Chapter I

REVERSE TRANSFER OF TECHNOLOGY: A PERSPECTIVE

The human resources constitute an integral part of the technological capabilities of a nation. The technological excellence that industrialised world command today could be traced to the stock of technological personnel, expertise and other forms of human resources developed by them over a long period of time. As a matter of fact, developed countries account for major portion of the global technological personnel and capabilities.

On the other hand, developing countries as a group are found to possess neither adequate technology infrastructure, nor such capabilities. In fact, they account for a very meagre share of the technology as embodied in personnel. Having deprived of the opportunity to develop national technological capabilities, for well known historical reasons, it was natural for the developing countries to strive for the creation of an indigenous technological base.

However, a major problem that confront most of the developing countries has been the excessive outflow of Highly Qualified Manpower (HQM) resources. This phenomenon, popularly known as brain drain is, in fact, a transfer of technological resources in the reverse direction. As it takes place from the technologically weak to technologically stable countries, it is referred to as Reverse Transfer of Technology (RTT).

Literature on international migration shows that there has been a tremendous increase in the outflow of high quality manpower resources from developing countries during the post-War period. Conceptually and otherwise, the issue of brain drain has aroused much controversies and disputes. It is an issue of multiple
dimensions and disagreement exists on all aspects, starting from the very definition of the phenomenon. Reflecting on the problem, United Nations’ Secretary General Kurt Waldheim acknowledged in his report, way back in 1974, the difficulties involved in the measurement of the magnitude of the outflow.

It is very important to clarify the concept in order to have a correct analysis of any problem. A phenomenon can be better analysed if all its major characteristics as well as distinguishing traits are clarified. Hence it is very important to explain the essential characteristics of brain drain before we attempt a comprehensive study of the phenomenon.

There have been several efforts to define the concept of brain drain and there are as many variations of the definition of brain drain as there are situations to which it is applied. Still, it lacks a thorough and acceptable definition. It is the United Nations, that has defined the issue of brain drain in a relatively meaningful manner. According to the 1968 Report of the UNESCO, 'The brain drain has been defined as an abnormal form of scientific exchange between countries, characterised by a one-way migratory flow in favour of the most highly developed countries. The root cause of this process lies in the fact that countries at different stages of scientific and technological development have correspondingly different scientific and technical manpower requirements. Its more immediate cause is that the receiving countries wish to acquire productive intellectual capital as quickly and as cheaply as possible. This leads them to encourage selective immigration in various ways.'


A study conducted by the United Nations Institute for Training and Research (UNITAR) in 1968 on brain drain has enumerated the essential characteristics of brain drain as follows: (a) there are numerous flows of skilled and trained persons from developing to developed countries; (b) these are characterised by large flows from a comparatively small number of developing countries to a small number of developed countries and by smaller flows from an increasingly large number of developing countries. (c) In these flows engineers, medical personnel and scientists have unusually large weight; (d) the above flows have mounted rapidly in recent years until the 1968-69 fiscal years; (e) the greater the skill or training on the whole the greater the susceptibility to migration tends to be; (f) the flows increasingly respond to the changed economic complexity of world societies and to legislation, much of it new, which reflects the demands of a new economic era; (g) the above flows relate to flaws in national educational system and to the poorly planned or unplanned training of students from developing countries in developed countries; (h) except possibly for South America, there has been at least until 1968-69, no signs that the above talent migration is decreasing.3

The definition given by Dr. Charles V. Kidd, Executive Secretary of US Federal Council for Science and Technology, explains brain drain as “an index of structural mal-adjustments in both the ‘sending’ and ‘receiving’ countries”. For the latter, he continues, it indicates an inelastic supply of certain talents and skills, based in part on the monopolistic entry restrictions which were allowed to operate in the professional sector of the economy. For the sending nations, it may be the index of retarded development or underdevelopment. In all cases, the brain drain is simply the symptom of the disease rather than the disease itself.4

3 UNITAR, The Emigration of Highly-Skilled Manpower from the Developing Countries, Study Conducted by Gregory Henderson (New York, 1970), p.16.
However, due to the multidimensional nature of brain drain and its characterisation appearing in various planes, a one sentence definition or a listing of characteristics is not enough to serve as a basis for a comprehensive study; it needs to be explained in detail. First, it should be emphasised that the phenomenon of brain drain is qualitatively different from other types of migrations continuously occurring in history. Generally, studies and official statements published in Western Europe and America incorporate brain drain in the concept of general international migration. But, even though it could be included in the category of international migration, it is a special category of international migration. It is entirely different from the 19th and early 20th century migrations which consisted overwhelmingly of mass migrations from the old to the new world accompanying the migration of capital. It is also different from modern unskilled labour migration in pursuit of higher wages, which is still the largest component of international migration.

Another problem with the western literature is that, they consider brain drain as a continuation of an old phenomenon. According to this, brain drain has always existed and the recent process is only the continuation, in the modern world, of a well-known ancient phenomenon. For instance, Stefan Dediger, in his study, ‘Early Migration’, points out the eternal phenomenon of the migration of scientists from ancient times. The study begins with an example of Ptolmy and goes through a very interesting series. But the problem with such studies is that it is based on the assumption that the present day brain drain is a continuation of the migration of talents in the ancient times. Modern brain migration is obviously different from the historical events and hence such a study is inadequate to examine the case of modern brain drain.

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The essential difference between the old and new phases of migration is that for the modern brain migration, the flow is not one of isolated individuals as in the case of old type, but is large, steady and growing. This difference derives from the fact that the ancient migration of scientists and scholars was not economically motivated. It was associated mainly with the growth of centres of learning or universities.

Brain drain, as it is understood today, is a post-War phenomenon qualitatively and quantitatively different from the ancient migration. It is associated mainly with technological advancement, industrialisation, commercialisation of knowledge, development of modern warfare, and above all, the changing global economic scenario. It is motivated mainly by the desire for better standard of living on the part of migrants and facilitated by the official encouragement of the receiving countries that plan to acquire high quality manpower resources at cheap prices. Nations encourage immigration through preference provisions, work permits and other alluring elements in the immigration laws and regulations.

Another feature of modern migration is the increasing share of developing countries in the total flow of skilled manpower to the developed countries, while the share of developed countries has decreased considerably. This trend has perhaps manifested itself most strikingly in the case of the US where the developing countries, accounted for only 37 percent of total skilled migrants during 1961-65, whereas it has increased to 70 and 80 percent during late 1970s.\(^6\)

Migration of high quality manpower from developing to developed countries may be contrasted with a number of other types of migrations. One such pattern is developed to developed country migration and another one is developing to

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developing country migration.\textsuperscript{7} The developing to developing country HQM migration used to be relatively unimportant in the past and was associated mainly with the UN sponsored technical assistance programmes which deployed developing country experts in other developing countries. However, with the substantial increase in oil revenues of oil exporting countries, this type of migration has become substantial. However, such migration tends to be temporary rather than permanent due to reasons like the receiving country’s preference for a temporary HQM work force variable in terms of its national and cultural composition, the lack of development attributes in the immigrant country etc. Therefore the developing to developing country HQM migration should be considered quite different from the developing to developed country HQM migration which is more or less permanent.

Some developed countries are also found to lose their high quality manpower through brain drain. For example, the term ‘brain drain’ was coined by Britain when she began to lose a substantial number of medical doctors to the United States. However, the developed to developed country HQM migration seems to be subject to a greater reverse migration. The differences in economic conditions and rewards between the developed countries are not significant so that only minor relative changes in labour market conditions may induce reverse migration. The developmental impact of such HQM migration may be less serious compared to that of HQM migration from developing to developed countries.

Another problem at conceptual level is regarding the types of HQM to be included in brain drain migration. It is necessary to develop some criteria, which will enable us to identify from among those who go abroad, that segment which constitutes brain drain. This is, by no means, an easy task and the criteria thus developed will be open to the charge of being arbitrary at least in some respect or

being not applicable to all cases. International Labour Organisation (ILO) has made a move in this direction. The ILO definition of occupation under the title ‘professional, technical and related workers’ are given in the International Standard Classification of Occupations published in Geneva in 1958 by the ILO: “workers in this major group conduct research and apply in a professional capacity of scientific knowledge and methods to a variety of technological, economic, social, industrial and governmental problems, carry out technical tasks auxiliary to scientific research, development and practice, and perform religious, educational, legal, artistic and literary functions. Those classified in this major group perform tasks which usually require training in a specific scientific or other professional field, at a university, technical institute or similar establishment or which require creative ability in literature, or art or talent in entertaining”.

Even though the requirement of education or training is mentioned, this classification is based mainly on occupational statistics. It doesn’t tell the levels of qualification clearly. It covers partly more and partly less than, can be included in the professional manpower category involved in the brain drain process. For example, religious, artistic and literary activities are usually ignored when dealing with brain drain. On the other hand, the categories of doctors, nurses and other medical personnel can’t be fitted into ILO definition, although these professions constitute one of the fundamental elements of brain drain. However, the ILO classification is followed with more or less slight variations by many countries. For example, ‘athletes’ are included in the professional technical and kindred (PTK) workers in the American definition, but not in the Canadian professional and technical classification.

UNCTAD Secretariat considers the definition adopted by the United States’ Immigration and Naturalisation Service which includes professional, technical and

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8 UNITAR, n.3, p.4.
kindred workers as the most appropriate definition of those skilled migrants who constitute brain drain. The PTK classification is broadly similar to that utilised in other developed countries and includes categories such as natural scientists, social scientists, physicians, surgeons and dentists, nurses and others in medical and related fields, engineers and others in technology and related fields, editors and reporters, lawyers and judges, professors and instructors, religious workers, social and welfare workers, elementary and secondary school teachers.

Regarding the length of stay of the migrant, there are no universally accepted criteria and generally it is considered as more or less permanent settlement. Further, to find out the actual duration of the stay or to decide whether the immigrant is a permanent or a temporary settler is very difficult. Types of visas issued tell whether the migrant intends to hold permanent employment. But we cannot rely on one’s intention at the time of entry, because intentions are constantly revised as opportunities for employment develop at home and in the country of new residence. An individual who came as a ‘student’ or ‘trainee’ may change his status to a permanent resident while one who intended to stay permanently may return.

Criteria based on length of actual stay also are ambiguous because in many highly skilled professions, it is impossible to say when an individual who came as a student or trainee starts to ‘work’ and stop ‘learning’. For example, in the United States, the recipients of Ph.D in many disciplines would have a considerable period of apprenticeship in teaching and research as an ‘assistant’, albeit well paid, before he is a genuinely and fully qualified professional in his field.

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9. UNCTAD, n.6, p.3.
This issue is further complicated by the recent origin of new types of professional migrations. Recently, large numbers of highly skilled workers move on a relatively short term contract basis. Business trips of varying duration account for high proportions of border crossings, some of which resemble temporary migrations. The philosophy of corporate unity embraced by many large MNCs necessitates migrations within internal labour markets in order to improve communications and disseminate knowledge, experience and new technologies. Difficulties to distinguish between various types of migrations preclude accurate assessment of migration by the highly skilled without a rigid specification of time spent overseas. However, the brain drain is a more or less permanent migration.

Another issue is the availability of statistics. Accurate, comprehensive and rationally structured statistics is very much essential for a study on brain drain. According to Henderson, “nothing is central to the study of professional migration and its presumed values than the determination of what the available statistics mean and what they do not mean”. Though it appears as an easy task to estimate the numerical size of the flow, it has turned out to be very difficult in practice, running into serious conceptual and statistical problems. Immigration statistics should specify the status of the immigrant (whether permanent or temporary settlement) and the educational classification of the immigrant (whether he can be included in the category of brain drain) etc. and has to be distinguished from temporary visitors such as students, trainees, technical experts etc. on the one hand and the permanent immigrants in general on the other.

Available statistics are incomplete and have several draw backs. Return flows are not generally recorded anywhere. Besides, availability of statistics is most uneven - relatively abundant for the US and Canada and, to a somewhat lesser
extent for Australia, of less satisfactory for the UK and, in general, lacking for Germany, France and most other countries.\textsuperscript{13}

The United States' statistics is the most comprehensive among the available statistics. The United States has established two broad categories by statute: immigrants and non-immigrants. Those applying and admitted as immigrants have the privilege of permanent residence, may after a term of years obtain naturalisation as citizens and may work. The non-immigrant category includes the following subcategories like students, exchange visitors, intra-company transferees, industrial trainees and temporary workers of exceptional merit. Transfer from the non-immigrant to the immigrant categories is made by 'adjustment' of visa status. Non-immigrants who do not obtain adjustment of their status or waivers of the requirement that they depart must leave the US on the expiration of the period for which their visas are valid.\textsuperscript{14}

A large number of theoretical and empirical studies have come out since the 1960s on the issue of brain drain. Among these, the studies made by various specialised agencies of the United Nations are the most significant ones. They suggest the disadvantageous consequences of migration of highly skilled manpower from the less developed countries. It has also been maintained that brain drain represents the hidden side of the developed-developing country relationships which perpetuate technological dependence and dominance. In the process, it seems to have facilitated the industrially advanced capitalist countries to further their economic and political considerations.

UN studies use the term 'Reverse Transfer of Technology' to denote the migration of highly qualified manpower from developing countries to developed

\textsuperscript{13} ibid, p.10.
countries. The term was introduced by UNCTAD in a series of studies conducted by its secretariat. UNCTAD studies consider brain drain as transfer of productive resources from the developing to the developed countries. Knowledge and skills are acquired as a result of the investment in education, training and allied activities of the persons concerned and could be considered as a form of productive resources embodied in human beings. In this sense, the loss of human capital implied the loss of technical capabilities to innovate and extend the frontiers of technological and applied knowledge. Illustrating this point, UNCTAD report observes: “the reverse transfer of technology constitutes a one-sided transfer of productive resources embodying technology in human skills from developing countries and has serious negative economic political and social implications for developing countries. This migration of skilled manpower constitutes a considerable loss to the sending countries and a gain to the receiving countries.”

Professor Kamal Nayan Kabra, in his study on the ‘Political Economy of Brain Drain’ published in 1976, has examined various dimensions of the problem with the reverse transfer of technology. Professor Kabra observes: “this characterisation, like brain drain has no claim of semantic neutrality, it straight-away represents the phenomenon as a reverse flow, giving a boost to the technological dependence of the less developed countries. It sounds a clear message of continuance of old colonial equation in new form through confluence of the needs of mature capitalist economies and the needs of dependent enclaves, neo-colonial development paths of the developing countries in which the multinational companies acting as the major instrument of collective colonialism, play a crucial role.”

The documents and reports published by various specialised agencies of the UN as well as UN Resolutions clearly point out the seriousness of the adverse consequences of reverse transfer of technology. The General Assembly, in its Resolution 3362 (S-VII) of 19th September 1975, highlights the urgent need to formulate national and international policies to avoid the brain drain and to obviate its adverse effects. In its Resolution 87 (87) adopted in Nairobi on 30th May 1976, UNCTAD recommended that all countries, particularly those benefiting from the brain drain should, in the light of UNCTAD’s works on reverse transfer of technology, consider what measures may be necessary to deal with the problems posed by such flows. In short, much of the UN work has focused on the effects, remedial measures and quantification in varying proportions. Similar resolutions and recommendations have also been adopted in other UN forums, particularly ILO, WHO and UNESCO. And most of the UN works deal with policy proposals like taxing the LDC PTK migrants in DCs, measures to reduce brain drain, proposals for measuring of HQM flows etc. Different tax proposals put forward by Bhagwati (UNCTAD study)\textsuperscript{17} as compensatory measures or as measures for global allocative efficiency, as well as measures to improve the equity and efficiency goals of developing countries, may be better than nothing, but not a solution to the problem. It should also be noted that they could never be effectively implemented or no sincere efforts were made in this regard.

Experts on international migration, through various case studies, have emphasised different aspects of the problem depending on their professional specialisation. For instance, Prof. Kamal Nayan Kabra summarises the approaches on the question of brain drain into four broad analytical categories - in his own words, ‘with their obviously fuzzy lines of demarcation’ - they are International

\textsuperscript{17} For a detailed account see UNCTAD, n.7.
Trade Theory Tradition, Welfare Economics Tradition, Economies of International Migration and Human Capital and Manpower Planning Approach.\textsuperscript{18}

Professor Walter Adams, in his edited volume entitled -‘Brain Drain’- categorises the approaches dealing with brain drain into two broad categories called ‘internationalist’ or ‘cosmopolitan’ and ‘nationalist’ models.

Internationalists perceive brain drain as a welcome step towards internationalisation of the professional market. They argue that one should think in terms of the welfare of the world and not in terms of the narrow concept of national welfare. The feeling of national identity creates artificial barriers to migration so that less migration from low income to high income regions occurs than would be economically optimal. Brain drain simply reflects the operation of an international market for a particular factor of production, i.e. specialised human capital. Like its physical counterpart, human capital would tend to move to those regions where its productivity is high, thereby leading to the efficient allocation of talents among countries and involves substantial gains in world efficiency.\textsuperscript{19}

Internationalists assume that the international circulation of human capital is a beneficial process since it reflects free choice of individuals who choose to migrate. Normally such migration, like any profit motivated international movement of factors of production, may be expected to raise total world output, and therefore, to be beneficial to the world as a whole. Exceptions may arise when the migrant’s private calculation of gain from migration exclude certain social costs that his migration entails.\textsuperscript{20}

\textsuperscript{18} ibid., p.79.
\textsuperscript{20} ibid., p.75.
With respect to the question of possible economic loss to the world as a whole, Harry Johnson, the chief exponent of internationalist approach argues that the realisation of such a loss happens when the migrant moves from a location where his total contribution to social output would be higher to one where it will be lower. If potential migrants are motivated by purely economic considerations, they will migrate in response to differences in the private income available to them, where ‘private income’ means the sum of net income after taxation and the value to them of the government services they receive in exchange for the taxes. Hence, there can be a world loss from the emigration of educated people only if the relationship between the private income available in the countries of emigration and immigration is inverse to the relationship between the alternative contributions to social output in the two locations.

This can be possible only in two major types of situations. The first is when the ratio of social contribution to private income is relatively higher in the country of emigration than in the country of immigration. The second is when the activity of the educated person involves an externality and that externality is greater in his country of birth than in the country of immigration. Johnson argues that this seems to a very unlikely possibility in practice, at least for the migration of educated people among the more developed countries of the western world and is, on the contrary, likely to produce substantial increase in world economic welfare.\(^{21}\)

With respect to the emigration of educated people from less developed to developed countries, in one important respect the argument for a probable world gain from the flow of migration of human capital is much stronger owing to the much greater size of the income differential between developed and less developed countries than among the developed countries, for people with professional qualifications. This differential is large enough to make it virtually impossible for

\(^{21}\) ibid., pp.79-80.
such migration to result in a world loss as a result of the inversion of relative social and private contributions in the alternative locations by relatively more progressive fiscal system in the less developed countries or by the exercise of holding down the professional income for the benefit of the poorer class of society. Any possibility of world loss must therefore hinge on a loss of externalities to the country of emigration, unmatched by an offsetting gain of externalities to the country of immigration and quantitatively large enough to outweigh the private income gains to the migrants. After going through four theoretical possibilities of such loss of externalities, Johnson concludes that the externalities are greater in advanced countries and there is no significant probability of world loss from the international migration of educated people.22

The internationalist's criterion in defining brain drain is, therefore, whether the individual scientist performs a greater service to humanity by leaving his native country or in remaining or returning home. Ultimately, they argue, the loosing countries can gain if he has greater opportunities abroad for exercising his skills and talents and in realising his professional course. In this view, indeed, his migration might be to the mutual advantage of the receiving and sending countries. The best policy, therefore is laissez faire, non-interference with mobility and migration.

Interestingly, this view fails to explain what is meant by world welfare, and does not answer the questions like, whether the absence of any restriction on the flow of HQM in the international market has maximised world welfare, whether, in the absence of a world government, such welfare functions can be visualised, specially when interests and goals differ very much from country to country. If this view is accepted, looking retrospectively, can we say that brain drain from the developing countries to the developed countries has been gainful for both countries. The arguments advanced by the proponents of internationalist approach are

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22 ibid., pp.80-83.
inconsistent with the experience of developing countries in this regard for the simple reason that the losses that result from brain drain far out-weigh relative gains.

Besides, the internationalist approach adopts an individualist nationalist and internationalist standpoint at the same time. It is suggested by the internationalist school that the verdict against migration of skilled people from the developing countries is based on the explicit formulation of the problem in terms of the nationalistic principle that what matters is not human welfare, but the rate of growth of the output per head produced in the geographical area defined by the nation state. On the one hand, human welfare is sought to be counterpoised to per capita national income and on the other, the existence of nation states and conscious pursuit of policies to further these interests, by implication, are sought to be denied. According to professor Brinley Thomas, they ignore Harry Johnson's concern for American interests and close eyes to Johnson's own departure from the internationalist perceptions.23

Conversely, nationalist approach rejects the viewpoint that the world should be considered as a single aggregate from the welfare viewpoint and that the welfare of this unit is maximised by the free flow of resources between countries. On the other hand, nationalist perspective regards human capital as indispensable to a country's economic development. If migration of human capital, 'the critical mass,' causes the nation to fall below this minimum, the consequence is not merely to raise the marginal product of the human capital remaining, but to jeopardise the growth potential of all combined resources in the country.24

Nationalist approach points out that unfettered migration of brain power today favours the most advanced and affluent nations. It suggests that some interference, analogous to the protection of infant industries against premature international competition is necessary to assure less advanced countries against the loss of the specialised manpower they vitally need, if they are to realise the growth aspirations. They view the brain drain problem as a tied up aspect of the general problem of creating a political, social and economic milieu that will encourage development. According to John Patinkin, it can accordingly be approached only within the framework of this far more basic and difficult problem.25

The internationalists criticise the nationalist approach as acting in accordance with anachronistic concepts of economic and military power and national prestige. According to Harry G. Johnson, the chief exponent of the internationalist approach, the nationalist school visualises economic and cultural welfare in terms of the welfare of the residents of a nation state or region, viewed as a totality, and excludes from consideration, both the welfare of people born in that region who choose to leave it, and the welfare of the outside world in general.26 Patinkin defends this criticism by the argument that the implicit assumption of this criticism is that such nationalistic actions are interfering with the free flow of manpower resources in an international market which would otherwise reflect the welfare maximising behaviour of individuals. But this is not the case for brain drain. The market for HQM reflects to a highly significant degree as demand for manpower generated by the nationalistic considerations. Correspondingly, the nationalist influence which the brain losing countries attempt to exert on the supply side of the international manpower market can to a large extent be seen as an offset of the nationalist forces on the demand side.27

26 Harry G. Johnson, n.19, p.69.
27 John Patinkin, n.25,p.106.
Specifically, these two approaches concentrate on the 'loss' or 'gain' considerations and fails to analyse the root causes of HQM migration in its totality. However, the nationalist view has great relevance for developing countries, for many of these countries pay the highest social cost for the loss of skilled manpower. Accordingly, developing countries perceive this problem more directly in terms of how it impairs their national welfare and development and not in terms of the aggregate welfare of the world.

From the perspective of conventional economics, there are several other theoretical works and models dealing with the issue of brain drain. The countries from which brain drain originate are, naturally, concerned about both the loss of potential income and the detrimental impact of this exodus on the population that remains. As a reflection of this, the brain drain phenomenon has attracted considerable attention from economists mainly on two issues. The first issue is the question of whether brain drain causes a substantial loss in income for those who continue to reside in the country of emigration. The second issue which stems from the above proposition is the identification of the appropriate policies to compensate for the welfare loss suffered by those who are left behind. Hence, most of the studies deal with these two issues and do not consider the issue of brain drain in its totality.

The causes of brain drain are often seen in a bipolar model of pulls exerted by the immigration countries and the push factors operating in the emigration countries, in which the differentials between the two determine the decision of the individual who migrates.

The major pull factors identified in this regard include: availability of better educational facilities and higher levels of scientific and technological advancement, professional challenges and satisfaction, better working conditions, desire to obtain a higher standard of living and better opportunities for their children and
themselves, greater opportunities for research, a natural curiosity to travel and know foreign lands and people, more opportunities for employment on account of a constant demand for highly qualified manpower thrown up by ever modernising technology intensive economies and the resultant production needs, immigration policies of countries facilitating the entry of these professionals easily etc. The push factors are: high rates of unemployment and under employment and under-utilisation of science and technology personnel due to poor absorption capacity of national economies, slow rate of economic development and lack of opportunities, low salary scales with no special incentives for professional advancement, for example, lack of recognition of merit and abilities in recruitment and emphasis on seniority in promotions, lack of institutional support and technical and professional equipment and opportunities for research, low status of the professional and skilled persons in the total administrative system and social milieu, limited or non-participation of professionals and skilled manpower in the decision making process, failures to motivate high level of science and technology personnel towards national goals, lack of freedom to express dissent, lack of on-the-job training and staff development policies, lack of manpower planning resulting in skill surpluses and skill shortages, lack of linkages between educational and socio-economic planning, problems inherent in educational and national developmental models, policies discriminating against minorities. It may be relevant to reiterate that the push-pull factors leading to brain drain appear to be rooted in the unequal economic development among and within nations.28

Enrique Oteiza in a study on 'Differential Push-Pull Approach' attempts to deal with both the individual decision to migrate and the international trends in the migratory movements. Reliance is placed on the general position of demand for and supply of labour, demographic factors, cyclical fluctuations, trends in income

savings, investment, as also a host of socio-political and cultural factors to explain broad trends in international migration. According to him, the strategic importance of science and technology activities which are dense in high level human resources stimulates demand for highly trained persons. Countries try to acquire the needed HQM through education as well as selective immigration policies which, in turn, is determined by the manpower requirements of the nation in relation to national objectives. The manpower requirements for a certain type of national development are determined by “an explicit definition of the quantities of labour inputs with different qualifications and levels of formal educational attainments, formulated by a country to permit it to satisfy its national, economic, social and cultural targets”.29

However, what appears to be an individual’s act of choice in response to the interactions of pulls exerted by foreign lands for better opportunities and the push factors operating in the individual’s mother country is in fact a phenomenon needing better understanding. The migrant is an individual who moves only on account of the collective will, embodied in the emigration and immigration countries’ laws and policies. The push-pull causal model is incomplete as the event is not just a bilateral transaction between the receiving countries and the loosing countries, but it emanates in the wider structural context of internal and international social orders that are highly iniquitous.30

Therefore, the central difficulty with push-pull and other models and approaches discussed above is that they do not consider the changing historical contexts of migration. To understand the changing historical contexts of migration, a conceptualisation which could see migration as part of a broader system to which all the units belong, is needed. On the other hand, in the case of approaches/models discussed above, migration occurs between two distinct social units, that which

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30 Usha Nayar, n.28, p.11.
supply labour and that which receive it. The possibility that such flows may actually be part of a broader system to which both units belong is not usually contemplated. Such a conceptualisation only could explain the historical origins of labour migration and professional migration in particular.

Articulation of such an international system has resulted in changing forces underlying migration. The penetration of outlying regions by capitalism has produced imbalances in their internal social and economic structures. Though first induced from outside, these imbalances become internal to the incorporated societies and lead in time to migratory pressures. Hence, the pull from advanced countries is not based primarily on invidious comparisons of advantages with outside world, but on the solution to otherwise insoluble problems inside the sending countries. At the same time the advanced countries are in perpetual need for ready and appropriate supplies of all kinds of labour for their expanding process of capital accumulation, thereby creating a global labour market. Thus, the changing character of push and pull, the obsolescence of labour recruitment and the spontaneous origin of labour flows are all consequences of the development of an international economy and the changing modes of incorporation of units into it. It is this relational dynamics within a global order that appears to offer the most satisfactory explanation for the origins of international migration, both labour and HQM migration. This conceptualisation is based on the principles of world systems theory.\textsuperscript{31}

World systems theory considers the global economy as the basic economic entity in which nations are hierarchically ordered. In order to distinguish countries within the global economic system, dependency theorists have formulated analytical models such as the metropolis-satellite model and the core-periphery model based

\textsuperscript{31} Alegandro Portes, "One Field, Many View: Competing Theories of International Migration", in James T Fawcett and Benjamin V Carino (eds.), Pacific Bridges: the New Immigration from Asia and the Pacific Islands (New York: Center for Migration Studies, 1987), p.55.
on their socio-economic status within the world system. This division explains the structural inequalities embedded in the trans-national relationships. Immanuel Wallerstein proposes a tri-model world system consisting of core-semi periphery-periphery nations arguing that the centre periphery bi-model explanation fails to depict the diverse and complicated world. This further stratification of the developing countries is an important indicator of the diversification of the world economy and the complexity of issues involved in the hierarchy of national economics in the world system.32

The metropolis-satellite dependency relations has its origin during the colonial period starting with the internationalisation of the market economy and the incorporation of the outlying regions into the world capitalist economy. Incorporation of the colonies into the world capitalist economy has disrupted their internal social and economic structures. Though first induced from outside, these imbalances become internal to the incorporated societies and the structures of the peripheral states are remoulded to fit external demands and the resulting structural imbalances perpetuate dependency. Exploitation of their resources and markets by the imperial power forced them into a process of de-capitalisation and de-development.33

For the peripheral countries, dependence is all encompassing and the contradictory metropolis-satellite relationship runs through the entire world capitalist system in chain like fashion from its uppermost metropolitan world centre through each of the various national, regional and local centres. Once a country is incorporated into the world capitalist system, the exploitative metropolis-satellite structure comes to organise and dominate the domestic economic, political and

social life of the people. Therefore, capitalist satellite countries, regions and localities are condemned to underdevelopment.34

However, the new dependency studies and world systems theories advocate the potential for change toward greater balance between nations. World system theorists content that there has been upward and downward mobility within the world economic structure, as evidenced by a historical shift in the major economic powers since the 16th century. But the fact that particular states change their position within world economy does not in itself change the nature of the system. The world capitalist system throughout its expansion and development on a world scale, as a whole, maintain the essential structures and would generate the same fundamental contradiction.35

The world capitalist system is fundamentally allied with an economically rooted division of labour which is primarily based on the capital intensity in the economic arena. The changing pattern of dependence derives mainly from this economically rooted division of labour which has perpetuated underdevelopment through the integration of peripheral countries into the world capitalist system. The prime mover behind the capitalist development based on international division of labour is the valorisation and accumulation of capital.36

Historically, the peripheral countries entered the world economy as export suppliers of basic and primary materials. The core, dependent upon these materials for its own industrial manufactures, in turn, recycled them to the periphery in the form of durable and consumer goods. This unequal exchange associated with this

35 ibid., p.12.
specialisation within the international division of labour is partly responsible for the impoverishment of the periphery.

World systems theory argues that international migration follows directly from the globalisation of the market economy. It is a natural outgrowth of disruptions and dislocations that inevitably occur in the process of capitalist development. As capitalism extends from its core nations and incorporate the countries of the developing world into the world market economy, market relations penetrate into these countries and the non-capitalist patterns of social and economic organisations are disrupted and transformed. In this process, however, large numbers of people are displaced from secure livelihood as peasants, farmers, family artisans etc., creating a socially and economically uprooted population that is prone to migration, both internally and internationally.37

The economically rooted division of labour engenders the simultaneous flow of low wage labour from the periphery and semi-periphery to the core and the emigration of the core capital to the migrants’ countries of origin. Together these forces constitute the world capitalist system and only in combination can we understand the tendencies towards a new international division of labour. Once the process of incorporation of the less developed states into the world capitalist system and its penetration by that system’s political and economic institutions has commenced, the structures of the peripheral state are remoulded to fit external demands and the resulting structural imbalances promote emigration.38

According to world systems theory, international migration is especially likely between post-colonial powers and their former colonies, because cultural,

linguistic, administrative, investment links were established during the colonial period, leading to the formation of specific trans-national markets and cultural systems.39

Migration of HQM is a special category of international migration. Its emergence coincides with what has been termed as 'the third technological revolution' characterised by increased control of machines by electronic apparatus, thereby rendering the quality of labour more critical. Though a part of international migration, HQM is different from other types of migrations because of its high degree of selectivity and quality. Its specific effect has been the widening of the technological gap which separates developing and developed countries. This is aggravated in so far as loss of special skills and scarce human resources constitute an additional drain on technologically less developed societies, and a further contribution to the technological edge already held by the importing societies.40

Global science and technology order is the most decisive factor determining the nature and pattern of the migration of high quality manpower. Technological change is the most important factor which has helped the emergence of the new international division of labour which, in turn, has created an international market for high quality manpower. International market for HQM, thus, is a reflection of the global science and technology order which is hierarchically structured.

Since World War II, science and technology has been playing a crucial role in national economic productivity and international competitiveness. Scientific and technological revolution has changed the world economy at a rapid rate and society has become more complex and diversified and scientific knowledge has become

more closely related to socio-economic changes and has led to a post modern knowledge based society. In such a society, scientific knowledge and information have become major components in the global competition for power. Knowledge itself has become a commodity that is related to the operation of the market economy and the market economy is increasingly taking on the characteristics of a single capitalist global economy. Scientific and technological knowledge is among the critical engines that drive this trend towards internationalisation and in this sense, scientific knowledge is located at the heart of the international economy.41

In this context, nations are increasingly concerned about economic benefits to be drawn from the application of scientific knowledge. Science and technology has become crucial national resources as important as land and capital for maintaining and expanding a nation’s economic and political power in the world system.

According to the world systems theory, there is a hierarchical structure embedded in the international science and technology networks. This hierarchical structure derives mainly from the strong correlation between the global pattern of distribution of income and wealth and control of technology. Since modern science and technology demands more expensive physical facilities than before, the capacity of the nation to give economic support to scientific communities has become the critical basis for the development of science. Obviously, advanced capitalist countries control majority of the global scientific and technological resources and play a dominant role in the production and distribution of advanced knowledge and technology, though they account for only a minority of world population. Technological power measured in terms of the money spent on research and development (R&D) activities, reveals that around 90 per cent of technological

capacity rests with the developed countries. For instance, share of underdeveloped countries was only 6.2 per cent of the total world expenditure on R&D during 1980 and remaining resources are concentrated in the advanced countries. The control over R&D and therefore, the control over the development of advanced technologies which have become increasingly the function of large scale R&D has, therefore, been placed in the hands of a few major actors. These actors include the powerful TNCs based in a few developed countries and governmental authorities such as defence administration of major Powers. The monopoly over technological development is guarded through intellectual property rights and restrictive business practices by TNCs and developed country governments. Hence, the underdeveloped countries find themselves in a shocking state of technological dependence on the industrialised countries which hold over 90 per cent of the global patents. Therefore, the realm of technology is characterised by a great degree of structural asymmetry between developed and developing countries.

A logical corollary to the concentration of R&D activities in the developed countries is the concentration of highly skilled and trained human resources or scientific and technological manpower in these countries. In the year 1980, developing countries employed only 11.2 per cent of the total number of scientists and engineers engaged in R&D all around the world and the rest were employed by advanced countries. Concentration of R&D in industrialised countries creates much demand for R&D personnel, which could not be met, most often, by the output of educational institutions in these countries. This increasing demand for R&D personnel in developed countries creates heightened pull for R&D personnel from other countries which are unable to employ their educated manpower.

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43 ibid., pp.342-3.
Concentration of technology in the hands of a few has rendered the technology market highly imperfect. Moreover, rapid technological changes has further strengthened the monopolistic practices in technology market. As Dieter Ernest observes, “technological change is a powerful instrument for consolidating oligopolistic structures and increasing concentration”\(^{44}\). This oligopolistic nature reinforces at higher levels of technological development. T. Baumgartner and T. R. Burns observe in this regard, “the global political economy of the leading sectors which will determine system development in next decades remains highly oligopolistic if not monopolistic”. In this imperfect technological market the technology suppliers are in a superior bargaining position.\(^{45}\)

Besides, the western technology has been found inappropriate to the social conditions in underdeveloped countries and the dependence of these countries on western technology has further tied down them to a dependence on western countries. Characteristics of technology are influenced by the economic and social conditions in the economy in which it is developed. Western technology is capital-intensive and skill-intensive and can only be put to use where there is a sufficient concentration of capital and scientific and technological infrastructure. Therefore, western technology is inappropriate in relation to the resource endowment of the developing countries. Developing countries with labour surpluses and capital scarcity needs labour intensive technology. The injection of western technology, therefore, inevitably tends to aggravate the problems of unemployment and income disparities. Illustrating this, Johan Gatung observes, “western technology is inherently periphery forming. The techniques always induce externalities largely positive for the centre in so far as creativity is demanded from the few, but primarily


negative for the periphery because of the sacrifices demanded from the many and from the nature”.46

Further, western technology leans on the social elite. The products manufactured in advanced countries and the way they are manufactured reflect the basic characteristic of the economic environment in the advanced countries. The products are generally designed to meet the requirements of high income consumers, who demand high quality goods and the process of technological innovation in the advanced countries results in successive increase in the capital intensity of production i.e. technical change is biased in a capital using direction.

Apart from the inappropriate nature of the foreign technology, it has a devastating impact on the indigenous R&D structure in developing countries. The process of industrialisation in most of the developing countries has been heavily influenced by the fact that income distribution is skewed in favour of the urban middle and upper classes, who therefore, dominate consumer goods markets. Generally, the elite consumers demand the same kinds of goods as consumers in the industrialised countries. Therefore, the private enterprises in these countries, the major manufactures of consumer products, heavily depend on western countries, where the technologies required to manufacture these goods are already in existence. The dependence on western technology creates imbalances in the indigenous science and technology system in these countries which, in turn has led to the alienation of scientific institutions from production activities and therefore, their marginalisation. Since there is no demand for indigenous science and technology, there is no incentives for the local science and technology (S&T) system

to produce and the S&T system of the developing countries proved to be incapable of generating any significant amount of indigenous technology.47

While there has been relative neglect of applied research in developing countries, there is heavy concentration on basic research. Such basic research, as is carried out, is oriented to the concerns and preoccupation of scientific communities in the developed world, the natural consequence of the marginalisation or alienation of science from its local environment. The research centres function as isolated enclaves which do little to encourage indigenous R&D. Cooper rightly observes in this regard, that the lack of pressure on science from the local economy means that the main determinants of research orientation are the individual decisions of research workers and these research workers take their lead from the international orientation of research. The scientific communities in the developing countries are the outposts of the advanced country science, with very limited links with the economic and social realities which surround them. There is no conspiracy or individual bad faith in it. It is simply the way the system works. This system acts as a vicious circle leading to continued technological dependence of developing countries.48

As far as this system exists as it exists today, the chance for most of the developing countries to come out their underdevelopment and over-dependence is problematic. The developed countries continue to dominate in the technology field and the production of technology would be concentrated in these countries. As a natural corollary, migration of research personnel from developing countries to the developed countries also would continue.

Like many other systems, higher education system also reflects larger global uneven development and dependency. The education required to train the highly educated places developing countries in a dependent relationship with western societies. Countries that had been under colonial rule, developed their schools and higher education system based on western model. In the post-colonial period, despite the efforts to indigenise the system, reliance on western model has been continuing. During this period, the world of scholarship also shifted from the UK to the US and the US emerged as the dominant force shaping higher education through its foreign aid grants, inter university programmes etc.49

Developing countries continued to depend upon the US and other developed countries, who had the advantage of accumulated scientific knowledge, for training in the engineering and scientific fields. The dependence continued in the form of adoption of western curricula and techniques as well as training of students abroad. After World War II, the US emerged as the major place of study for international students. Over the last three decades, the foreign student population from South and East Asia increased dramatically from about 10,000 in the mid 1950’s to 30,000 in the mid 1960’s. to 60,000 in the mid 1970’s and to over 1,42,000 in 1984-85.50 Among the Asian countries, Taiwan, India, Japan, Korea and Hong Kong have been consistently sending large contingents of students, and in recent years have been joined by the Peoples Republic of China. While the United States receives the largest absolute number of students, other advanced countries also host large number of Asian students relative to their size. For example, Britain, Canada and Australia continue to receive many students from the Third World Countries of the Commonwealth.

50 ibid., p.551.
Through the dependence on Western Education, a global integration of the higher education has been generated and the resultant internationalisation of the highly educated from the developing countries made them prone to migration. This dependency in the field of higher education is a part of a larger global economic dependency. The cost of independently recreating the institutions and accumulated knowledge is prohibitively high even for smaller western nations. At the same time the salient features of training in advanced countries make migration inevitable.

The training in advanced countries is narrowly defined, the product of a high degree of specialisation making the skills not readily transferable to another field. Secondly, the human capital is highly complementary to and therefore highly dependent upon very specific types of physical capital. Given these two characteristics, the role of highly educated labour varies across jobs, industries and nations. Hence, the developing country manpower trained in developed countries is most often irrelevant or unsuitable to the particular conditions of developing countries, and they can pursue a career in their chosen field only in advanced countries and they are forced to migrate. Thus, the dependence on western training and education acts as a vicious circle by making the developing countries as suppliers of high quality manpower to developed countries and thereby reinforces their dependence on developed countries.

Besides, the efforts of many developing countries in the capitalist world system to develop their own technological capacity have produced an imbalance between the supply and demand for highly educated labour. Although the expansion of higher education is a necessary condition of industrialisation, it is not a sufficient condition. The structural imbalance due to lack of homogenous development of various sectors of the domestic economy has made the underdeveloped countries unable to economically utilise their high level manpower.

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51 ibid., p. 558.
It is important that the over-expansion of higher education is partially the result of efforts by developing nations to meet the aspirations of its upper and middle classes. Because many of the desirable jobs, particularly in the public sector have been allocated based on educational credentials, the demand for higher education is high, even though the economy may not be able to absorb all the graduates. Its consequence is a growing class of highly educated labour that is unemployed or under-employed, and that is a potential source of social discontent. Ironically, migration removes those who may becomes frustrated, thus functioning as a social safety valve.

In the process of international migration, states play an important role, which the world system theory does not deal with or fails to explain. State action is decisive in structuring the international migration flows. Though the labour market operates in principle through the world economy, its overall operation is segmented in the form of a seemingly discrete set of very different national labour markets, each more or less regulated, and a loosely interrelating international labour market.52

The state is a territorial unit as well as a political and economic unit within the world system, and enjoys autonomy and control over its borders. Independently of other factors, it is state action with respect to borders that determine whether any international migration will take place at all. The rules that states create regarding entry and exit determine the magnitude, composition and direction of international migration.53

Ties between countries of origin and destination are not exclusively economic, but social and political as well, and they are influenced by the continuing

52 Elizabeth McLean Petras, n.40, p.48.
existence of supportive networks like historical and cultural ties. Therefore, the rules of entry and exit that the states create are influenced by relations between them and in determining what policies they should pursue with regard to international population movements, countries take into account the actions of others. In other words, rules of entry and exit are not necessarily political expression of economic forces only but are influenced by political, social, cultural factors also, seemingly non-economic in origin, however, they are decidedly economic in impact.

Migration of HQM also is conditioned by these complex and inter-linked factors. Potential receivers facilitate the entry of HQM through immigration legislation. They make visa regulations selective, so that professionals having higher qualifications might obtain them easily. Immigration policy of the US is the best example illustrating state action through legislation to attract highly qualified manpower. The US has changed its immigration policies periodically with a view to encourage a free flow of HQM from developing countries. This is true in the case of other developed countries like Canada, UK, Australia etc.

The fore-going discussion reveals that, at the conceptual level, the phenomenon of reverse transfer of technology lacks conceptual clarity and disagreement exists on all aspects, starting from the very definition of the phenomenon. There are as many variations in its definition as there are situations to which it is applied. For instance, western literature view brain drain synonymous with the immigration of talented people in ancient times, and does not differentiate between different types of migrations. Again, studies and official statements published in Western Europe and America incorporate brain drain in the category of general international migration.

However, it should be emphasised that reverse transfer of technology is entirely different from both ancient migration of talents and modern labour migrations and other types of induced migrations. Reverse transfer of technology is
a post-War phenomenon qualitatively and quantitatively different from other types of migrations. As against the ancient talent migration which was of single and isolated individuals, the modern brain migration is large and characterised by steady flow of skilled manpower. While the ancient migration was associated mainly with the growth of centres of learning, the modern migration is economically motivated and is associated mainly with technological advancement, industrialisation, commercialisation of knowledge and above all the changing global economic scenario. Another feature of modern migration is the increasing share of developing countries in the total flow of skilled manpower to the developed countries while the share of developed countries has decreased considerably. The definition of reverse transfer of technology adopted by the UN and the characteristics of modern migration listed by the UNITAR, which were mentioned earlier, perhaps, offer a relatively viable explanation from an academic as well as development perspective.

Another problem at the conceptual level is regarding the types of migrants to be included in the category of brain drain. ILO definition of occupations under the PTK category given in the international standard classification of occupations is considered satisfactory. However, in the present study, we have adopted the definition of occupations under the category of ‘PTK’ workers made by immigration and Naturalisation service of the US Department of Justice. This classification is broadly similar to that utilised in other developed countries.

Regarding the length of stay of the immigrant there is no universally accepted criteria and generally it is considered more or less permanent settlement. The present study also considers brain drain as more or less permanent migration of highly qualified and talented manpower from the developing countries to the developed countries.

A review of debate on brain drain, in brief, reveals that the major theoretical formulations, especially on the impact of brain drain on sending and receiving
countries belong to the internationalist and nationalist schools. The internationalist school view the international migration of human capital based on free choice as resulting in optimisation of individuals productivity and therefore world welfare. They argue that one should think in terms of the welfare of the world and not in terms of the narrow concept of national welfare. Brain drain simply reflects the operation of an international market for human capital. Like its physical counterpart, human capital would tend to move to those regions, where its productivity is high, thereby maximising world welfare.

Nationalist model rejects the view point that the world should be considered as a single aggregate from the welfare view point. They perceive this problem in terms of how it impairs the national welfare and development and not how it serves the aggregate welfare of the world. The principal criterion is service to the nation. This view regards human capital as indispensable to a country’s economic development. In order to realise the growth aspiration of developing countries, who pay the highest social cost for the loss of their skilled manpower, nationalist perspective suggests that some interference, analogous to the protection of infant industries against premature competition is necessary. However, nationalist view also maintains that brain drain to a limited extent, or if not too large, would be beneficial to the losing countries since it prevents the development of monopolistic tendency within scientific communities in these countries and also provide the opportunity for these countries to train their students in advanced countries. The nationalist argument, therefore, is that the immigration should cause no loss as long as the percentage of those remaining in advanced countries is not too large and the income of those left behind does not decrease.

In brief, although internationalist and nationalist approaches concentrate on the ‘loss’ or ‘gain’ considerations, the loss incurred by the developing countries in its totality
countries are not adequately considered in these two approaches. More over, these approaches fail to analyse the root causes of HQM migration in its totality.

The causes of brain drain are generally attributed to push and pull factors. The push factors originating in the emigrating countries include general economic backwardness of the country, low salaries, unsuitable institutional setting, lack of manpower planning, political instability etc. and the latter which originate in the immigration countries include growing demand for talented professionals, lure of higher standard of living, income differentials, better research facilities etc. But this model does not take into adequate consideration the structure within which individual decisions are made in response to pull and push factors which emanates in the wider structural contexts of internal and international orders that are highly iniquitous.

In fact, it is the world systems approach that examines the issues involved in international migration leading to reverse transfer of technology in its totality and in a socio-historical perspective. This approach views brain drain as a characteristic feature of capitalist world economy which encompasses both receiving and sending countries. The push factors originating in the sending country and the pulls exerted by the receiving country originate in a wider structural context of international economic and technological order that are highly iniquitous.

Stated otherwise, the world systems approach traces the origin of migration with the modern technological revolution. Modern science and technology demands more expensive physical facilities and equipment’s than before and quite naturally the core nations play the dominant role in the production and dissemination of advanced knowledge and technology. The periphery countries simply do not have the capacity to do so and they are destined to a state of technological dependence which has historical roots related to the development of the capitalist world economic system. Historical pattern of dependence from the colonial up to the post
highly educated unemployed or under employed. In brief, it is the interplay of a variety of internal and external factors, originating in the wider structural contexts of highly iniquitous international economic and technological order that leads to the migration of HQM from developing countries to developed countries.

The fore-going discussion suggests that international migration has assumed a qualitatively new phase in the post-War period. The characteristic features that attend its very nature and pattern today, which have made it to be referred as reverse transfer of technology and brain drain need to be viewed in its totality. Many of the prevalent perspectives on the problem throw light on certain aspects, but turns out to be relatively inadequate. In fact, the issue has to be viewed in the content of the process of globalisation of developing societies. Hence, the emerging perspective, as is outlined in the world systems theory undoubtedly shall offer a high degree of conceptual and theoretical framework for the problem under examination.
CHAPTER II