did not include any incentives to encourage advanced ITT or R&D activities by local economic actors (Peoples Assembly, 2000). The decree enlisted three new areas of technological investment: designing and manufacturing equipment, machinery, and production lines; designing computer software and producing electronic audio, video, and data compilations; and

establishing and managing technology valleys. Hence, the three areas now enjoy the same general protection provisions of Law 8/1997, and can make use of the tax holidays offered by the same law for investment in new cities.

In 1999, the Egyptian legislature issued the new Commerce Law No. 17/1999. Articles 72-87 of Law 17/1999 deal with technology contracts. The new law tries to strike a balance between protectionism and liberalism, but generally tends towards unreasoned protectionism of local technology importers (Peoples Assembly, 2000). This approach suffers from a number of problems, including, first restricting the competitiveness of the Egyptian economy in a global setting characterised by severe competition to attract FDI, especially high-technology FDI. Second, Law 17/1999 largely applies the protectionist philosophy that prevailed between the 1960s and early 1980s, at the time most other countries have abandoned such philosophy since the late 1980s. Third, the law ignores the fact that the best protection of foreign-technology importers is maximising their chances in obtaining the technologies they need, in a balanced legal environment. Fourth, Law 17/1999 largely fails to provide incentives to attract needed ITT and FDI, or encourage technology importers to absorb and further develop foreign technologies. Instead of absolute outlawing of a big number of restrictive business practices in ITT agreements[1], which has become an obsolete approach in most of the world, the law should have applied a proactive approach aimed at encouraging ITT operations, through allowing restrictive practices that are justifiable by other offsetting gains, as long as this practice does not contravene with the objective of ensuring fair competition in the local market. In addition, Law 17/1999 should have incorporated rational ITT incentives aimed at encouraging the transfer of needed foreign technologies. In essence, Law 17/1999 fails to provide a balanced, accommodating, or attractive ITT environment.

With respect to IPRs protection, Egypt is a signatory of all major IPRs protection conventions. However, enforcement of IPRs is largely ineffective and courts have little experience in this field. Particularly, in the area of patents, protection has been provided under Law No. 132/1949, which suffers from some major discrepancies with international patent protection standards. First, the protection period, under this law, is a standard 15 years period from application date, with pharmaceutical and food products given only 10 years protection. Second, the law is replete with compulsory licensing provisions. Particularly, it provides for the expropriation of a patent by the state on the grounds of public interest or national defence. Third, the law's definition of infringement excludes the use, sale, or import of a product produced via a process protected in Egypt, if the law prohibits patenting the product itself. In the area of copyrights, piracy in video and audio cassettes and disks, textbooks, and computer software is a problem with wide ramifications. For instance, the percentage of pirated computer software amounts to around 85% of all software used (Peoples Assembly, 2000). The protection of trademarks and other IPRs is less of a problem. Recently, however, a new IPRs law was drafted and has been in the legislative pipeline until this very moment. This law is expected to largely improve Egypt's record in IPRs protection and fulfil its commitments under the TRIPs Agreement (UNCTAD, 1999a). Redressing the weaknesses of the IPRs protection system should provide an environment more conducive to creativity and may lead to higher FDI and ITT inflows.

Egypt regulates ITT only through ITT provisions in its investment and commercial laws. There has never been an independent ITT regulation or any other separate regulatory mechanism for contractual licensing or other non-FDI forms of ITT. This has had its negative impact in terms of marginalizing the role ITT plays in Egypt. Most importantly, there is a need to establish an adequate mechanism for entry of external forms of ITT (UNCTAD, 1990a). In addition, the legal ITT environment as well as the general legal environment need some radical changes, so as to be parallel to counterpart environments in most other developed and developing countries. Otherwise, the technological competitiveness of the Egyptian economy will remain prejudiced.

4. The Institutional Environment:

The General Authority for Investment and Free Zones (GAFI) is the only entity entitled with full powers for examining and approving of FDI projects in the unlisted areas of Law 8/1997 (UNCTAD, 199a). Projected technology transfer is one of the main factors why approval should be given. GAFI controls this factor through requiring FDI application forms to include a description of planned technology transfer and training; detailed description of equipment to be imported; projections of the ratios of technical/administrative, skilled/unskilled, and foreign/local personnel; and a recapitulation of balance of payments issues such as royalty payments, management fees, expatriate salaries, interest payments, loan repayments, and other payments in foreign currencies (UNCTAD, 1990a). Especially, the questions about whether imported technologies are labour or capital intensive and the effect of such technologies on employment are very sensitive questions in Egypt (UNCTAD, 1995a). GAFI's staff and experts conduct detailed legal appraisal of submitted projects and involved ITT agreements. In this context, they enjoy a large degree of discretion as to whether or not to accept

1 There is only one widely accepted prohibition on restrictive business practices. This is the prohibition of contract provisions restricting the ability of technology importers to export products processed through imported technologies, as such a restriction would impair the ability of the technology-recipient country to promote its exports (Peoples Assembly, 2000).

foreign investors' applications. Practically, however, there has been a clear policy tendency towards approving of FDI applications, unless they are related to very sensitive areas. Even in sensitive cases, the relevant authorities often show a large degree of flexibility in negotiations. The main driving force behind such flexibility is the starvation for additional capital finance inflows in order to help achieve targeted economic growth rates. GAFI, however, depends on specialised ministries and other bodies, such as the ministries of Agriculture and Health, the General Organisation for Industrialisation, UNIDO, universities, commercial consultants, and other NGOs for technical appraisal of projects submitted and technology transfer agreements involved. Decisive elements in any such appraisal are the impact of a project on the national economy and the extent of its conformity with national development objectives (UNCTAD, 1990a). Whereas FDI in the listed areas of Law 8/1997 are admitted automatically, after complying with a set of routine procedures, which the government is concerting its efforts to facilitate. Consequently, FDI in the latter areas are not subject to the legal technology monitoring mechanism at all.

There is a wide spectrum of ministries and other governmental institutions participating in the implementation of plans of scientific research and technological development. Science and Technology (S&T) Policy is principally entrusted to the Ministry of State for Scientific Research (MSSR) in association with the Ministry of Higher Education (MHE). Thirteen other technical ministries are also heavily involved in S&T policy. They include two newly introduced ministries: Technological Development (part of the Ministry of Industry and Technological Development) and Telecommunications and Information. The Minister of State for Scientific Research heads a Permanent Ministerial Committee, the main task of which is coordinating between the different ministries involved in S&T activities. Co-partners with the MSSR and the MHE include the Academy of Scientific Research and Technology (ASRT) and the Supreme Council of Research Centres and Institutes (SCRCI). The MSSR has fourteen attached research centres, the largest of which is the National Research Centre with a total workforce of around 6,000 employees (UNCTAD, 1999a). In addition, there are the different universities and institutes, which represent the wide technological base of the country. Both the Export Development Bank and the Industrial Development Bank have separate departments that give assistance to private firms, especially involving the promotion of technological development (ASRT, 2001 and UNCTAD, 1999a).

There are around 350 S&T institutions in Egypt, about 70% of which are higher education ones, only 16% in the productive sector, and the remaining 14% are general-service institutions (ASRT, 2001). As can be inferred from the distribution of S&T institutions, the number of such institutions in the productive sector is very modest. In addition, there is a big gap between the productive sector and the rest of the S&T infrastructure. Virtually, this gap deprives the country from making use of much of its real technological potential. In general, institutions in Egypt suffer from acute problems, and need major restructuring, streamlining, and coordination programs.

5. The Policy Environment:

Since the early 1980s, Egypt has been applying a national technology policy (NTP) formulated and monitored by the ASRT (UNCTAD, 1995a). A major driving force behind the NTP was the dissatisfaction of the R&D community with the marginalized role they play in the national economy, and with Egypt's huge dependence on intensive-technology imports. Actually, evidence suggests that the utilisation of domestic R&D resources by local firms is trivial in Egypt (UNCTAD, 1999a). The NTP has three major dimensions: addressing the weaknesses of the national R&D community and strengthening its links with industry; formulating an appropriate ITT strategy, maximising the benefits from ITT, and minimising the negative impact of restrictive practices in ITT agreements; and encouraging technological capability building in the critical areas of advanced sciences and high technologies, as they have become corner stones of any economy's growth (UNCTAD, 1995a). As could be inferred, the debate on science and technology policies in Egypt is highly focused on strengthening the role the local R&D community plays in the productive sector, while underestimating the time and money ITT can save. At any case, there have been recent efforts to revise the NTP. Particularly, an appropriate technological development policy should reflect Egypt's need to establish an adequate mechanism of unpackaged ITT, strengthen available ITT mechanisms, and enhance the availability of information about alternative technologies and ITT channels.

In a new attempt to deal with the deep technological marginalisation of the Egyptian economy, the Peoples Assembly adopted the so-called National Strategy for Technological Development (NSTD) on the 31st of May 2000. The objectives of the NSTD include increasing economic growth, promoting exports, improving competitiveness in local and world markets, making use of advanced technologies in reducing production costs and product prices, confronting high unemployment, contributing to environmental protection, enhancing human capital development, and supporting national independence and economic capability. The NSTD relies on two main premises: transferring, absorbing, adapting, and further developing foreign technologies, and enhancing technological self-dependence (Peoples Assembly, 2000). A special focus of the NSTD is producing high-technology products and developing the information industries, such as software and telecommunications.

Although it received more attention in the NSTD, ITT remains a largely marginalized tool of technological development. The authorities overemphasise the fears from technological dependence on foreign suppliers; weakening national technological capabilities; vexatious terms of transfers; huge costs of ITT transactions; lack of domestic absorptive capacity; and transferring technologies that are incompatible with national development plans, the socio-economic environment, or environmental protection standards. On the other hand, the NSTD does not equally emphasise the gains the Egyptian economy can achieve from ITT. Thus, this strategy largely underestimates the role ITT and FDI can play in national technological development efforts. In essence, Egypt lacks an appropriate ITT strategy that can help invigorate the technological competitiveness of the Egyptian economy. Particularly, FDI should be a focal ITT tool in any such strategy. It is time to review the focus on FDI as a source of external capital transfer, while under-exploiting its technological development potential.

6. FDI and Technology in Egypt: Data and Trends:

The ranking of the four most FDI-attractive African countries was constant over the years 1998-1999, where the descending order was Angola, Egypt, Nigeria, and South Africa respectively. Egypt kept its rank as the second most FDI-attractive African country, with annual FDI inflows of slightly less than US$ 1.1 billion in both years (World Investment Reports, 2000/1). Furthermore, Egypt was expected to keep a similar ranking among African countries in the short-term. In a survey undertaken by UNCTAD on a sample of MNCs worldwide, Egypt ranked third after South Africa (first) and Morocco (second) and before Tunisia (fourth), as the expectedly most advanced African country in improving the business environment during the years 2000-2003. The same survey revealed that Egypt ranked second after South Africa (first) and before Morocco (third) and Nigeria (fourth), as the expectedly most FDI-attractive African country during the years 2000-2003 (World Investment Report, 2001). Impressively, in 2000, Egypt actually picked up to the first rank with around US$ 1.2 billion (World Investment Report, 2002). However, it then fell back to the seventh rank with around US$ 500 million after South Africa, Morocco, Algeria, Angola, Nigeria and Sudan respectively. This last decline is partly due to a few large FDI projects in South Africa and Morocco.

Unfortunately, Egypt's share in global FDI inflows remains too small to satisfy the targeted economic growth rate of 6% per annum, which is needed to absorb an average of 0.5 million new labour market entrants each year and decrease the unemployment rate of 8% to a more manageable rate (USAID, 2002). As a percentage of gross fixed capital formation, Egypt's inflow of FDI was only about 2.2% in 1998 and 1.8% in 1999 (International Financial Statistics, 2001). Compared to overall world FDI inflows, Egypt's share is negligible. With respect to Africa as a whole, from overall world FDI inflows of US$ 692.5 billion in 1998, US$ 1,075 billion in 1999, US$ 1.000 billion in 2000 and US$ 735 billion in 2001, Africa's shares were US$ 7.7 billion (1.1%), US$ 9 billion (0.84%), US$ 9 billion (1%) and US$ 17 billion (2%) respectively (World Investment Report, 2001/2). In spite of recent improvements, Africa's share in world FDI inflows remains minimal in view of the continent's big share in world population and its unexploited economic potential.

As provided by GAFI, the latest figures of FDI in Egypt run as in table (1). In 2001, the total number of MNCs operating in Egypt and registered according to the new Investment Law 8/1997 is 147 firms. The foreign share in overall investment expenditure in these firms is about 31%. The local employment share in the 147 firms is slightly more than 98%. The figures reflect a heavy existence of MNCs in the Egyptian economy. At least 26 of the 147 MNCs have been among the biggest 100 MNCs worldwide during the last few years (GAFI, 2001). In 1997, and according to World Investment Report (2000), Egypt ranked as the 17th most transnational developing economy[2]. In fact, the major attractions of FDI in Egypt are its sheer market size, accommodating macroeconomic environment, and low-wage skilful labour. Due to government intervention and the relatively high stock of human capital, the share of local employment is overwhelmingly high. This is very promising as to further developing local labour and widening the base of clever labour and entrepreneurial skills. Unfortunately, the majority of finance even in this type of investment comes from local sources. Just lately, the government started to realise the high leverage foreign investors have in the domestic financial market and their high dependence on local bank finance. In view of the scarcity of capital finance needed to boost economic growth, the government has set off on efforts to make better use of the deep pockets of MNCs operating in Egypt.

With respect to science and technology, the comparison table (2) reveals some of the strengths and weaknesses of Egypt in this area. Egypt is rich in human capital, as the average number of R&D specialists per million people was 800 in Egypt during the years 1987-1997, which is higher than that in China and all other developing countries in table (2) except Singapore and South Korea. Unfortunately, Egypt spends very little on R&D, as the average spending on R&D was only 0.22% of GNI during the years 1987-1997, which is below that in all other countries in table (2) except Indonesia and Thailand, and far below the developing-country benchmark of 1% of GNP. This has been echoed in the negligible value of high-technology exports of only US$

[2] There are four criteria for the UNCTAD transnationality index: FDI inflow as a percentage of gross fixed capital formation during the years (1995-1997), FDI inward stock as a percentage of GDP in 1997, value added of foreign affiliates as a percentage of GDP in 1997, and employment of foreign affiliates as a percentage of total employment in 1997.

3 million in 1999, which is far below that in any other country in table (2). In addition, the weakness of Egypt's local R&D spending is reflected in the small number of patents held by residents, where these residents are most often foreign firms represented in Egypt, not necessarily nationals. Peoples Assembly (2000) states that the number of patents registered globally by Egyptians between 1992 and 1996 is 12 patents only. As for royalty and fees receipts and payments, Egypt ranked in the fourth place among all the countries in table (2) with respect to each of the receipts and payments. Up to a point, this reflects a limited involvement in technology licensing activities by Egypt.

The figures in table (2) indicate an overall poor science and technology environment in Egypt. Other developing countries have outpaced Egypt with respect to technological development. Apparently, Egypt did not make use of the tide of reverse engineering and imitation activities, of which countries like Malaysia and Thailand are very famous examples. At any case, time is over for such activities, as the WTO TRIPs Agreement sets in place a new international system that mercilessly punishes activities infringing intellectual property rights. In effect, the TRIPs Agreement makes technological development efforts of technology latecomers, such as Egypt, more difficult (Correa, 2000). The only way to have feasible access to the technological fruits of other countries has become mutually accepted ITT.

VII. Studies on the Technological Impact of FDI in Egypt

The Egyptian economy has been taking forward leaps since the early 1990s. The large domestic market size and the currently promising macroeconomic environment have been attracting increasing FDI inflows (World Investment Report, 1999). In addition, particularly FDI-attractive are Egypt's membership in several regional free trade arrangements [such as the Common Market for East and South Africa (COMESA), the Great Arab Free Trade Area and Egypt-EU Partnership Agreement] and the overwhelming liberalisation of foreign trade (as necessitated by Egypt's membership in the WTO). Other important FDI attraction factors include the high human-capital stock [table (2)] available at low cost and the wide domestic R&D base of around 350 science and technology institutions (though this base is significantly separate from the market and largely ineffective) (UNCTAD, 1999a). Nonetheless, actual FDI inflows of around US$ 1.1 billion over the years 1998-1999 remain too small to parallel Egypt's efforts and economic potential.

Generally, Egypt gives high attention to science and technology through education, human capital development, as well as a degree of support to local science and technology institutions. Nevertheless, relatively less attention is given to ITT. The most important source of ITT is capital goods imports, which is the case in most other developing countries, then comes FDI, though inadequately exploited (DEPRA, 1998). As opposed to fast growing East and Southeast Asian economies, licensing, whether external or internal, plays a trivial role in the Egyptian economy [table (2)]. Egypt's shortcomings with respect to ITT restrict the potential of its economy. Thus, there should be a more effective ITT policy, which all relevant authorities apply diligently.

UNCTAD (1999a) studies the FDI environment in Egypt and states that Egypt enjoys an attractive base of human capital and technological infrastructure, which refers to a high technological absorptive capacity. There is a high stock of human capital and wide network of R&D institutions. On the other hand, the country suffers from inefficient national technology management, marginalisation of ITT, inadequate public and private R&D resources, and weak integration between R&D institutions and industry. It can be said that Egypt invests heavily in human capital and R&D institutions, but spends very little on actual R&D activities[3]. Peoples Assembly (2000) states that the number of patents registered globally by Egyptians between 1992 and 1996 is 12 patents only. In addition, although there is a relatively high stock of human capital, the abundance of skills is largely confined to technical and engineering personnel. Repeatedly, foreign investors complain about a shortage of middle-level and supervisory managerial skills, which is generally common to African countries (UNCTAD, 1999a and DEPRA, 1998). Thus, there is a need to attempt the path of Southeast Asian countries, such as Malaysia and Singapore, in inducing the private sector (local and foreign) to develop high-quality specialised training facilities that can contribute to fulfilling the different needs of the productive sector.

Though a modest contribution, FDI flows to Egypt have contributed to domestic technological development, especially in such areas as productivity and managerial skills[4]. In a survey of foreign firms working in Egypt

3 The private sector invests very little in R&D, 0.04% of GNP in 1990, and the R&D expenditure of both the public and private sectors is under the developing countries' benchmark of 1% of GDP (UNCTAD, 1999a).

4 This is very obvious in industries such as pharmaceuticals, textiles and garments and electronics and information technology. Outstanding examples include wholly-owned subsidiaries, such as Oracle, Bechtel, IBM, Nestle, 3M, Shell and Xerox as well as majority-owned subsidiaries, such as Glaxo Welcome (90%), Novartis (70%), Lecico (75%) and Eli Lilly (85%). These firms have all transferred some of their state-of-the-art technologies. In addition, joint ventures such as Ezz Group (steel joint venture named at the Egyptian partner), Suzuki and GM have been of significant importance for

conducted by the UNCTAD in 1997, in association with the Economic Research Forum (ERF) of North Africa and the Arab Countries, three major technological benefits of FDI were signalled: productivity improvement, product development, and sharing of R&D activities (UNCTAD, 1999a). In addition, particularly in Upper Egypt, foreign firms use labour-intensive technologies, which contribute to governmental efforts to alleviate unemployment and enhance human capital development.

Unfortunately, ITT activities by foreign investors in Egypt are largely limited to low-technological-content assembly operations (Peoples Assembly, 2000). Working under minimal performance requirements, MNCs tend to focus on exploiting the large size of the Egyptian market, with little interest in exportation or advanced technology transfer. In a study presented to the UNCTAD Working Group on the Interrelationship between Investment and Technology Transfer (between January 1993 and March 1994), two major MNCs working in Egypt were examined as to their contribution to domestic technological development (UNCTAD, 1995a). Science-based activities of the examined MNCs were predominantly confined to field-testing of products for demonstration purposes, training programs, and environmental consciousness activities. The study could not trace any significant R&D efforts aimed at developing new products or processes.

A major weakness of FDI as a source of ITT to Egypt is the relative absence of upstream and downstream linkages with domestic firms even in linkage-intensive industries, such as automobiles and consumer durables (UNCTAD, 1999a). As a result, FDI has weak domestic externalities. In fact, most Egyptian manufacturing enterprises are small and medium-sized enterprises, which can strongly feed FDIs, but lack requisite operating technologies, managerial skills, and technical expertise. This is why they tend to have difficulties meeting the quality standards and delivery requirements of foreign firms. Thus, there is a need to strengthen FDI local linkages, particularly in industries with high FDI and innovation potential such as agronomy, textiles, and information technology, through supporting small and medium-sized enterprises and requiring certain local content ratios in exchange of adequate advantages (UNCTAD, 1999a).

8. Survey of MNCs in Egypt:

The research includes a survey of twenty MNCs working in Egypt, with the major aim of testing the technological impact of these firms' investment on the Egyptian economy. The survey was undertaken through a questionnaire and, as far as possible, interviews with the relevant officials. The twenty firms surveyed are drawn from seven broad sectors: medical, sanitary, and healthcare (five); telecommunication and electronics (three); infrastructure (three); food and beverages (three); Automotive (three); pharmaceutical (two); and engineering consultancy (one)[5]. The seven sectors chosen are technology-intensive, where only infrastructure and food and beverages are mostly traditional industries, while the other five sectors are more science based. All the firms chosen are worldwide leaders in their areas. Thirteen firms hold a subsidiary status and the remaining seven are in the form of joint ventures. The sample avoided all types of branches and representative offices of MNCs, as these forms are mostly of commercial rather than substantial investment nature. Thus, the sample of MNCs is significantly representative of the different types of technology-intensive FDI in Egypt.

The survey tests the research hypothesis that there exists a strong potential for improving advanced technology transfer through FDI in Egypt through five suggested policies[6]:

(i) Enhancing local technological capacity,
(ii) Introducing new local content requirements,
(iii) Using ITT requirements,
(iv) Offering investment incentives,
(v) And strengthening the protection of intellectual property rights.

The survey begins by investigating the sample MNCs' involvement in ITT activities, using spending on R&D, technology licensing, and technological spillovers in the local economy as proxies for ITT. Conspicuously, all these proxies may be enforced as ITT requirements from foreign investors (policy - iii). Then, it tests whether the sample firms are subject to foreign ownership limitations or local content requirements (policy - ii), in order to be better poised to understand the firms' responses on their involvement in ITT activities. Actually, foreign ownership restrictions may deter foreign investors from transferring their most competitive technologies due to fear from leakage to local counterparts, while local content requirements may force foreign investors to transfer advanced industrial technologies to local production units. Most importantly, the firms are requested to provide

technological learning by national firms. Most joint ventures however are subject to minority ownership constraints, which might have deterred transfer of latest technologies (UNCTAD, 1999a).

[5] The twenty firms are: Procter and Gamble, Unilever, Johnson and Johnson, Duravit, and Sany Acrylic (medical, sanitary, and healthcare); Mitsubishi Electric, Siemens, and Xerox (telecommunication and electronics); ABB, FerroMetalco, and UNIMAR (infrastructure); Nestle, Vitrac, and Gianaclis (food and beverages); Mercedes, Suzuki, and General Motors (automotive); Pfizer and Novartis (pharmaceuticals); and House of Wisdom (engineering consultancy).

[6] Whenever possible, reference will be made to the numbering of these policies of improving ITT.

feedback on the major areas of recommended action, so as to enhance ITT through FDI. In this context, the firms are requested to rank policies (i), (ii), (iii), (iv), and (v) in order of importance. Finally, the survey is used to derive general recommendations on enhancing the overall technological competitiveness of the Egyptian economy.

8.1 Spending on R&D:

While eight firms reported spending on R&D to be confidential, most others said it is insignificant. Exceptions to this general statement include Mitsubishi Electric with an average of 4.5% of total annual sales spent on R&D, Vitrac with 2.5%, and Mercedes with 2%. Still, the survey makes it clear that most R&D undertaken by MNCs is adaptive rather than inventive. Although Proctor and Gamble spends 3-4 million L.E. on market research each year, this expenditure cannot be considered investment in R&D. The engineering consultancy firm House of Wisdom considers the research done in IT and lean manufacturing to be one of the main tasks carried out everyday, and as such no separate budget is designated for R&D. Only, Vitrac has a separate R&D department, where new recipes are developed and tested. In general, this part of the survey reflects an insignificant R&D investment by sample firms, and hence a weak ITT component of FDI in Egypt.

8.2Technology Licensing:

The survey shows that most firms get their licenses from mother or other affiliated firms (if they are subsidiaries) or foreign partners (if they are joint ventures). Only two firms (House of Wisdom and Gianaclis) have licenses from other unaffiliated foreign firms. Four firms have no licenses at all, and none reported licenses from national licensers. Concerning the novelty of technologies, the survey indicates that technologies licensed are 10-20 years old on average in six firms, more than 20 years old in four firms, and less than 10 years old in six firms. Although the majority of surveyed firms reported heavy licensing activity, most technologies transferred are more than 10 years old. This reflects a high degree of outdated standardisation in the domestic market, as most firms do not transfer the latest state-of-the-art technologies from their mother firms or foreign partners. With respect to know-how, which is not a negligible subject of transfer, it takes place automatically in FDI cases. Mother firms and foreign partners have a genuine interest in transferring their latest know-how to local firms, without any need for separate agreements. In general, this part of the survey reveals a heavy licensing activity that lacks the state-of-the-art nature.

8.3 Technological Spillovers in the Local Economy:

Technological spillovers from MNCs' activities take place through three main channels: linkages with local firms, training of local manpower, and direct competition (which is the main driving force behind the so-called demonstration effects). In addition, technology diffusion may take place through a more direct form, in case foreign firms get involved in direct technological cooperation schemes with local firms, most often local suppliers and customers. The survey indicates a high volume of spillovers, especially that fourteen of the firms surveyed reported linkages with local firms to be at least high, fourteen said that training of local manpower is at least high, and fourteen think that they work in an at least a highly competitive market. Only, Procter and Gamble is very highly involved in direct schemes of technological diffusion to local suppliers and customers, while only three other firms report such diffusion to be high. In general, this section indicates that there should be strong technological spillovers from FDI in Egypt. However, actual technological spillovers from FDI only take place when linkages with local firms involve a degree of quality improvement, trained personnel of MNCs move to local firms, or when demonstration effects take a technological competition approach. Notably, there is a general lack of these actual spillovers in developing economies. In addition, a sine qua non condition for actual spillovers to take place is an adequately strong domestic absorptive capacity (policy - i). Otherwise, local agents may be unable to reap the maximum possible technological benefits from FDI. With respect to Egypt in particular, even when actual technological spillovers from FDI take place, they must be subject to the aforementioned deficiencies in spending on R&D [section (1)] and technology licensing by foreign investors [section (2)]. Table (3) shows the distribution of firms as to their involvement in technological spillover activities.

8.4Foreign Ownership Limitation:

None of the firms surveyed was subject to foreign ownership limitation, either before Law 8/1997 or after that law. This means that, for all firms surveyed, the choice between a joint venture and a subsidiary was left over to the preference of concerned parties. In itself, this should induce foreign investors to undertake more R&D and advanced ITT activities, as they can freely make the choice they deem necessary to protect their most competitive technologies. Nevertheless, the two previous sections on spending on R&D and technology licensing generally reveal an insignificant R&D expenditure and a lack in state-of-the-art ITT activities by sample MNCs.

8.5 Local Content Requirements:

In addition to the consultancy firm (House of Wisdom), nine other firms reported no local content requirements (policy - ii). Four firms were involved in exportation operations, and as such have to abide by the minima of local content required to qualify for Egyptian origin, in order to take advantage of tariff concessions offered for products of Egyptian origin in the different regional trade arrangements (such as the COMESA, GAFTA, and Egypt-EU partnership). Each of Mercedes, Suzuki, and General Motors reported local content requirements of at least 45%, as conditions to qualify for the ten-year tax holiday offered by the government for investment in new cities. Conspicuously, each of Mercedes, Suzuki, and General Motors produce for the domestic market, and so the local content requirements they are subject to escape the TRIMs Agreement, because these requirements do not interfere with international trade. In compliance with the 45% local content condition, Mercedes had to build a new production plant, and should start full-scale manufacture of components and cars for both the local and regional markets in May 2002. Finally, Mitsubishi Electric, Siemens, and FerroMetalco reported irregular local content requirements of up to up to 20% in some cases, only in some of the contracts signed with the government. Generally, governments of both developed and developing countries, especially on the municipal level, use government procurement policies to achieve objectives such as encouraging linkages between foreign and local firms.

To sum up, this section reflects a general governmental policy based on abstention from enforcing local content requirements from foreign investors. This leaves space for those investors to rely on imported components more than local counterparts. However, one should say that foreign firms have a genuine interest in developing efficient local suppliers, even if not subject to any local content requirements or limitations, because local suppliers can offer a number of advantages in terms of cost, time, and distance. In this context, one can understand the high linkages with local firms that were reported in the previous section on technological spillovers in the local economy.

8.6 Enhancing ITT Activities:

Assuming that there are seven major factors that can encourage ITT activities by foreign firms, the surveyed firms were requested to rank the seven factors in order of importance. Five of these factors are covered by the research hypothesis. The remaining two are the macroeconomic environment and foreign ownership restrictions. Both are outside the research hypothesis, due to the first being general to all types of economic activities and the second being assumed to have a negative effect on ITT by foreign investors. The resulting ranking is as follows: enhancing local technological capacity (policy - i)[7], offering investment incentives linked to ITT activities (policy - iv), providing an accommodating macroeconomic environment, introducing new local content requirements (policy - ii), using ITT requirements (policy - iii), protecting intellectual property rights in a more effective way (policy - v), and using foreign ownership restrictions. Notably, the survey reveals a higher than expected priority to the use of investment incentives linked to ITT activities (policy - iv). An accommodating macroeconomic environment is assumed to be a sine qua non for all types of economic activities. Hence, the study will not take this point any further. Finally, the survey reflects a very negative perception of foreign ownership restrictions. Although none of the surveyed firms was subject to any such restrictions, fourteen of the surveyed firms stated that the restrictions are at best hardly important in encouraging ITT activities by MNCs. Table (4) shows the distribution of firms as to their perception of the suggested factors to enhance their ITT activities.

a. Please note that Egypt does not provide any investment incentives directly linked to ITT activities.

b. Please note that Egypt does not impose any ITT requirements from foreign investors.

8.7 Recommendations on Enhancing the General Technological Competitiveness of the Egyptian Economy:

Sample MNCs were asked to make recommendations on how to enhance the overall technological competitiveness of the Egyptian economy. The recommendations received largely apply to other developing countries. Particularly, both Mercedes and House of Wisdom showed high interest in this part, and gave detailed recommendations. Other firms made brief recommendations. Overall recommendations can be summarised as follows, with the number of firms making each recommendation given between brackets:

1. Red Tape and General Institutional Efficiency (Five Firms): there is a dire need to improve general institutional efficiency and the quality of governmental services.

2. Investing More in Human Capital and Improving Labour Productivity (Four Firms) (Policy - i): although Egypt is rich in human capital, labour productivity is generally below that in other developing countries. Market needs should be a pivotal element in education and training programs.

[7] Numbers are as in the research hypothesis, p. 20.

3. Ensuring Macroeconomic Stability (Three Firms): an accommodating macroeconomic environment is a sine qua non of economic development in general. Mercedes thinks that such an environment is missing at the time being.

4. Government Support for High-Tech and R&D Activities, as Part of an Accurate Long-Term Strategy of Technological Development (Three Firms) (Policy - iv): among others, this support can take the form of a rational use of financial and fiscal incentives to private sector R&D, in addition to fostering public sector R&D centres.

5. Encouraging Joint Ventures and ITT Agreements With Respectable Foreign Firms (Two Firms): joint ventures and cooperation arrangements with foreign technology owners can be of major benefit to domestic firms, and can promote domestic technological development rapidly.

6. Selecting Technologies That Are Suitable for the Egyptian Economy, Culture, and Environment (Two Firms): Mercedes stresses the point that the issue should not be how sophisticated a technology is, but how absorbable this technology can be.

7. Improving the Legal Environment (Two Firm): the legal environment still lacks clear legal frameworks in many areas, and the legal system needs radical changes to address its repressive deficiencies.

8. Enforcing the Protection of Intellectual Property Rights (Two Firms) (Policy - v): there is a need to improve and enforce the protection of patents, brand names, and trade secrets. Interestingly, Vitrac reported that, until few years ago, a factory in Kafr El Sheikh used to produce jam labelled Vitrac. When this factory was discovered, Vitrac raised a case claiming closure of the factory and compensation. The factory was successfully closed, but Vitrac could not get any compensation.

9. Further Liberalisation of the Investment Environment (Two Firms): big foreign firms should be encouraged to invest in Egypt, through further liberalisation of the investment climate.

10. Exploiting Government Procurement Policies Positively (One Firm): interestingly enough, FerroMetalco reported that the Egyptian government sometimes conditions foreign inputs in the projects it contracts to private investors. This, however, may be due to the lack of high-quality local substitutes.

Supporting Small and Medium-Size Enterprises (One Firm): such enterprises represent the backbone of the Egyptian economy, and should be supported to enhance their ability to feed giant MNCs and cope with international business and quality standards.

11. Encouraging Exportation and Opening up New Export Markets (One Firm): in fact, the relationship between technological development and exports goes in both directions.

(8) Testing the Research Hypothesis:

The survey supports the research hypothesis, with a minor modification. The survey reveals that there is a strong potential for improving advanced ITT by foreign investors in Egypt through (policy - i) enhancing local technological capacity, (policy - iv) offering investment incentives linked to ITT activities, (policy - ii) introducing new local content requirements, (policy - iii) using ITT requirements, and (policy - v) protecting intellectual property rights in a more effective way. Thus, the only modification the survey makes is moving the importance of investment incentives linked to ITT activities from the fourth rank to the second rank.

10. Conclusion and Recommendations:

Dunning and Narula (2000) state that the improvement of location advantages is the only feasible way of maintaining a "sustainable FDI-assisted development strategy". This applies to all means, which this study suggested for improving the technological exploitation of FDI. Some basic factors of so doing may be optimising the internal spatial distribution of economic activities and encouraging agglomeration of related activities to attract FDI. In fact, MNCs look for scarce location-specific advantages that can marry with and advance their own competitiveness.

In accordance with the research hypothesis, improving local absorptive capacity comes at the top of the list of recommendations to enhance the technological competitiveness of the Egyptian economy. One of the problems of Egypt in this area is the existence of a big gap between science and technology institutions on the one hand, and the productive sector on the other hand. In addition, although Egypt is rich in human capital, certain market-needed skills are missing. Most importantly, a strategy should be developed to link R&D institutions to the productive sector. In addition, Egypt needs to develop skills and know-how in areas such as IT, production techniques and methods, establishing and managing competitive businesses, analysing market needs, and developing appropriate business strategies. In particular, middle-level supervisory skills and other market-needed skills should to be adequately developed.

Egypt does not offer any incentives linked to ITT activities. Just lately, prime Minister Decree No. 740/2000 enlisted three new areas of technological investment: designing and manufacturing equipment, machinery, and production lines; designing computer software and producing electronic audio, video, and data compilations; and establishing and managing technology valleys. Hence, the three areas now enjoy the same general protection provisions of Law 8/1997, and can make use of the tax holidays offered by the law for investment in new cities. In its exact meaning, these advantages do not qualify for the description of incentives linked to ITT. Rather, such incentives may take the form of fiscal incentives (tax holidays, duty remissions, or accelerated depreciation), financial incentives (grants, loan assistance, or risk sharing arrangements), or other incentives (preferential access to infrastructure or risk-reduction guarantee schemes). A key element in ITT incentives is linking them to ITT activities by foreign firms. In fact, both developed and developing countries offer wide spectra of incentives to help achieve economic objectives. Consequently, lack of incentives in some country may result in a diversion of incoming FDI from this country to another. More specifically, lack of ITT incentives may prejudice technological development plans. As a result, ITT incentives may be required in Egypt, provided that they are not abusively used. Very importantly, there should be an accurate cost-benefit analysis of incentives, in order to avoid the potential wiping out of future benefits from incoming FDI. ITT activities receiving incentives may include licensing, know-how transfer, or investment in R&D. In addition, incentives linked to ITT activities may very positively be linked to exportation too, on the basis that advanced ITT may at the same time promote exports.[8]

The use of local content requirements can speed up the technological development process. However, such requirements should be used very cautiously, so as to avoid any possible degrading of the attractiveness of Egypt to foreign investors. In fact, foreign firms have genuine interest in developing local suppliers and customers, i.e. backward and forward linkages, in order to make use of the advantages local businesses offer in terms of distance, time, cost, and consistency. Thus, developing domestic businesses, especially small and medium-size enterprises, is a largely shared target of recipient governments and foreign investors alike. Still, however, local content requirements may be successfully used to enforce higher local contributions to the international production networks of MNCs, provided that they are confined to local production, so as to escape the prohibition of the TRIMs Agreement. In addition, the conditioning of governmental incentives on local content may be an appropriate technique, provided that such incentives are rationally used. Moreover, governmental support to local suppliers can help these businesses improve quality standards and increase local content ratios. Besides financial support and technical assistance, the government can also use its procurement policy as a tool to enforce higher local content in government contracts.

In addition, Egypt does not impose any ITT requirements on foreign investors. Such requirements are totally outside the framework of the TRIMs Agreement. They may include diffusion of technology to local firms, local R&D investment, and training of local manpower. It is recommended that the government introduces ITT requirements from foreign investors, provided that the requirements are used cautiously, so as not to discourage potential foreign investors. In addition, it could be more feasible to link such requirements to adequate and rational fiscal, financial, or other incentives.

A new law on the protection of intellectual property rights is in the legislative pipeline. This new law should fulfil the international standards of protection that Egypt is bound by according to the TRIPs Agreement. Though unproven, surveyed firms stated that stronger protection of intellectual property rights could enhance ITT activities by MNCs. At any case, and at least from the socio-economic viewpoint, a better system of intellectual property rights protection should safeguard and encourage creativity in the society as a whole.

Pressured by anxiety about increasing unemployment and the need for more financial resources, Egypt principally focuses on boosting employment and promoting the capital finance component of FDI. Although important, ITT through FDI or non-FDI forms receives far less attention. This is highly reflected in the lack of performance requirements in Egypt's FDI regulations. Although the TRIMs Agreement does not prohibit ITT requirements, it has been a stable Egyptian orientation that foreign investors enjoy large discretion as to their ITT transactions. On the contrary, Egypt should give more attention to ITT as a tool of domestic technological development. Market forces cannot work without a minimum of government intervention and foreign firms have no interest in building Egyptian technological competitiveness, unless they are induced to do so. If not required, foreign investors should at least be induced to transfer more and more appropriate technologies.

Especially, foreign investors should be encouraged to undertake more local R&D activities in areas such as solving immediate production problems, improving product quality, and strengthening product marketability in neighbouring countries. With time, and as they come to face new challenges, foreign investors should need to undertake deeper local R&D activities, as these activities may provide important innovative solutions and

8 The WTO Agreement on Subsidies and Countervailing Measures (SCMs) exempts Egypt from the provision on the prohibition of subsidies aimed at promoting exports, as one of 20 countries listed in Annex VII, which includes developing countries with average GDP per capita less than $1000 per annum (where GDP per capita is calculated on the basis of 1990 price level).

results. Together with local investment, foreign investment in R&D activities should result in a more attractive local technological base, which in turn should lead to more FDI and ITT inflows (UNCTAD, 1995a).

Also, strategically needed is the removal of remaining legal, institutional, and other obstacles to FDI. Developing countries are increasingly applying a negative-list approach to FDI and removing other legal and financial constraints. Egypt may need to take the same path, as it is transforming into a worldwide benchmark. This, however, does not mean losing control over FDI or signalling wrong messages to foreign investors. Many of the surveyed MNCs complained about red tape and institutional backwardness in Egypt. Bureaucracy should be improved, so as to decrease time, effort, and money required in dealing with public service institutions. In addition, joint ventures, strategic technological alliances, technological consortia, and other technological cooperation arrangements tend to have better domestic spillovers, give local firms access to frontier technologies, and reduce R&D costs and risks[9]. GAFI should apply a comprehensive policy for promoting such arrangements, particularly in areas such as software, petrochemicals, and pharmaceuticals (UNCTAD, 1999a).

In essence, Egypt needs a comprehensive strategy of ITT. Knowing that it would be inappropriate to suggest an independent ITT regulation, in a time existing ITT regulations have been increasingly set aside, a detailed ITT strategy appears to be even a higher-priority suggestion. Such strategy should take into consideration the need for a comprehensive database of available and needed technologies. Other important considerations include the need for feasibility studies of candidate foreign technologies, analyses of socio-economic and environmental dimensions of targeted foreign technologies, compatibility between foreign technologies and domestic absorptive capacities, legal protection of technology importers, and adequate tools to deal with potential anticompetitive practices of technology owners and foreign investors. The government should look after these considerations, through appropriate regulations and policies, in order to direct the different economic actors towards the most beneficial ITT activities. In addition, the government should use its procurement policy so as to get hold of needed foreign technologies, ensure the availability of needed finance and guarantees of ITT operations, and expand its efforts to raise the level of domestic absorptive capacity.

It is also necessary to undertake periodical reviews of ITT operations, in terms of involved contracts and implementation processes, in order to evaluate their impact and rectify any problems. The results of such reviews should be made available to all other technology-importing units, so as to avoid reoccurrence of mistakes or problems and maximise the gains from ITT. In addition, the reviews can ensure compatibility of technologies transferred with national development plans and integration of these technologies in the different sectors of the economy (Peoples Assembly, 2000).

In general, for developing countries to make best use of ITT opportunities, three general policy recommendations could be made. First, host countries should undertake requisite investments in further developing their stocks of human capital, enhancing domestic R&D capacities, and providing stimulating macroeconomic, regulatory, and institutional environments. Second, host countries should give a high priority to channelling FDI flows into the sectors of high and/or needed technologies, and to attracting foreign investors offering the transfer of such technologies. In this context, the transfer of "black-box" technologies should be avoided, or otherwise spillovers from such technologies should be ensured through government intervention. Most importantly, technologies transferred should be appropriately adapted to the distinctive characteristics of host countries. Finally, anticompetitive practices by MNCs should be combated so as to ensure fair distribution of investment returns and, at the same time, establish domestic environments conducive to creativity and ITT.

With respect to international regulation of FDI, developing countries should take collective action towards the recurrent attempts at concluding a multilateral agreement on investment (especially the last attempt within the framework of the WTO), the negotiations on the TRIMs built-in agenda, and the discussions relating to international investment in the UNCTAD. This is particularly needed in relation to development-sensitive investment issues, such as ITT. Developing countries should recognise this fact and prepare themselves in an adequate way. However, the South should not view such an agreement as unavoidable devil. On the contrary, a MAI should have some positive effects, such as attenuating the wasteful incentives competition for FDI; ensuring more stable regulatory environments through irrevocable governmental commitments, which can be particularly useful for the South, where FDI regulations tend to change more frequently; and avoiding the abuse of performance requirements, which can lead to reductions in production costs and product quality of foreign firms. Nonetheless, any MAI should be a "development friendly" agreement that allows for the special needs of developing countries, grants them sufficient transitional periods, and integrates their need for selectivity with respect to FDI liberalisation. Selectivity is particularly needed in choosing which sectors to liberalise, when to liberalise them, and which foreign investments to encourage and which to avoid.

[9] Technological cooperative arrangements can extend to serve as a means of catching up through developing from original equipment manufacturer (OEM) arrangements, original design manufacturer (ODM) to original brand name manufacturer (OBM) (Dyker, 1999).

In addition, enhancing economic and technological cooperation among developing countries can largely contribute to their technological development efforts. This cooperation can take the form of sharing technologies that are more suitable to their needs than those available from other developed countries, establishing or strengthening existing R&D facilities, and joint training and human development programs (UNCTAD, 1992). Moreover, successful technological development in the South cannot be separated from industrialised countries' assistance, especially with respect to least-developed countries. Developed countries can help build critical masses of technology in the South through extending non-commercial ITT and expert advice, enhancing the roles that FDI and other means of ITT can play, and engaging in a more constructive dialogue with developing countries (UNCTAD, 1995a).

It is time for the world to recognise the technology gap and respond to it. Poor countries need to recognise the critical importance technology plays for their poverty-combat battles and development efforts. A "critical mass" of technological capacity is a prerequisite for technological development, adaptation, and implementation. Developing countries are advised to cooperate with the IT industry to help achieve some of the fruits of the revolution in telecommunications and information technology (Sachs, 2000b). Developed countries and international economic institutions should support the technological development efforts in poor-technology countries through market cooperation as well as non-market technology transfer and technical assistance.

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Table (1) MNCs in Egypt in 2001 (Values in Million L.E.)

FIELD	NUMBER OF MNCS	ISSUED CAPITAL	INVESTMENT EXPENDITURE	FOREIGN SHARE	LOCAL MANPOWER	FOREIGN MANPOWER
Textiles	7	218	368	197	1872	6
Food	24	687	974	505	5216	87
Chemicals	29	821	1256	718	6198	116
Engineering	43	1103	2371	413	8952	126
Construction	10	341	400	106	3052	23
Metals	17	1273	1801	230	6583	207
Medical	17	480	883	305	5278	33
Total	147	4923	8053	2474	37151	598

Source: GAFI, 2001.

Table (2) A Comparison of Science and Technology in Egypt and a Group of Other Developing Countries

	Technicians Scientists, Engineers, in R&D (per million people)	Expenditure on R&D (% of GNI)	High-Technology Exports $ million	Manufactured Exports %	Royalty & License Fees Receipts $ million	Payments $ million	Patent Application Filed Residents	Non-Residents
	1987-1997	1987-1997	1999	1999	1999	1999	1998	1998
Egypt	800	0.22	3	0	47	329	494	1,139
Israel	n. a.	2.35	4,644	19	258	263	2,529	39,742
Turkey	n. a.	0.45	892	4	n. a.	n. a.	231	37,155
China	654	0.66	29,614	17	75	792	14,004	68,285
India	257	0.73	1,415	6	23	315	2,111	7,997
South Korea	2511	2.82	41,452	32	455	2,661	50,714	71,036
Singapore	2619	1.13	60,032	61	n. a.	n. a.	311	44,637
Malaysia	125	0.24	39,996	59	0	0	179	6,272
Indonesia	n. a.	0.07	2,731	10	n. a.	n. a.	0	32,910
Thailand	142	0.13	13,999	32	19	583	477	4,594

Table (3)
Distribution of Firms With Respect to Involvement in Technological Spillover Activities

	(1) None	(2) Low	(3) Medium	(4) High	(5) Very High	(6)=(4)+(5) At Least High
Linkages with Local Companies	1	0	5	4	10	14
Training of Local Manpower	1	0	5	5	9	14
Direct Local Competition	1	4	1	7	7	14
Direct Diffusion of Technology to Local Firms	6	4	6	3	1	4

Table (4) Distribution of Firms With Respect to the Perception of the Factors Suggested to Enhance ITT Activities

	(1) Irrelevant	(2) Hardly Important	(3) Important	(4) Very Important	(5)=(3)+(4) At Least Important
Local Technological Capacity (Policy - i)	0	0	4	16	20
Investment incentives (Policy - iv)[a]	0	1	6	13	19
Local Content Requirements (Policy - ii)	0	2	12	6	18
ITT Requirements (Policy - iii)[b]	1	2	15	2	17
Intellectual Property Rights Protection (Policy - v)	0	4	7	9	16
Macroeconomic Environment	0	2	12	6	18
Foreign Ownership Restrictions	10	4	2	4	6

Diagram (1): The Institutional Architecture of Science & Technology (2001)

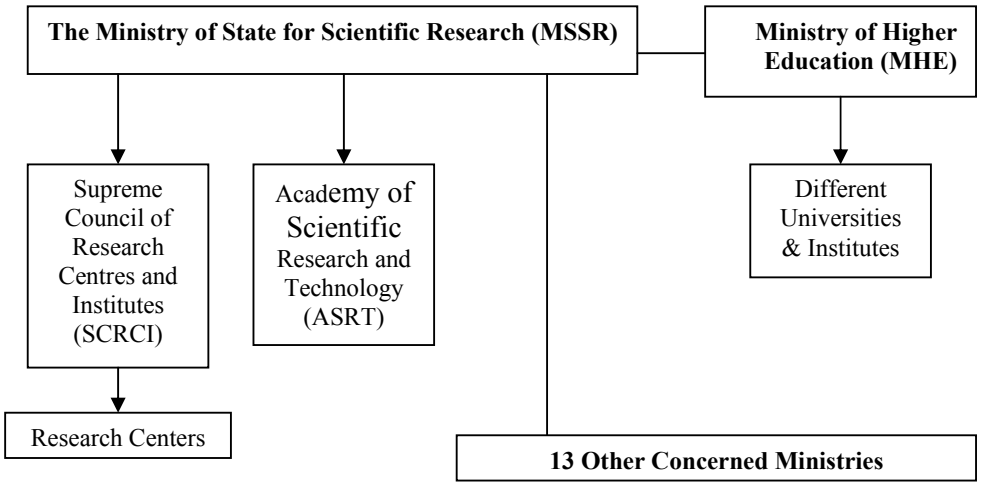
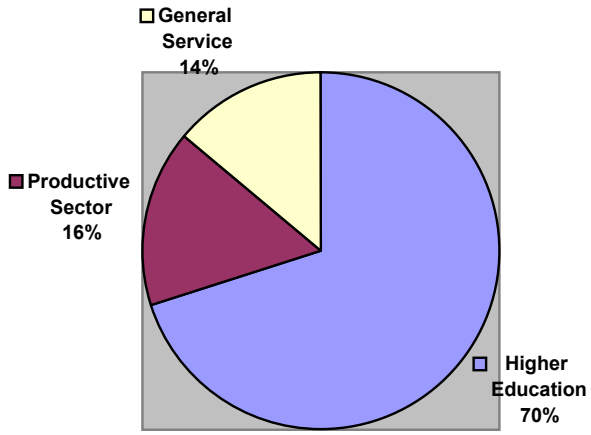


Diagram (2)
Distribution of Science & Technology Institutions (2001)



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