INTRODUCTION

Technology has been a major instrument of social change. In fact, major technological changes have invariably been accompanied by fundamental socio-economic and cultural changes. Central to socio-economic transformation of the western societies, for instance, has been the industrial revolution, stimulated essentially by technological changes.

Transformation of western societies, from its essential backwardness to the present industrially and technologically advanced nature, has been possible mainly due to the accelerated application of technology to the production process. As the process gathered momentum, it was natural for the capitalist countries to integrate the backward societies of Asia, Africa and Latin America into the global production system.

In turn, roles and functions of different societies got transformed into centres of production on the one hand and sources of raw materials and market for finished goods on the other. The colonial conquests and its subsequent consolidation reinforced the asymmetry in the development.

Although technology stimulated tremendous socio-economic changes in the West, the countries in Asia, Africa and Latin America were deprived of the opportunity for socio-economic transformation. Further, it has been widely argued that it is not the technology as such, rather the control over it that perpetuated wide technological disparities and uneven development of societies.

The imbalance in the technological transformation of nations is evident from the widely used technological parameters. For instance, developed countries
accounted for major chunk of the research and development (R&D) scientists and engineers and R&D expenditure even during the seventies and eighties. The share of developing countries in this regard was insignificantly low, as is illustrated in Table 1. Such wide disparities appear to exist, if measured in terms of number of patents owned by the developing countries as a whole or in terms of aggregate technological capabilities, share in world trade and levels of socio-economic development.

Table 1
Distribution of R&D Scientists and Engineers and Expenditures Estimated
Percentages for 1970 and 1980

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D Scientists &amp; Engineers</th>
<th>R&amp;D Expenditure</th>
<th>Expenditure for R&amp;D as percentage of GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Developed Countries &amp; territories</td>
<td>Developed Countries &amp; territories</td>
<td>Developed Countries &amp; territories</td>
</tr>
<tr>
<td>1970</td>
<td>91.5</td>
<td>8.5</td>
<td>97.5</td>
</tr>
<tr>
<td>1980</td>
<td>88.8</td>
<td>11.2</td>
<td>93.8</td>
</tr>
</tbody>
</table>


The huge imbalance in the technological capabilities of the developed and developing countries, as mentioned above, resulted mainly from the colonial past. Colonial system of exploitation, as various studies reveal, not only deprived the colonies of the modern technological opportunities, but destroyed indigenous technological capabilities as well. Quite naturally, development of technology infrastructure and technological personnel in particular occupied the central position in the development agenda of newly independent countries.

However, the post-War technology order seems to have acted inconsistent with the technology requirements and development aspirations of the technological
have-notes. The industrially advanced western countries, with their immense technological capabilities, rather preferred to use technology as an instrument of control and domination. Multinational corporations, the major carriers of technology, were most often reluctant to transfer technology to the developing countries; and as and when technologies were transferred, it was found to be inappropriate to the prevalent socio-economic and cultural milieu.

The plea for the creation of a new international economic order in the 1970s, and the call for a code of conduct on multinationals as well as on transfer of technology later, all of which fell on deaf ears, suggest the glaring anomalies that characterised the post-War technology order. The critical nature of such issues are evident from the innumerable resolutions and programmes of action adopted by the United Nations and various international fora.

For well known historical reasons, the stock of science and technology personnel was negligibly small in the 50s in almost all developing countries. The efforts of newly independent countries to build certain amount of science and technology personnel as well as engineering and medical professionals met with considerable difficulties. Technology, as embodied in human personnel, being an intrinsic element of the technological capabilities, inadequate stock of such resources would be detrimental for socio-economic transformation.

Perhaps, it is this realisation that prompted many newly independent countries to develop manpower resources. Although it was possible for many developing countries to train and develop certain amount of human resources, it was highly inadequate in relation to the minimum human capital requirements for development. Paradoxically, developing countries, without exception, began to experience a severe drain of such resources, the stock of which was already scarce. Gradually, 1960s and 70s witnessed an excessive outflow of the trained and qualified human resources already in short supply at home.
A number of studies suggest that transfer of resources, as embodied in human personnel, takes place mainly from the developing countries and destination has been mostly industrially advanced western countries. A variety of explanations have been offered highlighting either the push factors originating in the sending country or the pulls exerted by the recipient country or both.

The situation being what it is, the qualitative transformation in international migration during the post-War period, characterised by an excessive outflow of highly qualified manpower (HQM) from developing countries which was skewed in their disfavour, came to be equated to Reverse Transfer of Technology. With the ever growing imbalance in the technological capabilities and stock of qualified and trained personnel on the one hand and the excessive outflow of HQM from developing countries on the other, the issue of reverse transfer of technology gradually acquired a central position in the development debate.

Gradually, reverse transfer of technology emerged as an issue of multiple dimensions and disagreement appears to exist on all aspects of the problem starting from the very definition of the phenomenon to the types of skills to be included in the category, on the extent of stay of the migrants in the host country, and on its development impact. The literature on reverse transfer of technology suggest that major approaches that attempt to offer a theoretical explanation for the problem are themselves in total disagreement with each other.

While the internationalist perspective perceives the issue as a welcome step towards global welfare, the nationalists view the problem as detrimental to the development efforts of developing countries. On the other hand, push-pull approach appears to consider brain drain in terms of a bipolar model of pulls exerted by the immigration countries and the push factors operating in the emigration countries. However, it is widely argued that nationalist, internationalist and push-pull
approaches do not consider the issue of Reverse Transfer of Technology in its totality.

The world systems approach, on the other hand, appears to offer relatively satisfactory explanation to the problem of reverse transfer of technology. This approach, unlike others, considers global economy as the basic economic entity in which nations are hierarchically ordered and international migration results from the globalisation. Further, global science and technology order is of particular importance in relation to reverse transfer of technology since it is the hierarchical nature of science and technology system that has resulted in the migration of highly qualified manpower from developing to developed countries. Differences appear to exist on the problem of reverse transfer of technology, conceptually and otherwise.

A cursory examination of the literature on migration suggests that the nature and pattern of international migration changed substantially in the post-War period, quantitatively and qualitatively. Migration of HQM seems to have emerged as the dominant form of international migration in the post-War period. The process gathered momentum in the 1960s and assumed critical proportions during the 1970s and 80s.

Statistics on international migration suggest that developed countries of the West are the major destination of HQM and the United States is the prime recipient among the developed countries. Among the sending countries, countries of the Asian region seem to account for the largest number of HQM outflow and India is considered to be one of the major suppliers. United States being considered as the major recipient and India being viewed as a major supplier, there is ample scope for a study on the problem of reverse transfer of technology from India to the United States. Immigration policy being one of the major determinants that facilitate the actual immigration, emphasis of the study shall be on the US immigration policy vis-à-vis India.
In the light of the above considerations, this study shall examine, among other things:

* the conceptual debate on the reverse transfer of technology, with a view to identifying an appropriate perspective that shall provide a framework for the problem under examination,

* the nature and trends in international migration - its general features, causative and conditioning factors, the considerations that underlie both emigration and immigration, and the qualitative and quantitative trends in its course;

* salient features of the US immigration policy, its parameters and determinants - ethnic and racial dimensions, economic, labour market and foreign policy considerations - implications of the restrictionist and anti-restrictionist campaign on the policy reforms;

* impact of the immigration reforms from time to time on the nature and course of international migration, from developing countries particularly HQM migration;

* impact of the policies on the immigration into the United States, especially HQM;

* experience of India - a major supplier of HQM and the United States - a major recipient - the circumstances that condition the emigration of HQM from India and the considerations that underlie the immigration of HQM into the US and the implication for both countries.

For the purposes of discussion, this study has been divided into six chapters, exclusive of the brief introduction.

In Chapter I, efforts have been made to trace the issues involved in the realm of reverse transfer of technology at the conceptual level. Here, major approaches - nationalist approach, internationalist approach, push-pull approach and world systems approach to reverse transfer of technology - have been discussed and an
earnest attempt has been made to identify the perspective that shall provide a framework for the problem under examination.

Chapter II traces the nature, pattern and trends in the international migration. Here, efforts have been made to examine the different phases in the course of migration - pre-War period, inter-War period and post-War period, the quantitative and qualitative features of the process of transformation, underlying causal factors. Efforts have also been made to assess the reverse transfer of technology dimension of the problem in the context of the experiences of developing countries.

In Chapter III, efforts have been made for a comprehensive analysis of US immigration policy. The discussion in this chapter reveals the distinct phases in the US immigration history, the basic parameters and the varying determinants that shape the policy reforms from time to time - internal and external factors such as ethnic and racial considerations, economic imperatives, labour market pressures as well as foreign policy considerations. Attempts have also been made in this chapter to assess the changing provisions in the immigration reforms in relation to HQM.

Chapter IV examines the nature and magnitude of HQM migration into the United States in relation to US immigration policy. This chapter analyses the impact of major immigration policy reforms, especially the immigration Acts of 1965 and 1990 on international migration especially HQM immigration into the United States.

In Chapter V, efforts have been made to examine the experiences of both India and the United States in the context of the major immigration policy reforms during the post-War period. The chapter traces the changing pattern and emerging trends in the immigration of HQM from India to the United States, national circumstances and considerations that shape emigration from India and immigration.
into the United States as well as the implications of the reverse transfer process on both the supplier and the recipient.

Major observations of the study have been placed in the final chapter. (Chapter VI).

Reverse transfer of technology, as used in this study, refers to the excessive outflow of trained and qualified manpower resources (HQM) from developing countries to developed countries. The term is used synonymously with brain drain. This study does not make much of a distinction between the terms ‘HQM’ as generally used in the UN Studies and Professional Technical and Kindred (PTK) categorisation employed in the US sources, even though marginal differences exist.

The study is based both on primary and secondary sources. Primary sources include UN documents, Studies and Reports published by the United Nations and its specialised agencies, Reports published by and Studies conducted by different agencies of the Government of India and the Government of the United States. Secondary sources comprise of books, journals and newspapers.

This study has employed a historical-analytical method and the problem under examination has been approached largely from the perspective of a political scientist.

Modest efforts have been made to collect latest and relevant data available. However, non-availability of comprehensive primary data, especially for the 1980s and after on the experience of developing countries and India in particular has been a major constraint experienced in the course of the study.
CHAPTER 1