Technology Transfer in the Age of Globalization: Lessons from Egypt's Car Industry

Ali Shamsavari
Kingston University

Yasser Taha
Kingston University

Abstract

Largely based on an empirical study of Egypt's car industry, the paper criticises traditional approaches to and models of technology transfer in the new age of openness to trade and FDI and in the light of Egyptian experience. It is argued that these ideas and models, such as technological independence, need to be re-examined.

Key Words: Technology, technology transfer, FDI, TNC, global car industry, technological independence

INTRODUCTION

A decade or so ago the spread of car manufacturing (assembly as well as parts production) to the South on a large scale was almost inconceivable. The industry spread to the South initially in the 1950s but its expansion was geographically limited to Latin America, Brazil and Mexico in particular. Brazil attracted massive foreign direct investment (FDI) in both assembly and component production thanks to government policies of tax incentives, domestic content requirements and export subsidies. Major Transnational corporations (TNCs) involved included Ford and VW. Mexico attracted investments largely in component production.

But it was only in 1980s that we see a widening of the regional base of car manufacturing toward Asia. In this period we observe the emergence of South Korean car manufacturing with strong export orientation in the form of joint ventures between Korean companies and American and Japanese TNCs.

Although the predictions based on Vernon's product life cycle (PLC) (Vernon 1966) foresaw this movement to the South, particularly in parts production, the influential MIT study (Altschuler 1984) precluded such possibility based on trends in developed economies (Technological Divergence Model: see Gwynne 1990 and Shamsavari and Taha 2003). The focus of both Altschuler and Gwynne was on assumptions of low incomes and small markets in the South. The crucial factor ignored in these studies was that movement of component production to the South, with its associated linkage creation, raises incomes and cumulatively leads to greater demand for cars and further movement of car production to the South. Another factor involved has been greater liberalisation of trade and FDI since the 1980s.

In this paper technology transfer to the Egyptian car industry will be analysed in the context of the following factors:

1. The evolving world economy with the increasing role of the TNC in the creation of global production systems and networks.
2. Changes in global car industry involving greater outsourcing of components particularly to developing countries (LDC), e.g. Mexico and more recently India and Thailand, as well as greater reliance on modular production and JIT based supply chains.
3. The changing nature of technology transfer from complete to incomplete transfers and the shift from process technology to management technology transfer.
4. The strategies of TNCs and their FDI policies in LDCs (e.g. assembly, component and module production, domestic, regional or global orientation in productive activities).

In what follows we will first situate the Egyptian case historically by comparing it with other countries. Next we will look at this industry as it was shaping up towards the end of 20th century and the beginning of 21st. After a critical analysis of technology transfer experiences in Egypt we will end the paper with a final evaluation and certain policy recommendations.

HISTORICAL MODELS OF TECHNOLOGY TRANSFER IN THE 20TH CENTURY

In the last century we can identify three main and distinctive models of technology transfer by a number of countries. These models can be distinguished by certain factors, i.e. the geographical area, the route or mechanism of technology transfer, the extent of state intervention, trade strategy and policies of the host country.

i) The Soviet (East-European) Model: This was used initially by the former Soviet Union (SU). But it was copied in Eastern Europe and India and China after WWII. It aimed at Import Substitution (IS) with primary channel of transfer being licensing agreements (e.g. production of Lada cars under license with Fiat). As the SU was not a market economy tariff was not used as an instrument of protection of domestic industry. State intervention was supreme.

ii) The Brazilian (Latin American) model: This model also aimed at import substitution but relied heavily on wholly-owned FDI (e.g. American Ford company investments in the 1950-60s). Trade policies included tariff, quota and tax-subsidy incentives. Thus the role of state was important but private sector also played a significant role especially in supplier industries.

iii) The Korean (Asian) Model: This was a complete departure from the above two in that both the aims and routes of technology transfer were different. It aimed at export promotion (EP) and used joint-ventures with Japanese and American TNCs. The extent of state intervention was lower than LA model, while private sector played a major role. Trade policies included mostly tariff and subsidies.

At this stage we will not attempt an evaluation of these alternative models but rather concentrate on the Egyptian experience.

In Egypt we find a unique hybrid model which can be best described as a combination of models (i) and (iii) above.

The Egyptian experience is rather unique as it began technology transfer in car industry based on the Soviet model. It borrowed process technology from the West (e.g. Fiat) using license contracts, just like the former SU which had followed a similar path. In 1950s and 1960s under the Arab Socialist/Nationalist ideology of the Nasserite State the adoption of the Soviet model led to the establishment of NASCO (El-Nasr Automotive Manufacturing Company), the first state owned car manufacturer in Egypt. This experiment was partially a failure as evident from the

fact that NASCO did not achieve significant domestic content in manufacturing of cars and failed in the long run to satisfy increasing demand for personal cars in Egypt. Importation of cars continued unabated with considerable strain on foreign exchange reserves. NASCO has survived but its output is largely limited to buses and trucks.

Some home grown initiatives in the private sector such as Ramses cars designed and engineered by two Egyptian brothers was compromised as a result (Taha 2002, pp.351-53).

In the 1970s-1990s under the liberal states governed by Sadat and Mubarak we see a gradual shift toward the third model. In this period an economic regime emerged that emphasised openness to trade and FDI as well as private sector development.

By 1980s the results of the policy change led to the growth of a variety of paths of technology transfer in Egypt's car industry.

In this decade we observe a variety and diversity of paths from licensing to turnkey and joint ventures. Technology can be transferred in a number of ways (Shamsavari, et. al, 2002) which include licensing, franchising, machinery supply contracts, turnkey and management contracts, international outsourcing, FDI and joint ventures. In Egypt as of early 21st century we can identify 16 enterprises, most of which are connected in one way or another to global carmakers, operating in the market (see below).

The car industry in Egypt has thus moved away from the Soviet model in significant ways but it has not completely assimilated the Asian model:

i) In contrast to the Soviet model Egypt has been open to a variety of transfer methods.

ii) In contrast to the Soviet model Egypt has become increasingly export oriented.

iii) Compared with the Asian model, in which dynamic domestic enterprise (e.g. Hyundai) have entered into joint ventures with global car makers with strong export performance especially in rich Western markets, Egyptian export base has so far been restricted regionally to Arab countries in the

Mid-East and North Africa. Another difference here is that no major Egyptian domestic enterprise has been involved in joint ventures with car TNCs.

THE SHAPE OF THE NEW CAR INDUSTRY IN EGYPT UP TO THE 1990's

Here, we will briefly describe the factories which survived in the 1990s along with the newcomers in the industry. In this decade there was a noticeable increase in the number of newcomers to the industry.

Now there are various global vehicle manufacturers with CKD (completely knocked down kits based on turnkey contracts) assembly operations.

Presently there is a thriving CKD industry, which owes its existence to high tariffs. Though the targets for achieving domestic content are quite high in reality this industry uses a low local content and there is virtually no component production with CKD kits being imported in and assembly performed in the host country. CKD assemblers are initially required to achieve a local content of 30%, rising to between 40% and 60% once the venture is established for a few years. Egypt is under pressure to reduce tariffs to comply with WTO requirements. At the present time there are no vehicle assemblers that can remain competitive in face of a lowering of tariffs. It would appear that the industry is only viable as long as tariffs remain at present limits. The sector will need constantly to improve efficiency and increase local content to remain competitive as tariffs are brought down, especially if export of cars is to be encouraged.

General Motors Egypt Company

General Motors began producing vehicles in Egypt in 1985, when it set up Egypt's first privately owned vehicle production company, General Motors Egypt, which is

currently owned 31% by GM, 20% by Isuzu and 49% by Egyptian, Kuwaiti and Saudi investors.

The factory is located in the industrial city of Sixth of October, where it began by producing Isuzu commercial vehicles and buses. The Opel Vectra model started being assembled in 1993, with a capacity of 5,000 vehicles per year. Production was around 3,500 in 1997, but in 1995, its first full year of production, output exceeded 4,500 units.

Ghabbour Group

The Ghabbour Group is a family owned industrial group which assembles vehicles in joint ventures with and under license from a number of manufacturers. Traditionally it is dominant in the bus sector. The Ghabbour Brothers company assembles Scania chassis (KI 13) at Kalyub and has done so since 1990. Capacity for Scania heavy trucks and buses is around 400 units per year. The company claims a domestic content rate of almost 70%.

Ghabbour also assembles Mercedes-Benz trucks and buses. This began with the assembly of buses sourced from Mercedes' Brazilian plant, and has now been extended to trucks as well, thanks to the construction of a new dedicated plant at New Salheya near Cairo. The plant employs 1,000 people and has the capacity to build 7,000 trucks and 600 buses per year.

Mercedes-Benz

When it came to building cars in Egypt, Mercedes-Benz established a new joint venture called Egyptian German Automotive (EGA), with the Egyptian company,

National Automotive. The plant has the capacity to build up to 10,000 E-class cars per year. For Mercedes this was the first direct investment in the Arab world.

Hyundai

The Hyundai Accent has been assembled in Egypt since 1996 through a venture sponsored by the Ghabbour Group. Ghabbour actually began assembling the Excel in 1995, but quickly switched to the new Accent. The domestic content level is reported to be 40% which is understood to include some panels produced by Ghabbour with newly bought-in production lines and other parts supplied by 30 other local companies. The remaining 60% of components are imported in kits from South Korea.

Daewoo

Daewoo has set up a new car assembly plant in Egypt with an initial annual capacity of 5,000 units of the models Llanos and Leganza. Total investment amounts to $70m. Daewoo holds 60% of the shares in the recently founded company, Daewoo Motors Egypt. Daewoo's partner is a private Egyptian entrepreneur who is also BMW's partner for assembly and sale of the BMW 523i in Egypt. It is the first plant Daewoo has secured in Africa and Daewoo plans to use the joint company as a bridgehead into the region. Daewoo is also reportedly negotiating with Libya to construct a plant with a capacity of 50,000 units.

JAC Carmakers of Egypt

JAC began assembling the Citroen AX under license in 1994. A new plant was built at El Obur in the suburbs of Cairo, and in 1996 the ZX was also added to production.

Arab American Vehicles

Arab American Vehicles is 40% owned by Chrysler and 51% owned by the Arab Organisation for Industrialisation (AK), a consortium of investors from the Arab world. The company assembled 1,500 Jeep Grand Cherokees in 1997, as well as 1,000 Peugeot cars.

Krysler Kamion

Krysler Kamion has agreed with the local Medco Egypt Company to supply components and technology for a truck plant to be built in 6 October city. The Turkish firm manufactures several makes of truck under brand names patented by Chrysler Corporation of the US, including Dodge and Fargo. The initial production line in Egypt will involve its PD950 model of 18-tonne trucks. The company does not have a licence to use the Chrysler brand names outside Turkey.

BMW

Encouraged by the peace process and the hope of stability in the Middle East, BMW invested in an all-new plant in 6th of October City. With initial capacity of 2,500 units, the plant became operational from mid-1997. BMW has plans to export to Saudi Arabia, Syria and Palestine from Egypt.

The table below lists the major global manufacturers in the vehicle industry along with their local allies and the vehicles being produced by them.

GLOBAL CAR MANUFACTURERS AND PARTNERS					
Global Manufacturer	**BMW**	**CHRYSLER**	**DAEWOO**	**FIAT/IVECO**	**HYUNDAI**
Local Partner	Al Fotouh	Arab American Vehicles	Engineering Automotive Manufacturing Company	El Nasr Automotive Manufacturing (NASCO)	Prima Engineering Industries (Ghabbour Bros)
Vehicles Assembled	5 Series Land Rover	Jeep Cherokee	Cielo, Espero	Fiat 131, Daily	Accent
Global Manufacturer	**GM/ISUZU**	**CHRYSLER KAMION**	**MERCEDES BENZ**	**MITSUBISHI**	**NISSAN**
Local Partner	General Motors Egypt	Medco Egypt	Ghabbour Brothers/ NASCO	JAC	Nissan Misr
Vehicles Assembled	Vectra, Isuzu pickup	Heavy trucks	Heavy buses, vans, minibuses, E class	L200 pickup	Pickups
Global Manufacturer	**PSA CITROEN**	**PSA PEUGEOT**	**SCANIA**	**SSANGYONG**	**SUZUKI**
Vehicles Assembled	AX, JX	405, 505	Heavy trucks and buses	Musso	Swift, Alto, Carry

Source: Taha (2002)

In the next section we will briefly discuss the channels of technology transfer which have been utilised in the Egyptian motor vehicle industry (MVI).

Channels of Technology Transfer in Egyptian MVI

The transfer of technology to Egypt's MVI has taken both contractual and equity based forms.

Within the industry we can distinguish between car assembly and the supplier sectors. Below we will discuss technology transfer in both sectors.

1) **Assembly**

i) Equity forms of assembly: Egyptian car assembly sector has attracted massive inflows of FDI. This type of transfer of technology has taken two forms: majority-owned TNC subsidiary and joint ventures, e.g. GM Egypt, Mercedes and BMW.

ii) Contractual forms: this has included licensing, turnkey and management contracts

2) **Suppliers**: Technology transfer has taken the forms of license contracts, some joint ventures, but negligible amounts of FDI.

It is clear that in the assembly sector FDI and turnkey contracts and some joint ventures are preferred routes for car TNCs. This is due to the fact that car transnationals rely heavily on propriety product and process technology as well as strong product and brand concepts. Thus license contracts are rare in this sector. As cars are directly demanded by consumers, brand names and product quality are important factors. On the other hand in supplier companies as well as bus and truck sectors buyers (mostly institutional and business) are not so much concerned with brand concept as they are with technical specifications. Therefore in this sector we are more likely to find non-equity forms such as licensing.

The Extent of Technology Transfer to Egypt's MVI

The following table adopted from Taha (2002) summarises the main findings of the latter on the extent of technology transfer to Egyptian MVI.

PROCESS	WEAK	AVERAGE	GOOD
Design Engineering	X		
Engineering Setups	X		
Management		X	
Organisational Structure		X	
Executive Structure	X		
Material Management	X		
Planning		X	
Quantity of Production	X		
Quality of Production		X	
Theoretical Skills of Workers		X	
Purchase Skills of Workers	X		
Purchase Structure	X		
Sales Structure			X
Marketing	X		
Quality Control		X	
Financing	X		
Developing Ability of Workers	X		

Based on the above findings urgent action by the government, TNCs and national companies is needed in design engineering, engineering set up, executive structure, material management, scale of production, marketing, finance and education of the labour force.

Egyptian MVI sector has achieved average (satisfactory) results in management, organisational situation, planning, quality control, theoretical skills of workers. Although no urgent action is required in these areas, government support is needed to strengthen these. No action is needed in the area of sales structure.

From a traditional point of view of complete technology transfer (see below for a theoretical discussion) it would seem that there is little technology transfer in the MVI in Egypt. This is true in one sense but not true in another.

If we interpret technology as process technology alone then it is true that the extent of technology transfer to MVI in Egypt has been limited. However, if we interpret technology in another sense that includes product, quality and management technologies as well (UNCTC 1988, Shamsavari, et.al. 2003) then technology transfer to Egypt has been considerable.

It is true that a significant transfer of technology at the level of product, design, quality and management has taken place in Egypt's car assembly sector. This is a positive development as Egypt can earn much needed foreign exchange through export of branded high quality cars. Further the transfer of management technologies (e.g. marketing) can spread essential knowledge to the rest of Egyptian economy.

If Egypt did not possess any significant amount of educational and technical or infrastructural assets in MVI at the process technology level then the present situation would have been unsatisfactory.

But as a matter of fact Egypt has these assets. The question is how these assets can be utilised in the presence of car transnationals which are mainly concerned about setting up joint ventures, turnkey contracts and majority controlled FDI in the assembly sector with the main objectives of sales and profit maximisation in host and export markets. We believe it is up to the host government to channel TNC activities (by

appropriate policy measures) into areas where TNCs may transfer technologies which made full use of national assets (see Conclusions below).

In what follows we will analyse the issues raised so far in terms of the changing context of technology transfer in a more open world economy and changing nature of TNC behaviour as well as specific conditions of Egypt's economy.

Complete vs. Incomplete Technology Transfer

Both the definition of technology and technological transfer are problematic. We have dealt with the first in Shamsavari et. al (2002), where we contrasted the narrow and broad definitions of technology. Here we will deal with the problematic nature of technology transfer.

According to one authority on the subject, the difficulty of defining technology transfer arises from the issue of completeness of technology transfer.

> At the one end, technology transfer may simply be the movement of technology from one location to another or from one use to another, or a combination of the two (Smith, 1980). On the other end, technology transfer must be "nothing less than the transfer of the capacity to understand and develop the introduced technology," (Komoda, 1986, p407) [Chen, 1996].

Chen follows the above by pointing out that based on Komoda's views, technology transfer cannot be complete unless it is completely adopted and absorbed without outside assistance, i.e. until the transferee is able to operate and maintain the process independently and furthermore can 'improve, extend and develop the technology originally transferred'. He continues by stating that 'Technology transfer is not just

acquiring of knowledge in production, but also building up of a nation's technological capabilities. The difficulties of defining technology transfer arise largely from the fact that technology is knowledge, not a product. The transfer process and mechanism are necessarily difficult to define operationally.' (Chen, ibid, p182).

It is not clear from the above what Chen's position is about complete and incomplete technology.

Based on recent study of technology transfer in the Egyptian MVI, we offer the following analysis.

The traditional literature on technology transfer (Stewart 1978, Adikibi 1984, UNCTC 1988, Souder 1990) defines the latter as a process which goes through three stages of introduction, adoption and absorption. It is not often clear whether or not this scheme is supposed to apply to a few sectors of the economy or the entire economy. Complete technology transfer to one or a few sectors, as opposed to complete technology transfer to the entire economy, are two entirely separate issues.

It is possible and may be desirable to transfer technology completely in a few sectors of the economy. The obvious candidate sectors would be those that rely on locally available factors of production and may be low-tech, e.g. textiles, construction sector, building materials, detergents, timber and wood, paper, steel, food, beverage and tobacco, etc. The possibility of transfer of technology in these sectors is based on the low level of technology and availability of local factors of production, e.g. land, mineral deposits and labour. In more high-tech sectors such as household durables and cars, technology transfer is both possible and desirable. It is possible as many

MNC are happy to grant turnkey contracts (CKD) to host countries. It is desirable as many LDC's will benefit from saving in foreign exchange and some degree of employment and education of the labour force. This stage of technology transfer in the IS strategy has been referred to as the easy phase of IS by Hirshman (1968). The second and more difficult phase requires development of supplier industries (Hirshman, 1968). As many supplier industries require a minimum size to operate efficiently (MES), a size which depends on the extent of the domestic market, the second phase may not be feasible in a great number of small developing countries. Thus for a large number of LDCs, particularly the least developed countries (LLDC's) that number between 50-60 countries, including island, land-locked, sparsely-populated countries located in sub-Saharan Africa, Central America and the Pacific Ocean), the second phase of IS (corresponding to adoption-absorption stages of technology transfer) may not be a feasible option.

Thus, complete technology transfer in a few sectors of the economy may or may not be possible due to factors such as the size of the economy, economies of scale, etc. When we consider complete technology transfer to the whole economy the issue becomes problematic.

The possibility of such complete technology transfer is not only dependent upon the size of the economy and its stage of development but also on the constraints relating to the nature of technology and its availability to transfer. Another factor is the sector specificity of technology.

In certain manufacturing sectors, e.g. simple household durables such as vacuum cleaners or in certain chemical industries, the raw materials and parts used are small and limited. In these sectors it is easy to achieve complete technology transfer, especially if the raw materials are locally available (e.g. the petrochemical industry in oil producing countries).

In other sectors where the final product either requires a great number of parts, components and subassemblies (car) or the parts used are very high-tech (PCs) complete technology transfer is either inconceivable or very difficult.

The nature of technology in the 19th century and the first half of the 20th century made it easier to transfer as it involved largely process technology, which could be transferred through licensing agreements. These technologies did not involve product differentiation, brands, quality control, management technologies etc. They were largely non-propriety technologies. It also involved sectors such as capital goods, business to business transactions in which advertising, brand loyalty etc, play an insignificant role compared to quality and technical specification. The reason that the US, Germany and Japan in the late 19th century were successful in technology transfer had to do with building up the basic industries such as steel and shipbuilding.

The possibility of technology transfer in the 19th century and early 20th century in certain countries with large internal markets and in the capital goods sector were rooted in the nature of technologies transferred, the originators of technology transfer, which were large organisations that engaged in licensing agreements as the only way to maximise returns on their investment in the context of world economic conditions

that favoured autarky. Apart from the fact that post-war developments favour greater trade liberalisation, etc. it is hard to conceive of complete technology transfer either in certain sectors or in the whole economy, in view of modern trends in technological change.

How is it possible to transfer technology completely when the technology is rapidly changing? In the rapidly changing technologies in the world today complete technological transfer is neither feasible nor desirable. It is not feasible due to the speed of change. It is not desirable due to the fact that many LDCs may be left out if they insist on non-propriety technology transfer.

Technology transfer involves transfer of knowledge at five levels of technology, product, process, marketing, finance and quality (UNCTC 1988, Shamsavari, et.al, 2002). The emphasis of traditional technology transfer models was largely on process technology. This was justified as the nature of technologies and the mode of their transfer, especially before World War II, involved strictly process technological know-how at the expense of other aspects. This point will be clarified in the following section.

The Egyptian experience in technology transfer in MVI tends to confirm the analysis provided above:

1. In MVI we have demonstrated that only NASCO has achieved a high level of technology transfer, particularly in the commercial vehicle sector (bus, van, etc). This is partly due to the fact that in the commercial vehicle sector brand names, design and attractiveness of the product plays a very little role.

2. Other companies, by and large, have successfully transferred technology at the assembly stage and have succeeded in the education of the labour force.

3. According to Taha (2002) there is insufficient investment in feeder industries. This is a crucial area for technology transfer, but there is little support from government or TNCs to help this sector. The home content requirement policy of the Egyptian government is well placed. But the requirement of TNCs in the context of trade liberalisation and flexibility of exchange rates implies that unless domestic feeder industries produce high quality parts and components, TNCs will outsource their provision of these materials elsewhere in the region or in the world. This requires a degree of flexibility in the home-content requirements policy of the government. The government should enforce home content requirement if the domestic supplier industries or subsidiaries of TNCs involved in these industries produce high quality and competitive parts and components.

The evolution of the MVI industry and technology transfer into this sector would be evaluated in the following contexts:

I) Evolving world economy

II) The evolution of the TNCs

III) The evolution of government policy

IV) The particular conditions of the Egyptian economy

I Evolving World Economy

Broadly speaking we can distinguish two periods in capitalist development in the past two hundred years. The first period, which we can call Monopoly Capitalism, coincides with the industrial revolution in Britain and British monopoly of industrial production. This monopoly was partially ended at the end of the century as the US and Germany took over Britain in industrial production. Industrialisation spread in the late 19th and early 20th centuries to Japan, Russia and some European countries (Kemp 1988). The period from the end of the 19th century to the end of World War II, however, can be characterised as an era in which individual countries, whenever they had the opportunity, attempted to achieve economic autarky and technological independence. Japan and former Soviet Union are prime examples. There were many factors that prompted these developments (e.g. political ideology, nationalism, communism).

Before the outbreak of World War II, industrial production was limited to a small number of Western countries, USSR and Japan. These countries held a monopoly in industrial production. Thus we differ from Lenin (1913) and other authors (Baran and Sweexy1966) in our periodisation of liberal and monopoly capitalism. Broadly speaking, the latter tend to characterise the 19th century as the period of competitive and liberal capitalism and the 20th century as the period of monopoly capitalism (see also Auerbach 1988).

We believe that these views were based on closed economy models. In contrast to the above-mentioned theories we tend to characterise the 19th century to the end of World War II as the phase of monopoly capitalism and the period of time since the end of

World War II as competitive capitalism. The post war period is characterised by a number of significant developments.

1) The rise of Bretton-Woods institutions, i.e. IMF, World Bank and GATT (now WTO). The operation of these institutions created in the first instance stability of exchange rates until 1972 that contributed immensely to greater trade and FDI. The end of the fixed exchange rates by 1972 was largely due to a huge increase in foreign investment flows.

   The rise in FDI and the operation generalised scheme of preferences (GSP) led to the rise of newly industrialising countries (NICs).

2) Before the rise of NICs, in the 1950s-60s we witnesses the emergence of Japanese industry that by the late 1960s started to flood the rest of the world with high quality and low priced manufactured goods. This development essentially broke down the Western monopoly in manufactured goods, ushering the age of new competition.

   The rise of the Japanese economy was followed by the rise of NICs (initially South Korea, Taiwan, Singapore and Hong Kong). This proved to be the last blow to the monopoly of the Western world on manufacturing.

   These countries, whose rank has grown to 30 LDC (including China and India) have managed to produce and export goods and services not only to other

LDCs but also to rich countries. The emergence of NICs has created a more competitive world economy.

3) The success of the Uruguay round of GATT negotiations and the formation of the World Trade Organisation by 1996 has led to a greater liberalisation of trade.

II The Evolution of TNCs

The evolution of TNCs has meant a rise in new multinationals from LDCs and a change in the behaviour of rich country TNCs.

According the UNCTAD (1993, chap. 5) the outsourcing activities of TNCs basically has involved a shift from international production (stand alone strategy – simple integration) to internationally integrated production (complex integration).

According to UNCTAD the factors that have contributed to increased outsourcing are:

1. The convergence of incomes and tastes around the world

Thus many products initially produced and consumed in rich developed countries have new markets in developing countries, which may be better served at locations closer to these markets.

2. The increasing role of information technology

With advances in information technology it is easier to outsource as communication becomes instantaneous. A new fashion wear designed in London can be

communicated via internet to a factory in Taiwan where it can be produced in a computer-integrated system and then sold worldwide.

3. Greater competition globally

Trade liberalisation over the past 45 years has made it less costly to outsource to foreign locations as goods crossing many borders do not face many trade barriers.

To the list above we may also add factors such as the flexibility of exchange rates that motivate TNCs to switch outsourcing from countries with over-valued exchange rates to countries which have devalued their currency. Government policies in some LDCs (e.g. China) has attracted a lot of FDI inflow through the formation of Export Processing Zones (EPZs) which offer good infrastructure, low paid but educated labour and tax incentives (on the origin of outsourcing see Shamsavari 1973 and UNCTAD, 2000, Chap. 1).

The implication of complex integration is that TNCs will outsource their various activities around the globe based on the exchange rate regime, locational factors, income, etc. Thus technology will be transferred by TNCs globally on the basis of these factors.

In Egypt incomes are rising and locational factors (low cost labour, good infrastructure, government policy, etc) are favourable for outsourcing of TNCs activities.

Technology has been transferred to the Egyptian MVI industry and will be transferred further as Egypt offers an educated but low cost labour force, good infrastructure and favourable government policies. Technology transferred will depend on the factors mentioned above.

As we have seen above, there has been a significant technology transfer by TNCs in Egypt MVI. What is hoped for Egypt is that it will act as a hub of a regional network comprising of the Middle East and North Africa. Such networks have been developing based on locational advantages through the activities of TNCs for some time. A good example is the South China regional network comprising the southern part of PRC, Taiwan and Hong Kong.

In this section we can conclude that the effects of changing strategies of TNC in the context of changes in the world economy have changed the nature and the extent of technology transfer by TNCs.

The formation of regional networks and the outsourcing activities of TNCs imply that technology will be transferred partially to countries that offer locational advantages in the overall strategy of TNCs effort to reduce costs and expand the market. LDCs can only attempt to provide the locational advantage that TNCs require.

We have found from the Egyptian experience that complete technology transfer in MVI has not materialised. The advantage of complete technology transfer would have been the production of a completely Egyptian made car. But this scenario may have led to a low quality car which consumers would reject in preference for imported cars

produced by TNCs. Thus the disadvantages of complete technology transfer include low quality cars, inability to export those cars to foreign markets, lack of investment in product and process technologies by TNCs (as the example of Ford-Brazil shows).

III The Evolution of Government Policies

A number of LDCs after World War II pursued ISI policies, e.g. Brazil, Iran, Egypt, China, India.

These policies created tremendous technological and industrial capacity in these countries. In the 1950s-1960s these countries showed considerable economic growth rates. However, these growth rates were short lived as in some countries it was sustained by high foreign debts that by the early 1980s led to the Debt Crisis.

The IS strategy based on wholly-owned subsidiaries of TNCs (e.g. Brazil) proved to be unsuccessful as TNCs attempted to reorganise their outsourcing decisions based on locational factors, economies of scale, floating exchange rates and the emerging information technology (see UNCTAD, 1993).

IS may be a valid strategy for large countries at the early stages of development (early examples include USA and Germany and late ones include China, India, Iran and Nigeria). This strategy, particularly using instruments such as high effective rates of protection, over-valued exchange rates and import-licensing, has proved expense, inefficient and detrimental in equitable income distribution. Also, this inward-looking strategy is today at odds with trends in the world economy (trade liberalisation) and the changing behaviour of TNCs.

IV The Particular Condition of the Egyptian Economy

In the context of the Egyptian economy we have witnessed a shift from ISI to greater emphasis on openness and export orientation (the shift from the Soviet Model to the Asian one). This development is more in line with both Egyptian domestic policies for technology transfer and the strategies of MNCs as well as trends towards openness in the world economy.

As industry always and continuously changes, many governments around the world have changed their policy to cope with the new globalisd world economy. Creating linkages between domestic companies and TNC affiliates (Shamsavari 2005, UNCTAD 2001) is not only required for employment creation but will transfer the latest knowledge or know-how to the host country. The World Bank (1998/99) argues that knowledge has become the most important factor in determining the standard of living, more than land, tools or labour. Today's most technologically advanced economies are knowledge-based. The knowledge economy is not only about new creative industries and high-tech businesses, it is also relevant to traditional manufacturing and services and to businesses ranging from construction to engineering, retailing and banking.

Egypt is a large and populous country. Its geographical location at the crossroads between Africa, Asia an Europe and its shared culture and history with much of North Africa and Middle East makes it an ideal magnet to attract FDI and act as hub for exports to the region. We have showed that Egypt's car industry has become such a hub in the region. But there is some evidence that some Egyptian car makers are

considering exporting to EU (Observer Supplement:Egypt 1999). The future potential for technology transfer in many sectors of the economy is immense.

CONCLUSIONS

1) Egypt has attracted an impressive number of car TNCs in a variety of roles involving contractual as well as equity based participation. This has led to increased competition in the car market, increased exports and thus export earnings for Egypt.
2) Technology has been transferred to Egyptian MVI largely at car assembly stage (product and process technology) but also at the level of management (marketing, finance) technologies.
3) Technology transfer to MVI in the supplier sector has been modest and slow. Some TNCs such as Daimler-Chrysler have not transferred any technologies to supplier industries, preferring to source parts from Mercedes German plants. Others have invested in the supply chain and sourced components domestically, e.g. Daewoo. This situation is understandable in view of the fact that Mercedes produces high quality luxury cars while Daewoo turns out lower quality mass produced cars. It is obvious that the contribution of Mercedes has been in the area of export earning (which is partially offset by the high import cost of parts from Europe), while Daewoo has created more employment opportunities in Egypt.
4) Government incentives e.g. tax breaks and domestic content requirements have helped in the process of technology transfer. But more action is needed especially in encouraging TNC investment in supplier industry sector.

5) Egypt seems to lag behind several developing countries in initiating linkage promotion programmes that are aimed at enabling domestic enterprises to become suppliers to TNCs .

REFERENCES

Adikibi, O, 1984, The multinationals and acquisition of technology by LDCs: a model for assessment, Paper presented at the **Institute of Development Studies**, Sussex University

Altsculer, et. Al., 1984, **The Future of Automobile**, George Allen and Unwin, London

Auerbach, P., 1988, **Competition**, Basil Blackwell, Oxford

Baran, P & Sweezy, P, 1966, **Monopoly Capital**, Monthly Review Press, New York

Chen, E. K. Y, 1996, Transnational Corporation and Technology Transfer to Developing Countries, in UNCTAD 1996

Gwynne, R.N, 1990**, New Horizons? Third World Industrialization in an International Framework,** Longman Group UK Limited, Harlow, Essex

Hirschman, 1968, The political economy of import-substituting industrialization in Latin America, **Quarterly Journal of Economics**, Feb, 1968

Kemp, T, 1985, **Industrialisation in the Non-Western World,** Longman, London

Lenin, V. I, 1913, **Imperialism: the Highest Stage of Capitalism,** Moscow

Malecki, , E.J, 1997,**Technology & Economic Development**, 1997, Addison Wesley Longman Limited, Harlow, Essex

Observer, 1999, **Egypt**, 18 July

Shamsavari, A, 1973, **Some Aspects of the Evolution, Structure and Impact of the Multinational Firm**, Ph.D. dissertation, Vanderbilt University, USA

Shamsavari, A, Adibiki, O & Taha, Y., 2002, **Technology and technology Transfer: Some Basic Issues**, Kingston Economic Discussion Papers, Kingston University

Shamsavari, A & Taha, Y, 2003, **Global Car Industry: Options for Developing Countries**, Economics Discussion Paper, Kingston University

Shamsavari, A, 2005, **Global Production Networks and Linkages: A New Development Perspective**, Economics Discussion Paper, Kingston University

Souder, E., 1990, Technology transfer process stage, **The Journal of Technology Transfer**, Winter-Spring 1990, vol. 15, nos. 1 and 2, (double issue)

Stewart, F, 1978, **Technology and Underdevelopment**, 2nd. edn, Macmillan, London

Taha, Y., 2002, **Technology Transfer by the Multinational Firm: The Case of Car Industry in Egypt**, Ph.D. Dissertation, Kingston University

Vernon, R, 1966, International investment and international trade in the product cycle, **Quarterly Journal of Economics**, v. 80

UNCTAD, 1993, **World Investment Report**,

UNCTAD, 1996, **Transnational Corporations and World Development**

UNCTAD, 2000, **World Investment Report**,

UNCTAD, 2001, **World Investment Report**

United Nations Centre on Transnational Corporations (UNCTC), 1988, **Transnational Corporations in World Development: Trends and Prospects**, New York.

World Bank, 1998/99, **Knowledge for Development**, Oxford University Press, Oxford