The Brain Drain of Scientists, Engineers, and Physicians From the Developing Countries to the United States.

Michael Hugh Truscott
Louisiana State University and Agricultural & Mechanical College

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The Louisiana State University and Agricultural
and Mechanical College, Ph.D., 1971
Economics, general

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THE BRAIN DRAIN OF SCIENTISTS, ENGINEERS, AND PHYSICIANS FROM THE DEVELOPING COUNTRIES TO THE UNITED STATES

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Economics

by

Michael Hugh Truscott
B.A., Southwestern at Memphis, 1962
M.B.A., Memphis State University, 1966
May, 1971
ACKNOWLEDGMENTS

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ABSTRACT

The brain drain from the developing countries to the United States has been a controversial topic since the end of World War II. Some students of the brain drain contend that the underdeveloped countries are using up their vital and scarce human talent to provide the developed countries with highly skilled human capital at zero cost, thus foregoing the use of a highly specialized resource which is essential to the economic and social development process. Others contend that the movement of highly educated individuals from developing to developed countries is salutary since it results in a more efficient allocation of world resources. This conclusion is based on the conviction that the marginal productivity of highly trained individuals is relatively low in underdeveloped countries because the supply of such talents is great relative to the effective demand for them; as a result, proponents of this view feel that the emigration of highly skilled manpower from developing countries does not significantly alter their development potential.

From the point of view of those desiring to reduce this unidirectional flow of human capital, it is particularly important to attempt to identify those factors which induce this flow to take place. This study examines some of the more important "push" and "pull" forces which are commonly cited as contributing to the brain drain. However, a basic conclusion of this study is that the immigration laws of the United States are the main factors contributing to the brain drain from other countries to the United States. In
addition, a regression analysis was undertaken in an attempt to isolate the most significant "push" or "pull" variables affecting the brain drain of scientists and engineers.

Finally, this study concludes that the brain drain is more a symptom of the state of underdevelopment than a cause of underdevelopment. In particular, it is concluded that the brain drain is a symptom of the disequilibrium that exists between the typical pattern of expansion of higher education in developing countries and their limited capacity to absorb an expanding number of graduates. The possibility of a reverse brain drain for the United States presents itself in the very near future and is a question which this study raises for further discussion.
CHAPTER I

INTRODUCTION

Scope and Purpose

The main purpose of this study is to consolidate all of the various ideas and aspects of the brain drain that have emerged separately in journal articles during the last decade or so. It has not been the purpose of this study to formulate an original "model" of the brain drain, but rather to bring a lot of loose ends together so as to provide an integrated and comprehensive overview of a controversial issue.

Primarily because statistics relating to the brain drain are so scanty, it is very difficult to test "theories" regarding the brain drain against empirical data. Perhaps this is one reason that most articles on the brain drain are in the "policy" area rather than in the "theory" area. At present there is no formal theory of the brain drain or, for that matter, of international human capital movements. Thus, any formulation of a "theory of the brain drain" must draw heavily on the traditional theories relating to factor movements. Chapter III of this study thus relates the brain drain to the marginal productivity theory.

Hopefully, the study of the United States emigration laws and the regression analysis at the end of Chapter III will provide contributions which will aid in the understanding of the brain drain phenomenon. Likewise, it is hoped that the recommendations drawn up in Chapter VI will provide the policymaker with a guide for making improvements in the situation.

-1-
The scope of this study encompasses underdeveloped countries in general and relates to the movement of human capital from these countries to the developed countries, but to the United States in particular. The human capital elements designated as "brains" include scientists, engineers, and physicians. This study is not narrow and specific in scope by necessity. The relative absence and inaccuracy of individual country statistics make it impossible to assess accurately the impact of the brain drain on specific countries. Thus, the study deals with generalities, rather than specifics.

The Problem in Perspective

This section will attempt to place the brain drain problem in its proper perspective. The general flow of highly educated individuals from underdeveloped to developed countries has been going on for quite some time without too much alarm from the countries involved. However, the brain drain issue came to the forefront during the post-World War II era when the underdeveloped countries attained a stronger voice in the United Nations and could make their views known more effectively in international circles. This fact combined with the Cold War and the battle to install ideologies in the underdeveloped countries has given the latter a tremendous amount of leverage and bargaining power with which to make their urgent needs known to the developed countries in the hope that some remedial action will be taken.

There is much disagreement as to whether, in fact, the brain drain does constitute a problem for the underdeveloped countries losing skilled manpower. Chapter V will provide a review of the main
ideas concerning the question of whether or not the brain drain does, in fact, constitute a pressing problem. For the present, suffice it to say that the brain drain has become an international issue which has created much concern, particularly among those who cling to the "nationalistic" view—that the brain drain does indeed constitute a problem the proportions of which cannot be ignored. What disturbs these "nationalists" the most is that the United States does not seem to be concerned with finding a solution to the problem. James Perkins, for instance, states that the United States is following rather paradoxical policies:

> While with one hand we give laboratory equipment, train teachers, send out our own teachers, build buildings—all on the very simple proposition that the modernization of the underdeveloped world is our immediate and demonstrated self-interest and that the critical component of a modernizing society is its modernizing men— with the other hand we take away not only the raw materials but the very people who have been so carefully trained to develop them.¹

Perkins' statement reflects the nationalistic view that the brain drain from underdeveloped countries is a force which tends to neutralize the effects of United States foreign aid to these countries. Kelly West provides an idea of the magnitude of the brain drain and its importance to the United States:

> America would have to build and operate twelve medical schools to produce the manpower being derived through immigration of physicians. The dollar value of this "foreign aid" to the United States is equal to the total cost of all United States medical aid, private and public, to foreign nations.²


Furthermore, another cause for alarm has been the increasing rate at which the underdeveloped countries have been losing manpower. In recent years the number of highly educated immigrants coming to the United States from developing countries has rapidly approached the number coming from developed countries and, in the near future, will doubtless surpass that number handily. See Tables 1 and 2.

The United States, for its part, has chosen to fill domestic manpower needs through selective immigration laws. Yet, in spite of the fact that the United States is committed to aid the developing nations in their quests for growth, nevertheless no change in United States policy has taken place which would indicate that the United States is concerned or, for that matter, even aware of their paradoxical actions. George Henderson explains one aspect of the paradox:

Sedulous in preventing "unfair competition" among ourselves, we place no restraints on our efforts to bid with all our resources against less fortunate nations for their own citizens.  

Nothing has yet been done in the United States to discourage or abate the brain drain. Probably the main reason for this inaction on the part of the United States has been the dilemma faced by policymakers in this country. On the one hand, the United States is morally and politically committed to assist the development of the underdeveloped countries of the world, and anything retarding this process, such as the loss of highly educated manpower, runs contrary to the declared foreign policy of the nation. On the other hand, the United States has considered it to be in its national interest to restrict general

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<th>Total, All Countries</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
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<tr>
<td></td>
<td>Number</td>
<td>Percent of Total</td>
<td>Number</td>
</tr>
<tr>
<td>1956</td>
<td>5,373</td>
<td>100.0</td>
<td>3,604</td>
</tr>
<tr>
<td>1962</td>
<td>5,956</td>
<td>100.0</td>
<td>3,573</td>
</tr>
<tr>
<td>1963</td>
<td>7,896</td>
<td>100.0</td>
<td>4,534</td>
</tr>
<tr>
<td>1964</td>
<td>7,810</td>
<td>100.0</td>
<td>4,607</td>
</tr>
<tr>
<td>1965</td>
<td>7,198</td>
<td>100.0</td>
<td>4,548</td>
</tr>
<tr>
<td>1966</td>
<td>9,534</td>
<td>100.0</td>
<td>5,144</td>
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Note: Developed countries include the European countries Canada, Japan, South Africa, Australia, and New Zealand. Developing countries are all other countries.

TABLE 2

Percentage Share of Developing Countries in Immigration into the United States of Scientists, Engineers, and Physicians Fiscal Years 1956 and 1962-66

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Total, 3 Groups</th>
<th>Scientists</th>
<th>Engineers</th>
<th>Physicians</th>
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<tr>
<td>1956</td>
<td>32.9</td>
<td>34.9</td>
<td>25.4</td>
<td>45.2</td>
</tr>
<tr>
<td>1962</td>
<td>40.0</td>
<td>26.9</td>
<td>33.5</td>
<td>57.6</td>
</tr>
<tr>
<td>1963</td>
<td>42.6</td>
<td>34.9</td>
<td>40.9</td>
<td>51.0</td>
</tr>
<tr>
<td>1964</td>
<td>41.0</td>
<td>32.6</td>
<td>36.8</td>
<td>53.3</td>
</tr>
<tr>
<td>1965</td>
<td>36.8</td>
<td>27.0</td>
<td>30.4</td>
<td>53.8</td>
</tr>
<tr>
<td>1966</td>
<td>46.0</td>
<td>41.2</td>
<td>40.9</td>
<td>58.5</td>
</tr>
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immigration and make it selective through a set of laws and regulations that favor individuals with high levels of training.

Relevancy of the Brain Drain to Developed and Underdeveloped Countries

Crucial Importance of Underdeveloped Countries to the Advanced Countries

One of the most pressing issues facing the developed countries today is what to do about the problem of underdevelopment in the world. In the developed countries, economic progress is more or less automatic. That is, economic growth itself creates the conditions, mechanisms, and attitudes which reinforce the factors making for growth. Expanding markets, capital accumulation, and technological change accompany the growth process. The development process thus becomes self-sustaining. In the underdeveloped countries, on the other hand, economic progress is minimal or nonexistent, and where it does exist to any significant degree it is diluted or even reversed due to population increases. To borrow from W. W. Rostow's terminology, the underdeveloped countries have not yet entered the "take-off" stage of economic growth, whereas the developed countries have reached the stage of self-sustaining growth. A look at Table 3 will serve to illustrate the ever-widening gap that exists between the developed and the underdeveloped countries. Quite aside from moral responsibilities which the developed countries might have toward eliminating poverty in the underdeveloped countries, there is a very real political factor involved. Harry G. Shaffer and Jan S. Prybyla

<table>
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<th>Per Cent Growth Rates Per Year</th>
<th>AC's**</th>
<th>UDC's</th>
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<tr>
<td>Of income</td>
<td>4.4</td>
<td>4.7</td>
</tr>
<tr>
<td>Of population</td>
<td>1.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Of income per capita</td>
<td>3.1</td>
<td>2.3</td>
</tr>
<tr>
<td>GNP per capita</td>
<td>$1,828</td>
<td>$400 - 480</td>
</tr>
<tr>
<td>Growth of GNP per capita, in dollars per year</td>
<td>$57</td>
<td>$9 - 11</td>
</tr>
</tbody>
</table>

* 1965 Data

** AC = Advanced countries; UDC = Underdeveloped countries

Almost all these new nations with their rapidly growing voice in the United Nations are in the group of underdeveloped countries, a group which in toto encompasses two thirds of the human race. Half of these—one third of the people on earth—live in underdeveloped countries which have not aligned themselves with any of the major power blocs. So far at least, they remain uncommitted.5

These facts serve to point out the crucial importance of the underdeveloped countries to the developed countries in the world today. Undoubtedly, their choices will have not only a great impact upon their own futures, but also great repercussions on economic and political developments throughout the rest of the world. It is no wonder that the Western Nations, the Soviet Union, and Communist China are all vying for the alignment of these neutral countries. The battle for friendship, or at least neutrality, is real and earnest.

It has been stated that the major aim of American foreign economic policy is to accelerate economic growth in the underdeveloped countries on the grounds that poverty-stricken nations are a threat to the serenity, peace, and freedom of the American people.6 The idea that the fate and future of the industrial countries is inseparably linked to that of the underdeveloped countries is probably universally accepted. Senator Walter F. Mondale quotes former Defense Secretary McNamara as saying "world security—and American security—depends on

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5 Harry G. Shaffer and Jan S. Prybyla, From Underdevelopment to Affluence (New York: Appleton, Century & Croft, 1968), p. V.

development in the less developed countries: development at sufficient speed to satisfy at least a portion of their rising aspirations.\(^7\)

If it is accepted that the United States has a vital interest in the development efforts of underdeveloped countries, then the question arises as to why the United States happens to be the focal point of a migration of large quantities of highly skilled human resources originating in the underdeveloped countries. In other words, does the migration of high-level manpower from the developing to the developed countries retard the former's efforts to develop and grow? Specifically, some individuals have charged that with one hand the wealthy countries have provided assistance for the development of the poorer nations, while with the other hand they seem to be taking away some of the best of the latter's newly trained, high-level manpower—the very resource on which continuing economic progress depends.\(^8\)

**Historical Evolution of Crucial Factors of Production**

Although as far back as two centuries ago the contributions of educated labor to the well-being of a society were noted,\(^9\) the realization of the important role played by skilled and educated labor in the development process is a relatively recent occurrence. Over the years, the importance of the crucial factor of production has


shifted from land, then to physical capital, and presently to human
capital. The key factor in each case is determined by the scarcity
of that factor at the margin.

Thus, three centuries ago when agricultural production accounted
for the predominant share in gross national product, ownership of
land provided a person with a hold in the dominant form of economic
activity and accordingly established him a position in the power
structure. Demand for the other factors of production was small and
limited; technology was stable.

Then during the latter half of the eighteenth century, the in­
creasing scarcity of land in Europe prompted a search for new sources
of supply. This led to the exploration of the two Americas, South
Africa, and Australia. But in the new lands there was a basic need
to build railroads, locomotives, bridges, buildings, roads, etc., all
of which were already in existence in Europe. In addition, it was
necessary to exploit the mineral ores which existed in vast abundance.
For all of this, capital was what counted. Capital became the scarce
resource. And, in conjunction with this occurrence, new technologies
were being developed to economize on the use of capital; one result
of this newly developed technology was expanded opportunities and new
demands for the employment of capital. Land in the new world was
abundant.

The key factor had become physical capital. However, at the
beginning of this century, intense competition among industrial enter­
prises resulted in a stronger emphasis upon innovation and the
development of new technologies. Now the emphasis was not so much on
increasing the bulk of one's physical capital, but rather toward
bettering the quality of the capital. In other words, the requirements of technology and planning had greatly increased the demand for specialized talent and for its organization. This is what Galbraith calls the technostructure. Thus, the key factor has now become the technostructure, that is, organized intelligence.

It is not surprising, therefore, to find that, given the crucial importance of the technostructure to the production functions of the developed countries, the brain drain has provided an important supplementary source of scarce human capital. At the same time, it should be noted that the technostructure probably does not play the pivotal role in underdeveloped countries that it assumes in more developed countries.

**Patterns of International Migration**

The brain drain itself is not a modern phenomenon. Rather, it is simply one aspect of a process which has been going on for centuries and which has contributed greatly to the rise in human living standards. Steven Dedijer describes the brain drain process as it occurred 2200 years ago in Greece:

In ancient Greece, from the little known about the sixty most famous Greek scholars, it seems three out of four of them emigrated as students, professors, scholars, or researchers, despite the fears and difficulties that leaving one's native city then entailed. Until 300 B.C. or thereabouts, migration tended to flow to Athens. Then Alexandria became the center of attraction for men of science as a result of the policy deliberately put into practice about 300 B.C. by the first king of the Ptolemaic dynasty. It was there

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that most of the best scientific and philosophical work still studied today was done between 300 B.C. and 500 A.D.  

When one looks at the present pattern of international migration and compares it with the pattern existing in the nineteenth century, some interesting contrasts are found. In the first place, the demand for highly educated labor such as scientists and engineers is much greater today than it was a century ago due to the far more crucial role played by technology. According to Brinley Thomas, in the nineteenth century the movement of skilled manpower from Europe to the new world was complementary to the inflow of unskilled labor and portfolio capital which contributed to the building up of infrastructure in those countries of new settlement.  

These exports of physical capital, human capital, and unskilled labor provided benefits to both the sending and receiving countries. Again quoting Thomas: "There was a progressive narrowing of the gap between countries at different levels of development and a diffusion of economic power."  

The current wave of migration, in contrast, has moved in the opposite direction from that of physical capital. While physical capital has been moving from the developed countries to the underdeveloped countries, human capital has been moving in the opposite direction due mainly to the increasing demand for educated manpower.

13 Ibid., p. 479.
in the technologically advanced countries. Thus, in comparing the present situation with that existing in the nineteenth century, the crucial problem is to determine whether or not the free international flow of human capital continues to be beneficial to both the sending and the receiving countries.

The basic issue, then, seems to be whether or not this migration of talent from developing to developed nations is really imposing a hardship on, or retarding, the economic development efforts of the developing countries. One of the purposes of this paper will be to attempt to answer this question. In other words, if it is determined that this emigration of high-level manpower from developing countries threatens development in the latter, then the case can be made that it would be in the best interests of the United States from a political standpoint, as well as in the interests of other developed countries, to take some measure to abate this outflow. Of course, from a strictly economic standpoint, this immigration of skilled individuals will almost invariably have a beneficial effect on the receiving country. A United Nations report states very succinctly that "highly trained personnel from many developing countries are emigrating to a few major developed countries, that the size of this flow is large and that it is increasing at a rapid rate." However, this statement implies nothing about the effects of this emigration on the "exporting" countries. In fact, as will be noted later on, there is a serious


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question as to whether this brain drain is imposing any kind of a burden on the countries of emigration.

Education and Economic Development: A Survey of the Literature

Having specified that this study deals with international migrations of highly skilled labor, it will be useful to briefly discuss the importance of the educational process to the productivity of individuals. Before attempting to evaluate the impact on development of the outmigration of educated manpower, it is necessary to first determine the relationship between education and productivity. In order to accomplish this end, it will be appropriate at this time briefly to engage in a survey of the literature regarding the benefits of education and its contribution to productivity.

Although the literature abounds with efforts aimed at determining the relative importance of education to economic growth, there is still no adequate or universally accepted method that would unequivocally link increases in educational expansion with increases in economic growth. While economists are reasonably sure that the returns to education are high, they are much less sure about the manner in which they should measure these returns so as to be able to make the comparison with the returns on other capital investments, and thus arrive at a system of ranking investment priorities. With these problems in mind, it may prove useful to review some of the ideas and studies devoted to the determination of the influence of education on economic growth.

One of these approaches assumes that differences in personal income are a close approximation of differences in contribution to
Thus, by showing the correlation that exists between personal income and different levels of education, a rough measure can be obtained of the contribution of education to gross national product. However, there is one very serious objection to the underlying assumption in this analysis: that income is not a perfect measure of contribution to total output, especially where monopoly and monopsony situations exist and, in the case of underdeveloped countries, where certain people get special privileges and remuneration does not reflect productivity.

Another approach is based on manpower planning, the assumption here being that education contributes to economic development through the knowledge and skills it produces in the labor force (labor productivity). Still another approach treats education as a "residual factor" in determining its influence on growth. The essence of this approach is to show statistically how secular increases in production cannot be accounted for only by increases in the inputs of labor and capital; in fact, these studies show that labor and capital account for only a minor portion of the increases in output, and that a "residual factor" therefore must account for the rest. This "residual factor is assumed to be education in the broad sense, including all kinds of technical training and technological progress that is a result of investment in education. For example, Robert Solow estimates that the "residual factor accounts for 90% of the growth of

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American output between 1900 and 1960. A study of the United Kingdom by Reddaway and Smith for the period 1949-54 indicated that 75% of the increase in manufacturing output must be explained by the residual. Theodore Schultz analyzed the agricultural sectors of some Latin American countries with the following results: Argentina (1912-14 to 1945-49), 62%; Brazil (1925-29 to 1945-49), 45%; Mexico (1925-29 to 1945-49), 50%. Arnold Harberger's study, concentrated on Chile, shows that "spectacular advances in the growth rate will come, if at all, from improvement in the quality of the labor force and from an increased pace of technical advance." There are many other studies, not mentioned here, that have been undertaken in an attempt to try and find a causal relationship between education on the one hand and economic growth and development on the other. None have been universally accepted. Nevertheless, most economists feel that investment in human capital is a necessary prerequisite for growth. Benjamin Higgins echoes this "blind faith" in the value of education when he states: "Today the conviction among


economic development planners that 'investment in human resources' yields particularly high returns is so strong that there is a maxim among them 'when in doubt, educate.' An exception to this view is provided by Everett Reimer, echoing the sentiments of Ivan Illich, when he writes that mass education leads to an "inflationary debasement of the academic currency," a result which may lead to more disillusionment and dissatisfaction particularly among the poor, who have come to accept inferiority as a fact of life.

There are other factors that would tend to underline the importance of human capital in the development process. According to Harbison and Myers, the rank correlation between indicators of human resource development and indicators of economic development is perfect for broad categories of countries. Of course, these correlations do not clearly indicate the direction of causation, but they do imply that education in the broad sense and economic development go hand in hand.

Today, the contributions made by human capital in the development process are recognized as being of crucial importance, perhaps more important than the contributions made by physical capital. Kenneth Boulding assesses the relative roles played by these two types of capital:

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21 Higgins, op. cit., p. 411.

22 Everett Reimer, An Essay on Alternatives in Education, Centro Intercultural de Documentacion, Cuaderno No. 1005, Cuernavaca, Mexico, p. 1/1.

Physical capital indeed is merely human knowledge imposed on the physical world. . . . The priority of human over physical capital can be seen very clearly in the experience of those countries which have recovered from physical devastation due to war. . . . It is clear, then, that the distribution of human capital may be a much more important factor in determining relative rates of economic development than the distribution or even redistribution of physical capital.24

Introduction to Ensuing Chapters

Chapter II will acquaint the reader with some of the major measurement and definitional problems encountered when any study of the brain drain is undertaken. The fact that statistics from underdeveloped countries are scarce makes it extremely difficult to assess accurately the magnitude of the brain drain. But even if detailed and accurate statistics were available, there would still be the problem of determining the extent of the loss or gain. If the available statistics and measuring procedures could be improved, then the "seriousness" of the brain drain could be put into its proper perspective and many of the unanswered questions could be answered. Ideally, if losses and gains could be measured with a reasonable degree of accuracy, it would be possible to create international institutions through which the gaining countries could compensate the losing countries for any losses they may have incurred through brain drains.

Chapter III discusses some of the more important causes contributing to the brain drain. The first part of the chapter is devoted to indicating the relationship between traditional theories of factor

movements and the brain drain. The latter half of the chapter goes into a detailed discussion of "push" and "pull" factors affecting the international migrations of highly educated individuals. Appendix A at the end of the chapter provides a summary of those immigration laws in the United States which exert a profound influence on the international migration of highly educated manpower. Appendix B in the same chapter provides the details of a regression analysis in an attempt to determine which factors (from among those that are measurable or can be quantified) are most important in affecting the brain drain.

The economic consequences of migration are provided in Chapter IV. In order to emphasize the crucial nature of skilled manpower to economic and social development, the first part of the chapter is devoted to a discussion of the external benefits contributed by such personnel. Since the emphasis in this study is mainly on the consequences of the brain drain for underdeveloped countries, only cursory attention was paid to the economic consequences of migration for the country of immigration. The main body of this chapter has thus been saved for the consequences to the country of emigration, in this case assumed to be a developing country.

Chapter V concentrates on the world welfare implications of migration. The issue of compensating the countries of emigration for loss of manpower is taken up in considerable detail. The chapter is concluded by an interesting array of views regarding the pluses and minuses of the brain drain from the point of view of maximizing world welfare.

Chapter VI contains a number of recommendations which are intended to curtail the brain drain. The specific recommendations are divided
into those that apply to ameliorating the conditions existing in the sending countries and those that aim at altering conditions in the receiving countries, both sets of recommendations having the specific objective of reducing the damaging effects of the brain drain.

The final chapter summarizes the most important conclusions arrived at in this study.
CHAPTER II

DEFINITION AND MEASUREMENT PROBLEMS

Definition of Terms

Brain Drain

As referred to in this study, the "brain drain" shall mean the emigration of "high-level manpower" from underdeveloped countries to developed countries, with the explicit purpose of establishing permanent residence in the developed countries; this means that students arriving in developed countries who do not plan permanent residence are not considered part of the "brain drain." By "high-level manpower" is meant persons who already possess at least a bachelor's degree. And for the purpose of this work, the discussion of brain drain shall be centralized on only one segment of this skilled manpower pool—engineers, scientists, and physicians. There are three main reasons, however, for using the present definition of the word "brain": (1) the literature has come to refer to these three occupational categories as comprising the main constituents of the brain drain; (2) the immigration and naturalization statistics available in the United States provide statistical breakdowns with reference to these particular occupations; (3) there is no practical way of determining who is a "brain" in the sense that the person involved is highly intelligent.

1Engineers shall be taken to include all of the following types: aeronautical, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, sales, and professors. Scientists shall include only natural scientists. Physicians shall include people with the M.D. degree and dentists.
This does not mean that the positive contributions and potential contributions of other types of highly educated manpower are unimportant. For example, it is widely agreed among Western economists that economic development requires a steady supply of entrepreneurs; now, although entrepreneurs need not necessarily be highly educated, in the majority of cases they do possess a bachelor's degree or equivalent. Since this study deals with brain drains as defined previously, many entrepreneurs for the most part would not be included in the statistics and thus it would be impossible to attain a true measure of their impact on development. Perhaps this points to a gap in the literature on brain drain and its effect on development; that is, maybe it would be more precise to change the definition of "brains" to include all kinds of entrepreneurs, regardless of whether they are classified as scientists, engineers, or physicians and regardless of whether or not they possess a bachelor's degree. Certainly, it can be safely concluded that possession of a bachelor's degree or any other advanced degree for that matter does not necessarily denote that a person is a "brain" in the sense of having a very high I.Q. rating. But these are semantic questions. Besides, how could statistical data be compiled in order to classify individuals in accordance with their I.Q. ratings? And furthermore, even if accurate statistical data were available regarding the emigration of scientists, engineers, and physicians, it would still not be possible to measure the relative caliber of the emigrating individuals. Just because two scientists possess the same educational degree does not mean that they are equally competent or that their contributions to society will be approximately equal. Thus, raw statistics measuring "brain drains" will not necessarily accurately
reflect the impact on development unless something is known about the
caliber and contributions of the emigrants. In other words, within
the ranks of the "brains" there are some individuals who are out­
standing leaders, or "key men," and it is the loss of these leaders
that is much more meaningful than the loss of ordinary run-of-the­
mill "brains." And yet, the loss of "key men" does not show up in the
migration statistics. Aware of these limitations in the definition
of "brain drain," it is now possible to look at the term in more
detail.

The term "brain drain" is itself a loaded term. It is suggestive
of a loss without compensation. To whom does the loss occur and what
sort of loss is it? In other words, who is to say what constitutes a
"brain" and what constitutes a "drain"? Robert Myers suggests that
countries might equally well talk about "brain gains."

The unfortunate phrase, "brain drain", has become a
part of the American vocabulary. It is an unfortunate
label because it reflects a nationalistic viewpoint
and rules out positive effects accompanying migratory
movements to which the label is attached. From an
individual or international viewpoint, migration may
result in a brain gain - either through education or
training in the new location or through the provision
of an environment within which the already developed
brainpower can be most productive.2

In most cases, discussions about the brain drain are highly
political and emotional, rather than objective. In the 23rd Session
of the United Nations, November 5, 1968, there were charges that the
rich countries of the world were deliberately draining off talent from

2Robert G. Myers, "The Brain Drain and Foreign Student Non­
return," International Education and Cultural Exchange (Spring, 1967),
p. 63.
the poor countries with the intent and with the effect of curtailing their development. To limit the discussion to "drains" shifts emphasis away from the fundamental questions associated with the utilization of talent, regardless of location, and it rules out potential gains. Part of the trouble stems from the fact that the losing countries only consider emigration of "brains" but do not acknowledge immigration of "brains." For example, Latin American countries have been complaining about the brain drain from their nations for years, and yet some studies show that Latin American countries have been net "gainers":

Other studies dealing with Greece and Latin America show that some countries have benefitted from this kind of migration. Indeed, they point to the surprising conclusion that Latin America's balance of migration shows a surplus: more Europeans have come to Latin America in the past 20 years than Latin Americans have emigrated to the United States.4

Internal versus External Brain Drains

Before proceeding any further, it should be mentioned that this study deals only with "external" brain drains. That is, many underdeveloped countries are more seriously affected by so-called "internal" brain drains than by the emigration of "brains" abroad.5 "Internal"

3United Nations, Study of Discrimination in Respect of the Right of Everyone to Leave, Publication 64, XIV, No. 2.


brain drains refer to the migrations of highly educated and skilled individuals from the provinces to the large modern cities within the country. While the typical metropolitan center in most underdeveloped countries is no paradise, life in the city is more desirable than the rural areas for various reasons: hospital facilities are more modern, schools and universities are better staffed, there are better employment opportunities, and the public services in general are more accommodating. But in addition to these factors, in the cities there are other professional people with common interests who can get together and exchange ideas and collaborate in common professional endeavors. Thus, "internal" migrations serve to intensify the dual nature of developing countries, while at the same time creating distortions in any evaluation of brain drain statistics. For example, as is true in most countries in South America, if the large cities have an oversupply of doctors and the provinces have an acute shortage then the loss of one doctor from the provinces is much more damaging than the loss of one doctor from the city. And when the country as a whole is examined, if the emigrating doctor leaves the city to go abroad, his loss will not impose on the nation nearly the burden that the loss of a "country" doctor would impose, even where the population-to-doctor ratio is extremely high. Unfortunately, one cannot be selective in interpreting the statistics, and therefore measuring the influence of these emigres on development is particularly difficult. At this point, all that will be said is that "internal" brain drains do exist and in many cases are more serious in their disruptive effects than "external" brain drains. Both cases of brain drain, however, are simply manifestations of the dual nature of underdeveloped economies.
Emigrant versus Immigrant

It is now necessary to define what is meant by the terms "emigrant" and "immigrant." In accordance with the statutes of the U.S. Immigration and Naturalization Service, an immigrant is classified as a person who seeks to achieve alien status as a lawful permanent resident of the United States. In other words, an immigrant is a person who enters the United States with the expressed purpose of making this country his permanent home. This means that students from other countries who come to the United States with the expressed purpose of getting an education are not classified as permanent residents, but rather are placed in the category of temporary residents and, as such, are not included in brain drain statistics. The Institute of International Education defines a foreign student as "a person who comes to the U.S. expressly for an education and states his intention of returning afterward."

Only those individuals who categorically state that they intend to make the U.S. their place of permanent residence and who are admitted to the U.S. on that basis can be counted as contributing to the brain drain because of the implication that their services and their physical presence are "lost to their home country for the duration." From the "losing" country's point of view, the emigrant is simply the mirror image of the immigrant, namely, a person who intends to leave his home country permanently and reside in a foreign country.

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Country of Birth versus Country of Last Permanent Residence

Another problem which arises is whether to classify emigrants with respect to their country of birth or with respect to their country of last permanent residence. Classifying an emigrant with respect to his country of birth may seriously distort the question of actual loss to that country, particularly if the emigrant attained his education in another country at public expense. In other words, if an individual attains a public education in a country where he was not born, then how can one state that his country of birth sustained a "loss"? It could be that the emigrant in question could not have obtained the education he wanted in his country of birth, and that the degree he received in his "new" country of permanent residence was not attainable in his country of birth. Stated differently, the only way he could make full use of his talents was by migrating to another country to take advantage of an educational system which suited his preferences and goals.

Immigration statistics in the United States provide data stating the place of origin of the immigrant with respect to both his country of birth and his country of last permanent residence. Which alternative one decides to choose is very important in attempting to determine what element of "loss" is involved. As will be seen in a later chapter, if proof can be provided that the country of emigration does sustain a "loss," then it would be possible to set up some kind of international institutional arrangement whereby the "gaining" countries could provide some sort of compensation to the "losing" countries. However, an immediate problem would present itself if an immigrant to
the United States came from a country other than his country of birth. The question of "loss" then would revolve around such matters as the country in which the migrant attained his public education, the country in which he could achieve his greatest potential, and, in general, the country to which he adds the most social gain. Undoubtedly, both the country of birth and the country of last permanent residence would claim the right to receive compensation from the country of immigration.

Problems of Statistical Measurement

Inadequacy of Available Statistics

One of the biggest problems involved in attempting to evaluate the impact of the brain drain and its effect on certain countries is the difficulty of obtaining reasonably accurate statistics. The statistics that are available are imperfect and, in any case, even if the statistics were accurate, there would be problems in determining what measuring procedures to use. Furthermore, developing countries do not keep an accurate record of emigration and immigration statistics. Thus, most of the data relating to manpower losses incurred by underdeveloped countries must be provided by the immigration records of the developed countries. This method of measurement thus omits the entire portion of migration that occurs between underdeveloped countries. For the most part, then, while migration data in developed countries is to be interpreted cautiously, data from most developing countries is extremely unreliable or non-existent.
**Gross versus Net Flows**

In all too many cases, statistical data only emphasizes gross migration movements with no reference to countermovements. That is, in assessing the impact of brain drain on a worldwide basis, it would be more accurate to look at new flows of individuals. However, strong national biases often emphasize only emigrations without any acknowledgment of immigrations or the return of former emigrants. In other words, in most cases, countries tend to look at the negative aspects of brain drain and emphasize emigration without due regard for the positive side which would emphasize "brain gains" from immigration. Alessandro Silj, citing a study made by the Organization for Economic Cooperation and Development, emphasizes the need to look at net migration figures: "... Sweden's actual losses in 1957-61 totaled 25 scientists and engineers, and not 106 as shown in the U.S. statistics."^8

It is probably safe to assume that the overwhelming bulk of migration statistics overstate the magnitude of permanent migrations. This is especially true due to the fact that there are no reliable figures providing the rate of "returns" of individuals to their "home" countries. That is, individuals who return to their home countries bring with them a valuable asset of human capital gained abroad which should constitute a "gain" to that country. Furthermore, such remigrations tend to offset the "losing" effects of emigrations and thus result in a more accurate assessment of the gains and losses from the international movement of highly educated manpower.

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Economic Gains and Losses

The question of how much an individual contributes to his home country or to his country of immigration depends upon how productively he utilizes his skills and to what degree his skills are needed in the country of question. Robert Myers states that: "Skill must be in some way relevant to national 'need', and 'needed' skill must be supported by proper individual motivation, by access to knowledge, and by an environment that provides necessary capital resources as well as encouragement."9 Thus, the economic impact of international migrations on the countries of emigration and immigration cannot be assessed accurately by referring simply to absolute numbers of migrants. For example, merely looking at an emigrant in terms of the economic loss he imparts when he leaves his home country does not take into consideration offsetting benefits which might accrue to his home country as a result of the emigrant's physical presence in the new host country; among these benefits should be included remittances, communication of knowledge to the home country, influence on the host country policy toward the home country, participation in basic research discoveries which are then made available to the home country, and many other benefits which will be discussed in an ensuing chapter.

Another reason that "losses" resulting from brain drains are difficult to measure can be attributed to the different economic sizes of nations. Grubel and Scott show how the absolute numbers of emigrants are not particularly meaningful as a measure of loss unless the relationship between the number of highly educated labor force is taken

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into consideration. In other words, referring simply to the absolute number of emigrants does not reveal anything about the seriousness of the losses involved; in order to get a true picture of losses, it is necessary to look at the effective demand and supply conditions for highly educated labor in the countries concerned. In this way, the loss of one emigrant in a country where a surplus situation exists (that is, where supply exceeds demand under current conditions) should not be as damaging as the loss of an emigrant to a country experiencing a shortage of such individuals.

But quite apart from the fact that a surplus or a shortage of skilled labor would have an important bearing on the determination of the marginal productivity of an individual, underdeveloped countries are usually lacking the necessary institutional and organizational infrastructures needed to train, develop, and use effectively their local human talent. Following Coutsoumaris' argument, "in such a case, the gains of the 'importing' countries do not represent a corresponding loss of output for the 'exporting' country, in the same way that the removal of surplus farm labor with zero opportunity cost does not represent a loss of agricultural output."  

Valuation of "Gains": Place of Origin or Destination

Another shortcoming of the statistics on migration involves the relevant base for comparison of average present value figures for


future income streams of the individual migrants involved. In a 1967 article in the *Journal of the American Statistical Association*, Mary Jean Bowman and Robert Myers show how one can get different results in measuring the value of human capital movements depending on whether the capital is valued with respect to its place of destination or whether it is valued with respect to its place of origin.\(^{12}\) Since it can safely be assumed that average incomes of highly educated people are higher in the United States than in underdeveloped countries, it is possible to appreciate the problems one would encounter in trying to determine new "losses" or "gains" in order to determine the magnitude of the "compensation" that the "gaining" countries should pay the "losing" countries. Obviously, if the underdeveloped country is the country of emigration, then it would desire to estimate the value of its emigrants in terms of what they could earn in the developed country (the country of immigration). On the other hand, the developed or "receiving" country would desire to fix the value of the immigrants at their place of origin since this would require a lower compensation payment; and even if there were no compensation required, the "receiving" country would like to minimize the magnitude of this "gift" for international political reasons. Each country will tend to manipulate the statistics and measuring procedures to suit their national goals.

Cost of Student Nonreturn

Another important consideration in measuring the losses entailed by brain drains should be the cost of student nonreturn. It has already been stated that students per se are generally not included in brain drain statistics because they are considered temporary residents in the host country. However, in many instances, students in the United States, for example, will decide to change their status from temporary to permanent residence. In such cases, the students making the change become a part of the brain drain. Estimates of the extent of student nonreturn vary greatly since there are no available statistics that accurately measure the phenomenon. Robert Myers, for example, has estimated the overall rate of student nonreturn to be between 15% and 25%, with great differences among individual countries. The State Department, on the other hand, estimates that only about 10% of foreign students remain permanently in the United States. But regardless of what estimate is used, there is still the difficulty of determining the magnitude of the "loss" to the home country. For example, according to a U.S. Senate subcommittee hearing, almost one-third of foreign graduate students are supported by U.S. colleges and universities as their major and only source of outside support. In the case of a foreign student supported by U.S. funds, public or


private, it would be improper and inaccurate for the home country to claim it had sustained a loss equal to the value of a graduate student, for, in the first place, the home country did not finance his graduate education and, in the second place, the home country may not have been possessed of the facilities necessary to provide the student with a graduate education.

A further point to consider with respect to students studying abroad is how the human capital value of these remigrants differs from what it was when they first migrated. In most cases, the returnees will have acquired a new asset which can be put to productive use in their home countries. But this may not always be the case. For example, a nuclear science engineer returning home to Paraguay after receiving a doctorate in the United States will most likely find no job where he can achieve his potential; or in the field of economic development, for example, there is a general presumption that the principles and policies learned in advanced countries are not applicable to situations in underdeveloped countries. It is for reasons such as these that faulty assessments of brain drains and brain gains can be made.

Conclusion

Mention has already been made of the fact that statistics on brain drain are sketchy and hard to come by, particularly in reference to data on underdeveloped countries. It has also been mentioned that, even if accurate raw figures were available with respect to international migrations of skilled labor, there would still be the problem of assessing the economic impact that these migrations would
impose on the countries involved. In spite of these difficulties, the available data is sufficient to provide us with a general picture of the phenomenon, and it is hoped that this overall picture will help countries to better understand and evaluate the impact of the brain drain. One of the best studies yet made on the impact of the brain drain is by Herbert Grubel in which he estimates the overall balance of resources from student exchange between the United States and the rest of the world. In this study, Grubel estimates that the United States experiences a net cost ranging from a low of 9 million dollars for the fiscal year 1958-1959 to a high of 27 million dollars for the fiscal year 1957-58. Although this study is subjected to all the limitations previously discussed, nevertheless it represents an important breakthrough in attempting to quantify the effects of brain drains and brain gains. See Table 4 for an explanation of the net resource cost to the United States for the period 1958-1964.

Before any such studies can become reliable indicators of brain drains and brain gains, it is necessary to obtain a much more detailed body of statistical data on the subject. As of now, the paucity of relevant statistical data is the main reason accounting for the lack of empirical studies on the brain drain. Unfortunately, studies of the brain drain today are based for the most part on judgments that rest, so far as facts are concerned, on approximations rather than exact counts. All that can be done is to try and piece together a general picture from the scarce data available on the subject.

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16 Ibid.
### TABLE 4

United States Resource Balance from College Student Exchange  
(values in $ million)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STUDENTS IN U.S.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Foreign Students in U.S.</td>
<td>47245</td>
<td>48486</td>
<td>53107</td>
<td>58086</td>
<td>64705</td>
<td>74814</td>
</tr>
<tr>
<td>Gross Value of Resources Absorbed by A</td>
<td>174</td>
<td>185</td>
<td>210</td>
<td>236</td>
<td>272</td>
<td>323</td>
</tr>
<tr>
<td>Net Value After Self-Support Adjustments</td>
<td>91</td>
<td>97</td>
<td>114</td>
<td>129</td>
<td>146</td>
<td>173</td>
</tr>
</tbody>
</table>

| AMERICAN STUDENTS ABROAD |      |      |      |      |      |      |
| Number of Students Abroad | 13651 | 15306 | 19836 | 16072 | 17162 | (*) |
| Value of Resources Absorbed | 21 | 25 | 33 | 28 | 31 | (*) |

| NONRETURNING STUDENTS |      |      |      |      |      |      |
| Number of Nonreturning Students | 2735 | 1783 | 2004 | 3220 | 3730 | 2378 |
| Total Human Capital Value | 44 | 31 | 36 | 60 | 72 | 48 |
| Adjustment for U.S. Subsidy | 17 | 18 | 21 | 24 | 27 | 32 |

| OVERALL BALANCE = |      |      |      |      |      |      |
| U.S. COST | Item C (above) Minus E, G, and H | 9 | 23 | 24 | 17 | 16 | (*) |

(*) Not Available

Item H (U.S. Subsidy) represents the self-financed part of nonreturning students' expenditures and, as such, it represents a subsidy accruing to the U.S.

CHAPTER III

CAUSES OF THE BRAIN DRAIN

Introduction

It is extremely difficult to isolate the exact causes of the brain drain. To begin with, this study deals with very broad groups of countries and therefore it is subject to the limitations of aggregation. For example, it is possible that the main cause of brain drain from one individual country is not significant at all when looking for the main common cause of a whole group of countries. One of the main purposes of this chapter is to examine the main overall causes of the brain drain from all countries or from broad groups of countries so that general policy measures can be put into effect to deal with the phenomenon if necessary. It would be highly impractical, if not impossible, to have numerous policies dealing with the different situations prevailing in many countries; thus, one could envision a situation where Policy A would apply to Country I but not to Country II, and Policy B would apply to Country II but not to Country I, and so on. Due to such discriminatory complications, it is more practical to adopt general policies that apply to broad groups of countries or to all countries uniformly. It is hoped that this chapter, by pointing out the general causes of the brain drain rather than the specific causes relating to single countries, will aid the policymakers in their decisions to cope with the brain drain.

The first part of this chapter will show how factor movements can be explained within a framework of international trade theory.
In particular, the complementarity of trade and factor movements is explored. The second section of this chapter provides a brief overview of existing theories of international migrations. The marginal productivity approach is discussed at some length. But the existing body of theory relating to international human capital movements is scanty to say the least. Many attempts at theorizing have been made in terms of purely economic factors and without much empirical backing. The lack of empirical studies in understanding due to the difficulty of obtaining reliable statistics, as is evidenced by the marked lack of data on the subject at the present time. However, attempts to explain international migrations, particularly of human capital, in terms of "seeking the highest rate of return" is to overlook a host of other equally important non-economic factors which exert a profound influence on migration.

Hence, the main body of this chapter seeks to examine the causes of the brain drain in a much broader context, looking at economic, political, and social causes, rather than simply looking at the brain drain from an economic perspective alone. This broader approach to the subject is couched in terms of "push" and "pull" factors.

International Trade and Factor Movements

The classical theory of international trade specifies that countries can gain benefits by specializing in the production of those goods in which they are relatively more efficient and exchanging these goods for goods which they can produce relatively less efficiently. The classical doctrine is based on the laws of comparative advantage and reciprocal demand. Very simply stated, the law of comparative
advantage (or comparative costs) directs that each country should specialize in the production of that good in which its relative cost advantage, vis-a-vis other countries, is the greatest. Thus, each country should export those commodities in which it has a comparative cost advantage and import those commodities in which it has a comparative cost disadvantage. Such specialization and exchange will result in each country being able to consume more of all commodities than would be the case in the absence of trade. But the theory of comparative advantage only tells what goods will be exported and imported. The law of reciprocal demand indicates the prices at which these goods will be traded. That is, with a given supply of a good, the price which a country can command in the international market will be determined by the intensity of foreign demand for the product.

Once it had been determined what goods a country should export and import (dictated by comparative costs) and at what prices they would be traded (determined by reciprocal demand), it was easy for the classical economists to show the gains that would accrue to a country that engaged in trade. But there is nevertheless a void left in this classical theory of international trade: no explanation is given of what lies behind international differences in comparative costs and no account is given of the effects of international trade. The pioneering works of Eli Heckscher and Bertil Ohlin provide an answer to

1 Heckscher's original article is reprinted in Readings in the Theory of International Trade ("The Effect of Foreign Trade on the Distribution of Income") (American Economic Association, 1950), pp. 272-300.

these questions. They attributed international differences in comparative costs to (a) different prevailing endowments of the factors of production, and (b) the fact that the production of various commodities requires that the factors of production be used with different degrees of intensity. As to the effects of international trade, they showed how the gains of real income within each country were divided among the different factors of production, a point which the classical economists tended to overlook.

Under the Heckscher-Ohlin theory, free international trade in the absence of transportation costs will lead to an equalization of commodity prices between countries; as long as the prices of goods differ around the world it pays to expand trade, and this will remain true until all price differences are eliminated. What is not so obvious is that relative factor prices throughout the world will also tend to be equalized even if the assumption is made that factors are immobile internationally. Thus, one of the central features of the Heckscher-Ohlin analysis is the proposition that international trade, by increasing the demand for each country's abundant factors, tends to equalize the relative returns to the factors of production in different countries. However, complete factor-price equalization is subject to some very restrictive assumptions:3 (1) two countries; (2) two commodities; (3) each commodity is produced with two factors of production and the production functions of each commodity are homogeneous of degree one; (4) the law of diminishing marginal productivity holds; (5) the factors of production are assumed to be qualitatively equal in the two

countries; (6) no factors of production can move between countries; (7) all commodities move perfectly freely in international trade, without encountering tariffs or transportation costs; (8) something is being produced in both countries of both commodities with both factors of production so that there is not complete specialization; (9) perfect competition prevails in all domestic markets.

It is equally true that perfect mobility of factors results in factor-price equalization and, even when commodity movements cannot take place, in a tendency toward commodity-price equalization. Thus, if one assumes that differences in relative factor scarcities are entirely eliminated through factor movements, then to the extent that commodity prices are determined by relative factor endowments, commodity-prices will tend to be equalized. Of course, both the assumptions of complete immobility of factors and commodities are extreme cases. Robert A. Mundell shows how both assumptions can be relaxed so that there is some degree of mobility in both cases, and he concludes that an increase in trade impediments stimulates factor movements and an increase in restrictions to factor movements stimulates trade.  

Free international trade, then, tends to increase the relative scarcity of the productive factor in abundant supply and brings about an increase in the relative returns paid to the abundant factor and lowers those paid to the scarce factor. Thus, if one assumes that a country is endowed with adequate capital and scarce labor, then in

the absence of factor movements, wages will tend to decline relative to the returns on capital. Consequently, from the point of view of labor, it would be advisable to impede trade in some way and thereby keep relative wages at the existing high level and prevent their deterioration. The only problem confronted in this case is whether or not labor will be able to improve its real incomes by such action. That is, tariffs interfere with the allocation of resources so that if the real income of the nation is correspondingly reduced, it may be small compensation to the scarce factor that it now obtains a larger share of the reduced total. Stolper and Samuelson, however, state that the real return and the relative return of a particular factor of production are likely to move in the same direction.\(^5\) In other words, if a tariff increases the share of national income accruing to labor, it will also improve the workers' standards of living, and conversely.

The purpose of this section has been to show how a theory of factor movements has evolved as an outgrowth of the theory of international trade. In attempting to account for the causes and consequences of trade, it was inevitable that theorists had to come up with an explanation of factor proportions and factor movements and their influence on commodity prices. In the following section, a closer look will be given to the traditional or "classical" explanation of factor movements, but with a specific type of factor in mind, namely, highly skilled labor.

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Economic Theories of Migration

Cost-Benefit Approach

There is no explicit theory of migration in the literature, but nevertheless most attempts at explaining the phenomenon place it within a framework of costs and benefits; that is, each prospective migrant will tend to move from areas in which his net expected returns are low to areas where they are higher. This approach is largely based on the neoclassical theory of investment and has appeared largely in the recent works of Schultz and Sjaastad. The returns to the prospective migrant consist of the differentials in real income streams accruing to the migrant from the better expected opportunities abroad. Costs are comprised of money costs in the form of increased expenditures on food, lodging, and transportation; non-money costs which include income foregone during the period spent on traveling, searching for, and learning a new job; and psychic costs such as homesickness, getting used to a new language and customs, and other acclimatization costs. On the basis of these costs and benefits, a calculation of the expected rate of return is made and a decision arrived at.

It is very doubtful whether migration will occur according to the dictates of the factor price-equalization theorem (see footnote 3 in the preceding section) because of the extremely restrictive assumptions under which it operates. In fact, substantial differences in real current earnings in two different countries may continue to exist.

Footnote 6: A summary of these works and others on the subject may be found in a special issue of the *Journal of Political Economy*, LXX, No. 5, Part 2 (1962).
without inducing significant migration because the costs of migration may (actually, or in the estimation of the prospective migrant) exceed the observed differences in earnings. Older workers, for example, may be less disposed to move, apart from the fact that they have established firm roots in their home countries, simply because the expected lifetime earnings are smaller for them than for younger workers.

**Marginal Productivity Approach**

Another well-known theory which has been used to account for migration, and closely associated with the above theory, is based on the marginal productivity theory of factor pricing. In this case, it is assumed that factors are remunerated in accordance with their contributions to the total product. Thus, factors will tend to move from areas where their contributions to output (and remuneration) are low to areas where their contributions to output (and remuneration) are correspondingly higher. This movement of factors will tend to increase the total product (whether on a world or on a national basis) that can be divided among the existing population.

The economic effects of the international migration of human capital under this approach are illustrated in Figure I. It is assumed that there are two countries in isolation, Country A being an underdeveloped country and Country B, a developed country. \( AA' \) and \( BB' \) represent the marginal product of labor curves for Countries A and B, respectively. The marginal product curve in Country B cuts the vertical axis at a higher point than that of Country A because it is assumed that Country B is endowed with a greater capital supply.
Figure I

Economic Effects of International Migration

MARGINAL PRODUCT OF HUMAN CAPITAL IN A

MARGINAL PRODUCT OF HUMAN CAPITAL IN B

LABOR SUPPLY


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and a superior technology, both of which would tend to make the skilled laborer in Country B more productive. However, it is assumed that the slope of the marginal product curve in Country A is steeper than that of Country B because of the greater relative scarcity of human capital in Country A; that is, when one laborer is withdrawn from either country, the marginal product of the remaining workers is more noticeably affected in Country A than in Country B.

Referring again to Figure I, the skilled labor supply in Country A is assumed to be OC and in Country B, O'C. Thus, gross national product in Country A is OAFC and in Country B is O'BE. In addition, assuming that factor prices are determined by marginal productivities, the prevailing wage rate in Country A is OW and in Country B is O'W'.

Now, if migration is allowed to occur and if it is assumed to be costless and in response solely to wage differentials, there will be a movement of human capital from Country A to Country B equal to GC; the labor supply in Country A is now OG and each laborer receives a wage rate of OW, and the labor supply in Country B is now O'G with each laborer receiving a wage equal to OW'. Wages in each country are equalized. Furthermore, as a result of these migratory movements, gross national product in Country A is now OADG (a shrinkage equal to GDFC) and in Country B is O'BDG (an increase equal to GDEC). From the point of view of world production, migration has resulted in a net gain in output equal to DBF, the amount by which the production gain of Country B outweighs the production loss of Country A.

In addition, there will be a redistribution of income in favor of skilled labor and to the detriment of the other factors of
production in the country of emigration (that is, Country A); originally, skilled labor's share of gross national product was $OW_3FC$ out of a total of $OAFC$; after emigration, the human capital share was $OW_1DC$ out of a total of $OADG$, the remaining share $(W_1AD)$ going to the complementary factors. On the other hand, human capital's share of the national income in Country B decreased as a result of the immigration while the share of the remaining factors increased. The important point to note is that, as a result of migration, skilled labor becomes relatively more scarce in Country A and relatively less scarce in Country B, thus increasing both the relative income share of skilled labor and the real wage in Country A and decreasing the relative income share of skilled labor and the real wage in Country B. This is precisely the conclusion arrived at by Samuelson and Stolper in their monumental article (see footnote 5).

It should also be noted that migration will result in a greater net world output (1) the lower is the marginal product of skilled labor in the country of emigration and the steeper is the slope of the marginal product curve, and (2) the higher is the marginal product of human capital in the country of immigration and the flatter the slope of the marginal product curve. A glance at Figure I will show that either of these occurrences will tend to enlarge the "triangle" representing the net gain in world output.

**Push-Pull Approach**

**Introduction**

Quite obviously, the migration of skilled labor is not responsive to economic factors alone. Whereas capital is almost always
responsive to differing rates of return around the world (except on the relatively few occasions when capital flight is experienced), labor, but particularly highly educated labor, may be affected by a great number of other considerations. In other words, the international migration of educated labor is most likely affected by both economic and non-economic factors. The two economic theories of migration outlined in the previous sections assume that factors of production, privately owned, will tend to move internationally and purely for motivations of self-interest from areas where their returns are low to areas where their returns are high and that, in so doing, will tend to enhance the efficiency of world resource allocation and result in an increased world output.

These economic theories of factor movements are probably more applicable to capital movements than they are to labor movements. Capital, for example, is not affected by certain very important non-economic factors that affect labor movements. For example, religious and racial persecution, different languages and cultures, and other "human" or psychic elements which greatly influence labor motivations probably have a negligible effect on capital movements. Capital movements are a result of the decisions made by knowledgeable individuals with an acute awareness of the economic climate in various countries around the world. One would expect capital, therefore, to be more mobile internationally than labor (skilled or unskilled).

One would also expect skilled labor to be more mobile internationally than unskilled labor. Not only are immigration laws more lenient for skilled labor than unskilled labor, but, in addition, several other factors tend to favor a greater movement of skilled
as opposed to unskilled labor. Among those factors tending to favor skilled labor movements one would have to include the universality of the scientific language, more knowledge of job opportunities abroad, a greater level of education and thus more exposure to foreign languages and cultures, a desire to be abroad and learn about the latest developments in their respective fields and to meet the leading scholars, and a greater "pride" in performing their functions as scientists, engineers, and physicians. Thus, a skilled engineer in an underdeveloped country might migrate to a developed country just so he can work with the latest equipment and an expert staff and colleagues, regardless of whether his pay in the advanced country is greater or less than he was receiving in the underdeveloped country; in other words, the emphasis here is on achievement in one's avocation rather than in economic remuneration. Unskilled labor, on the other hand, would have a much greater tendency to emphasize remuneration rather than achievement. Highly skilled labor, in other words, will be tempted to migrate on two counts: (1) higher wages, and (2) the desire for excellence in the respective fields.

The point of all this previous discussion is to underscore the important proposition that non-economic factors may play a much more important role in influencing highly educated labor than they do in influencing either capital or unskilled labor movements. If one accepts the supposition that non-economic factors are very important (perhaps equally as important as economic factors) in influencing human capital movements, then the "traditional" body of "migration literature" based on economic considerations is only partly relevant.
In order to combine both the economic and the non-economic factors affecting migration, the push-pull approach to migration is offered in this chapter.

Very briefly, the push factors affecting migration are both economic and non-economic in nature and tend to drive individuals out of a country because of conditions existing within the country. A different source of migration pressure is offered by pull factors (both economic and non-economic) in certain countries which tend to attract individuals to those countries. A discussion of these push and pull factors is the topic for the remainder of the chapter.

Applicability of Education in Developed Countries to Conditions Existing in Developing Countries

Prior to starting a detailed discussion of push and pull causes, it will be useful to review briefly a major cause of the brain drain which falls into both categories. In particular, mention should be made of the inapplicability of university education, as practiced in the advanced countries, to conditions existing in the underdeveloped countries. The discipline of economics will be provided as a specific example of this inapplicability.

There are strong reasons to doubt that even the basic economics courses in industrialized countries are applicable to the vastly different conditions existing in most developing countries. Pinto and Sunkel feel that this lack of relevance extends to the majority of economists from underdeveloped countries who receive their schooling in advanced countries:

The majority of young economists who go to industrialized countries for training return to their home environment with theoretical schemes that are to a
greater or lesser extent divorced from objective reality and from the economic problems of their own countries, and often with research methodologies that have no possibility of being usefully applied.7

However, it should be stated in all fairness that it is not the responsibility of American graduate schools to design a graduate curriculum that would ideally prepare each student for the (as yet unknown) role or roles that he will play in the future, but rather that some balance must be struck among competing demands while relatively neglecting the development of skills with very narrow applicability. Nevertheless, a strong case could be made for arguing that the demand for graduate programs in the field of economic development, with direct relevance and applicability to conditions existing in underdeveloped countries, is great enough to justify the cost and effort needed to implement them.

The question of relevance, however, relates not only to specific areas in the field of economic development, but to the entire field of economic theory. The problems in advanced and developing countries are entirely different in most cases. For example, in addition to economic development, the dominant concerns of underdeveloped countries would include: (1) the rigidities of the agricultural sector where the majority of land is concentrated in the hands of a small group of owners who do not organize its exploitation in an economically efficient manner; (2) vulnerable and unstable international trade, a condition which is extremely dangerous due to the characteristically heavy dependence on one or a few main export products;

(3) discriminatory foreign exchange policies. These problems are not major issues in industrialized countries where the emphasis is laid on such complex problems as full employment, problems of the business cycle brought on by an important capital intensive sector, agricultural overproduction, and international financial movements and their effects on the balance of payments. Probably the most obvious difference between the United States and underdeveloped countries is the relatively unimportant position played by international trade in the economy of the United States; this fact is reflected in macroeconomic models of the "closed" variety in which the international sector is accorded very little importance.

It, therefore, comes as no surprise that the economic theories developed in advanced countries, specifically for the purpose of analyzing phenomena in those countries, are not applicable to any great extent in underdeveloped countries. Pinto and Sunkel warn of the danger of misapplying the theories:

In fact, in their anxiety to accommodate the reality of our countries to theoretical schemes developed out of context or unrelated to objective circumstances, these foreign trained students not only contributed very little to the economic development of their countries, but frequently they retarded it.  

In other words, not only must one guard against the reality that economic theories of advanced countries might be of little value when applied in developing countries, but also care must be taken to prevent application of these theories when they might produce a counterproductive effect by being applied out of context. The fact that

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\[8\text{Ibid., p. 79.}\]
there is no uniform or universal economic theory that applies equally to developed and underdeveloped countries means that the underdeveloped countries have to construct their own theories in the light of conditions existing in their countries. The realization of this fact would probably go a long way toward eliminating one of the basic causes of the brain drain, namely, the lack of identification of a foreign student's course work in a developed country with conditions existing in his home country.

The relevancy problem is not limited to the field of economics, but extends to most of the scientific and technical fields. A glance at Table 5 will show that many more foreign students from the developing countries decide to remain in the United States instead of returning home than students from developed countries. An important reason accounting for this occurrence is the inapplicability of modern scientific and technical methods to conditions existing in the underdeveloped nations. The training that foreign students receive in the United States and their exposure to sophisticated and intricate machinery and methods may be of little use in an underdeveloped country where there is very little possibility of applying their newly acquired skills. Many of these students who return to their home countries after extensive advanced training in the advanced countries accept employment in administrative positions and other similar jobs for which their specialized training is of little use. Such a situation exemplifies the problem of a waste of resources at the national, international, and personal levels; the individual returning to his home country has "over-educated" himself for the tasks that confront him; the original country of emigration has not reaped the potential
<table>
<thead>
<tr>
<th>Source of Immigration</th>
<th>Total Scientific Immigrants (A)</th>
<th>Scientific Immigrants Who Adjusted Status From Student to Immigrant (B)</th>
<th>Percent, Col. B Col. A (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, All Countries</td>
<td>15,272</td>
<td>3,648</td>
<td>23.9</td>
</tr>
<tr>
<td>Developed countries total (Western Europe, Japan, Canada, South Africa, Australia, and New Zealand)</td>
<td>7,359</td>
<td>278</td>
<td>3.8</td>
</tr>
<tr>
<td>Developing countries, total</td>
<td>7,913</td>
<td>3,370</td>
<td>42.6</td>
</tr>
<tr>
<td>Selected developing countries:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China (Taiwan)</td>
<td>1,321</td>
<td>1,137</td>
<td>86.1</td>
</tr>
<tr>
<td>India</td>
<td>1,425</td>
<td>1,074</td>
<td>75.4</td>
</tr>
<tr>
<td>Korea</td>
<td>269</td>
<td>193</td>
<td>71.7</td>
</tr>
<tr>
<td>Iran</td>
<td>286</td>
<td>144</td>
<td>50.3</td>
</tr>
<tr>
<td>Israel</td>
<td>206</td>
<td>71</td>
<td>34.5</td>
</tr>
</tbody>
</table>

SOURCE: Immigration and Naturalization Service.
it had hoped to get from the returnee; and, lastly, the migrant in returning home is moving from an area where he is highly productive and his skills relevant to an area where his productivity is much lower and his skills irrelevant, the end result being a decrease in world output.

Push Factors

"Unavoidable" Factors. Before proceeding to examine specific push factors in detail, it will be useful to lump together a whole group of push factors for which there are no practical preventive measures. That is, these factors can be placed in a category classified as "unavoidable," or factors that cannot be eliminated by changing institutions or passing new legislation. These factors include political crises, military coups, university crises, racial, religious, ideological, or political persecutions, and war. Enrique Oteiza states that when situations such as these develop, it is difficult to call the increment of emigration a brain drain: "A situation of this type in a country of origin does not result from decisions taken on more or less rational economic grounds. From an economic point of view these cases can be considered accidents." The Cuban revolution and Castro's takeover in January, 1959, provides an example of this type of "accident." Figures provided by the United States Immigration and Naturalization Service show that the immigration of professional, technical, and kindred workers from Cuba during the

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fiscal years 1959-1962 amounted to 551, 771, 1511, and 2483, respectively.\(^\text{10}\) Undoubtedly, the very large increases in 1961 and 1962 were in response to the oppressive political regime.

It should be noted that these types of accidents are inevitable and virtually impossible to predict or prevent. There is no practical policy a country can follow to erase the possibility of their reoccurrence. For example, would it be realistic for a country to state that in order to slow down the brain drain it is going to avoid military coups in the future? If countries have to worry about military coups, racial persecutions, etc., then the brain drain is only a minor problem. Having established that no sweeping policy measures could effectively eradicate the existence (either dormant or active) of these accidental push factors, attention will be focused on those push factors to which palliative measures can be applied.

**Excess Supply of Graduates.** One of the main contentions among students of the brain drain is that a major cause of the problem is the excess supply of educated individuals in the countries losing manpower. It should be made clear, however, that such an oversupply condition is with reference to the existing level of effective demand. Since the level of effective demand is normally fairly low in underdeveloped countries, it is not possible to support a great number of graduates without the wages of the latter falling to a very low level. In other words, with a given number of graduates, an increasing level of aggregate demand will increase their relative scarcity, thus

\(^\text{10}\) U.S., Department of Justice, Immigration and Naturalization Service, *Annual Reports.*

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increasing their relative marginal contributions to output and presumably their wages. However, if the rate of increase of graduates exceeds the rate of increase of aggregate demand, then the marginal contributions of such graduates will decrease along with their wages. Hence, what is needed to gainfully employ these graduates at higher or constant wage-levels is to increase the absorptive capacity of those countries losing manpower. "Absorptive capacity" as used in this sense refers to the above relationship between aggregate demand and the output of graduates. If graduates increase at a faster rate than aggregate demand, then, other things equal, the capacity of the economy to absorb graduates is decreasing.

Expressed in a different manner, one of the main causes of surplus graduate production stems from the lack of manpower planning. In fact, the relationship between manpower requirements and absorptive capacity can be used to account for the excess supply of graduates. Manpower requirements may be defined as clearly evident "needs" for persons with particular education, training, and experience. ¹¹ "Absorptive capacity" is a looser term which refers to a country's capacity to provide some kind of useful employment for persons with certain educational qualifications. ¹² In effect, manpower requirements will express the minimum or essential needs necessary for development, while absorptive capacity will express the maximum number of persons who can be employed without encountering redundancy


¹² Ibid.
or serious underutilization of skill. Thus, with respect to scientists, engineers, and physicians, the turnout rate of such individuals should be between the set ranges of maxima and minima. Otherwise, there will be either a surplus (if the maximum is surpassed) or a shortage (if the minimum point is not attained).

However, simply mentioning the relationship between manpower requirements and absorptive capacity is not enough. This only refers to supply considerations. The demand for educated individuals in different fields is also an important aspect of the overall problem. Demand for education stems from social and political pressures for various kinds of education as well as from the willingness of people to pay fees to acquire it. Thus, in many countries, particularly developing ones, the demand for university education may be very high because of status and prestige; in such cases, where the output of university graduates does not even resemble the "needs" of the economy, the result is a supply of graduates that cannot be absorbed into the economy. When demand is clearly out of step with requirements or absorptive capacity, the country's educational system is clearly distorted or out of balance with the needs for national development.

It is a well-known fact that underdeveloped countries frequently establish universities for reasons of national prestige, modeled for the most part after the educational systems of developed countries. Originally, such universities were limited to the fields of law and the arts; but as of quite recently, according to a study by the Council on Education and World Affairs, the plethora of law and arts
graduates has extended to the medical and engineering professions in the underdeveloped countries.¹³

Harbison and Myers have developed an index which attempts to determine a country's capacity to produce graduates of all types and is thus closely related to the concept of a country's absorptive capacity.¹⁴ The index is an arithmetic summation of, first, the enrollment in second-level education as a percentage of the age group 15-19, adjusted for length of schooling; second, enrollment in third-level education as a percentage of the age group, multiplied by a weight of five. Table 6 indicates the index numbers assigned to selected countries, both developed and underdeveloped. Countries with a high index figure are more capable of reproducing graduates than countries with a low index. That is, the higher the index, the more easily can the negative effects of the brain drain be overcome. The Harbison-Myers index, then, can be used as a reference to determine how damaging the loss of a certain number of educated individuals has been to a particular country. The larger the index number, the more easily can the lost manpower be replaced and, conversely, the smaller the index number, the more vital is that manpower to the economic and social interests of that country.

The problem of oversupply has been compounded by the existence of internal brain drains within countries. A Pan American Health


TABLE 6
Countries Grouped by Levels of Human Resource Development According to Composite Index

<table>
<thead>
<tr>
<th>Level I - Underdeveloped</th>
<th>Level III - Semi-Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 Niger</td>
<td>33.0 Mexico</td>
</tr>
<tr>
<td>0.7 Ethiopia</td>
<td>35.1 Thailand</td>
</tr>
<tr>
<td>1.2 Nyasaland</td>
<td>35.2 India</td>
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<tr>
<td>1.5 Somalia</td>
<td>35.5 Cuba</td>
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<tr>
<td>1.9 Afghanistan</td>
<td>39.6 Spain</td>
</tr>
<tr>
<td>2.2 Tanganyika</td>
<td>40.0 South Africa</td>
</tr>
<tr>
<td>2.6 Ivory Coast</td>
<td>40.1 Egypt</td>
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<tr>
<td>2.9 Northern Rhodesia</td>
<td>40.8 Portugal</td>
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<tr>
<td>3.5 Congo</td>
<td>47.3 Costa Rica</td>
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<tr>
<td>4.1 Liberia</td>
<td>47.7 Venezuela</td>
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<tr>
<td>4.7 Kenya</td>
<td>48.5 Greece</td>
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<tr>
<td>4.9 Nigeria</td>
<td>51.2 Chile</td>
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<tr>
<td>5.3 Haiti</td>
<td>53.9 Hungary</td>
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<tr>
<td>5.4 Senegal</td>
<td>53.9 Taiwan</td>
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<tr>
<td>5.4 Uganda</td>
<td>55.0 South Korea</td>
</tr>
<tr>
<td>7.5 Sudan</td>
<td>56.8 Italy</td>
</tr>
<tr>
<td>Level II - Partially Developed</td>
<td>Level IV - Advanced</td>
</tr>
<tr>
<td>10.7 Guatemala</td>
<td>60.3 Yugoslavia</td>
</tr>
<tr>
<td>10.7 Indonesia</td>
<td>66.5 Poland</td>
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<tr>
<td>10.8 Libya</td>
<td>68.9 Czechoslovakia</td>
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<tr>
<td>14.2 Burma</td>
<td>69.8 Uruguay</td>
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<tr>
<td>14.5 Dominican Republic</td>
<td>73.8 Norway</td>
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<td>14.8 Bolivia</td>
<td>77.1 Denmark</td>
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<tr>
<td>15.2 Tunisia</td>
<td>79.2 Sweden</td>
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<tr>
<td>17.3 Iran</td>
<td>82.0 Argentina</td>
</tr>
<tr>
<td>19.5 China (Mainland)</td>
<td>84.9 Israel</td>
</tr>
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<td>20.9 Brazil</td>
<td>85.8 West Germany</td>
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<td>22.6 Colombia</td>
<td>88.7 Finland</td>
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<td>22.7 Paraguay</td>
<td>92.9 U.S.S.R.</td>
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<tr>
<td>23.1 Ghana</td>
<td>101.6 Canada</td>
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<td>23.6 Malaya</td>
<td>107.8 France</td>
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<tr>
<td>24.3 Lebanon</td>
<td>111.4 Japan</td>
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<tr>
<td>24.4 Ecuador</td>
<td>121.6 United Kingdom</td>
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<tr>
<td>25.2 Pakistan</td>
<td>123.6 Belgium</td>
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<td>26.8 Jamaica</td>
<td>133.7 Netherlands</td>
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<tr>
<td>27.2 Turkey</td>
<td>137.7 Australia</td>
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<tr>
<td>30.2 Peru</td>
<td>147.3 New Zealand</td>
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<tr>
<td>31.2 Iraq</td>
<td>261.3 United States</td>
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</tbody>
</table>

Organization report shows how internal brain drains give rise to lower earnings and thus contribute to external brain drains:

In Argentina, for example, there is one physician for every six hundred inhabitants, but they are not willing to practice in rural areas and small towns. As a result, a great number of physicians are concentrated in Buenos Aires, where there is one physician for every three hundred inhabitants. This gives rise to excessive competition among them and their earnings are as low as $100-$200 a month.15

Low Productivity. The extremely low salaries received by highly trained individuals in brain drain fields can be taken, with reservations, as reflecting the low productivities of these individuals. The result of this meager compensation leads either to emigration, since the opportunity cost of not emigrating becomes intolerably high, or to a search for an additional source of compensation. It is not uncommon for a university professor in an underdeveloped country to have one or two other jobs in addition to his teaching job in order to be able to earn a decent living; it is indeed a rare occasion to find a university professor who devotes his full time to teaching and research. H. M. Nussenzveig describes the situation for scientists as it exists in Latin America:

Delays of as much as several months in making salary payments are not uncommon in Latin American universities. Ravaging rates of inflation, budget cuts, and salary freezes are ever present threats or harsh realities.16


It is not surprising that university professors do not rely solely on the salaries they get from teaching, but rather on the salaries they get from several diverse types of jobs.

The excess supply of graduates combined with the inadequacy of complementary resources are the two main reasons accounting for the low productivity of human capital in developing countries. Many highly competent engineers and scientists have to spend much of their time tending to administrative problems which should be handled by a complementary staff, a consequence which is indicative of the lack of investment in elementary and secondary education. As a result, they cannot devote full time to their research endeavors, a fact which tends to lower the productivity of their scientific work. By emigrating to a developed country, they can avail themselves of the necessary complementary factors so that their productivity and presumably their wage will be increased.

**Lack of Government Support for Science-Oriented Enterprises.**

Two important ways in which the government of a country can increase the capacity of that country to absorb graduates productively is to either provide public funds for research purposes or encourage private industry to engage in research-oriented projects. In either case, the demand for graduates would be increased and the supply situation eased. However, in most underdeveloped countries the government is conspicuous by its complete lack of respect, or attitude of indifference, toward scientific research and supportive industries. Their attitude indicates an utter disregard for science and other
modernizing research-oriented disciplines. Instead, emphasis is placed on the more prestigious types of discipline such as law and the arts.

A good illustration of how a government can go even further and disrupt scientific work is provided by the Brazilian Center for Physics Research founded in 1949:

In 14 years of work, based upon the dedication and effort of pioneers, the largest theoretical physics group to date in Latin America was developed, attaining the level of a good department in foreign universities. The inflation, coupled with the refusal of the Goulart administration to increase federal subsidies accordingly, decreased salaries to the extent that a full professor earned less than $100 per month. This made it impossible for him to continue full-time work, and to accept the responsibility for training young people when there were no foreseeable prospects for their future. The group dissolved, and several of its members migrated. The effort of 14 years was destroyed in less than a year, with no repercussions within the country.\(^\text{17}\)

If the modern age is to ever arrive in underdeveloped countries, then the government should take an active part in supporting and promoting science. The alternative is for government to be apathetic; such an attitude will not only drive actual and potential scholars out of the country, but will also tend to doom the country to a state of perpetual backwardness. If the brain drain is to be stemmed, the government must take an active part in constructing and supporting financially an institutional framework which encourages scientific research and development.

**Lack of Funds Devoted to Research and Development.** An important cause of the brain drain is the lack of funds devoted to research and

\(^\text{17}\)Ibid., p. 1330.
development projects. Underdeveloped countries in general are notably devoid of an industrial and manufacturing sector in their economies; this fact alone helps to explain the low level of research and development expenditures. And, furthermore, most of the established industries in underdeveloped countries limit themselves to the duplication of products designed abroad, whether they are domestically-owned industries or foreign subsidiaries; in the case of foreign subsidiaries, it is extremely easy to import the know-how and technology from abroad. Thus, scientists who graduate from universities in developing countries have an extremely difficult time finding a job suitable to their specialized talents.

Most of the funds allocated to research and development in underdeveloped countries originate in the public sector. However, the amount of these funds in the government budget is minimal; as stated in the previous section, one of the main reasons that insufficient funds are forthcoming is the attitude of the government toward scientific research. However, this may not be the only reason for the paucity of funds allocated to scientific research and development. It is a well-known fact that the returns to investment in research and development are of a long-run nature and difficult to quantify. In underdeveloped countries particularly, given the relatively long "production time" needed for research and the high interest rates prevailing, the returns to investment in research and development may be too low compared to other investment opportunities promising more immediate and more tangible results. In fact, the returns to investment in research and development may even represent a real loss in the narrow sense that the discounted present value of a future
product at the going interest rates is less than the amount of capital invested. Thus, even from a purely economic standpoint, industries and governments of underdeveloped countries may be acting quite rationally in emphasizing investment projects which do not include research and development. Of course, over the long run this may not be a prudent policy; on the other hand, the temptation is strong to devote limited funds to investment projects that promise relatively rapid and tangible results while at the same time importing technological know-how from abroad relatively free of charge.

**Conclusion.** Before proceeding to a discussion of the pull factors affecting migration, it is important to note that the determination of the push factors was not made on the basis of any empirical evidence or statistical data, but rather on the basis of value judgments. That is, it is believed that these factors are important but that there is no empirical evidence available to prove their relevance. One of the major shortcomings in the data are supply and demand figures regarding high-level manpower. If such figures were available, then it could be determined whether, indeed, there was a surplus of graduates. In addition, there are no figures available indicating the extent of government support of science-oriented industries. Furthermore, the relative importance of such push factors as military coups and political instability cannot be quantified, thus making their effects inherently impossible to predict.
Pull Factors

Post-World War II Era of Unprecedented Economic Growth—Scientific and Technical Discoveries. If one looks at the past two decades in general, it will be noted that there has been an unprecedented era of affluence and economic growth spurred on by great technological and scientific discoveries in the advanced countries of the world. This rapid rate of economic growth in the advanced countries, combined with the technological requirements needed to support it, has created a vigorous demand for human capital. This increased demand for highly educated manpower has been generated from both the industrial sector and from the government sector of the economy. The former requires increasing amounts of human capital to keep abreast of the intense competition with other technology-oriented concerns. The public sector in the past two decades has greatly stepped up its expenditures on space and defense programs, both of which require large numbers of professional individuals.

Given this greatly expanded demand for highly educated manpower in the advanced countries, but particularly in the United States, and given that the elasticity of supply of such manpower is necessarily low in the short run, it is not difficult to see why this combination of events tends to attract human capital from abroad to fill the void. In other words, part of the explanation of the brain drain over the past twenty years can be attributed to the failure of American universities to supply educated manpower in sufficient numbers to meet the evergrowing demands of a rapidly expanding technologically-oriented economy.
It should be pointed out, however, that the leveling off of the United States economic boom of the late 1960's and the cuts in funds for scientific projects in industry and government, but especially in the aerospace industry, point to the possibility of a reverse brain drain occurring in the early 1970's. Thomas P. Southwick cites a report which states that European and Japanese research and development efforts are increasing at a much faster rate than those of the United States, thus hastening a narrowing of the technology gap between the United States and these two areas. It is quite possible that in the very near future Europe will be the main locus receiving "brains," exerting a strong pull not only on the talents of underdeveloped countries, but also on the talents of those presently living in the United States. The latter may lose scientists and engineers to Europe and Japan not only because of a pull effect, but also due to push factors within this country. The political situation, the war in Indochina, racial tensions, inflations, and pollution can all be cited as factors which would tend to induce professional people to leave the country.

Excellent Research Facilities and Research Teams. Undoubtedly, many professionals from developing countries are attracted to the developed countries due to the excellent research facilities provided there, and also in order to exchange ideas with their professional colleagues. Once such professionals have been "lured" to the developed countries to acquaint themselves with the latest discoveries and

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techniques, the temptation to remain in these countries is great. Highly trained individuals characteristically desire to excel in their fields, or at least to be aware of the latest developments in their fields; if they return home, not only are they deprived of the complementary staff and equipment necessary to achieve their newly inspired goals, but in many cases they lose all contact with the outside world in their fields and become technological anachronisms. Indeed, it would take a great deal of loyalty to one's country to have to relinquish all of the modern "tools of the trade" and make do with the inadequate and outdated equipment of the home country.

In most cases, the cost of modern scientific equipment is so great that only a few countries wish to invest in the required resources; individuals interested in research and deprived of the equipment are thus prompted to migrate. In addition, a very strong pull is exerted by the existence in advanced countries of one or a few outstanding and internationally renowned research teams. Of course, the fact that a research scientist increases his productivity when he works in an advanced country results in his receiving a higher wage. This fact, in addition to the desire for knowledge for knowledge's sake, tends to exert a magnetic pull on the potential migrant.

Monopolistic Practices of the American Medical Association. It is a well-known fact that the monopolistic practices of the American Medical Association in restricting the supply of American-trained doctors have been very successful in creating both an acute shortage of doctors and correspondingly high salaries. This contrived shortage has succeeded in attracting large numbers of immigrant doctors. Kelly
West has stated that approximately twenty-five per cent of all physicians in the United States are foreign-born and that the United States would have to build and operate twelve medical schools to produce the manpower being derived through the immigration of physicians.\textsuperscript{19} And S. Watanabe states that the United States produces only 800 physicians a year, while 12,000 are needed.\textsuperscript{20} The shortage of physicians in the United States is very real and continues to be one of the major pull factors responsible for attracting foreign physicians.

**Clearly Structured International Market for Human Capital.** The push-and-pull forces affecting international migrations of human capital have been aided by a clearly structured international market which has facilitated migration. In the words of the Council on Education and World Affairs:

>This market is characterized by increasing ease and rapidity of movement, much wider and more current dissemination of information about work in progress and the related employment opportunities, frequent contact among scholars and businessmen, the universality of the scientific and technological languages, vast expansion of study in developed countries by students from less developed countries, and overt recruiting on an international scale.\textsuperscript{21}

Certainly the spread of the multinational corporation has exacerbated the brain drain. Not only have corporations led "raiding

\textsuperscript{19} Kelly M. West, "Foreign Interns and Residents in the U.S.," *Journal of Medical Education*, XL (December, 1965), p. 1127.


\textsuperscript{21} Education and World Affairs, *op. cit.*, p. 18.
parties" to underdeveloped countries to recruit superior talents, but the mere presence of a corporation in a foreign country has made the indigenous professionals more aware of both conditions and developments relating to their fields in the advanced countries. In particular, they would probably have a rough idea of the skilled manpower requirements in advanced countries. In other words, the multinational corporation has helped not only to disseminate scientific information, but also to make highly educated manpower more aware of job market conditions in the advanced countries.

However, although this widening of the international market for human capital has facilitated migration, it is the contention of this study that the main factor accounting for the inflow of immigrants to the United States during the past two decades has been changes in the immigration laws of this country.

United States Immigration Laws

In what follows, it is demonstrated how the immigration laws during the period 1956-1967 have apparently had a great bearing on the immigration of scientists and engineers into the United States. The areas of emigration emphasized are South America, Asia, and Europe. In addition, an appendix to this chapter shows the results of a regression analysis in which various variables are tested to indicate their significances in conjunction with the brain drain.

Figure II on the following page indicates the emigration of scientists and engineers from Europe, Asia, and South America to the United States. It is quite obvious from the figure that South American emigration is low in absolute numbers and does not fluctuate
Figure II
Immigration of Scientists and Engineers by Country of Last Permanent Residence

SOURCE: See National Science Foundation sources in App. B.
very greatly. On the other hand, European and Asian immigration is much more unstable. The basic reason for this is that Asia and Europe are subjected to the immigration laws of the United States, whereas South America is a non-quota area; that is, South American scientists and engineers have entered the United States at a fairly uniform rate because the immigration laws have not impeded their movement in any way. The relatively small fluctuations in South American immigrants can partially be explained in reference to the business cycle in the United States.

A look at Figure II will confirm that for South America there is a small increase in immigration from fiscal 1956 to fiscal 1958, followed by a reduced rate of entry for the period 1958-1962 due to the generally slack conditions in the United States economy during those years. Then again during the period 1962-1965 there is a slight increase in response to improved economic conditions in the United States, but this is followed by a decrease in 1966 owing to the recession in that year. With the recovery of the economy in 1967, immigration from South America again increases.

It is important to note that, whereas South American scientists and engineers can migrate to the United States whenever they desire, Asian and European scientists and engineers are subjected to a quota system embodied in the United States immigration laws. Due to the existence of the quota system and the changes in the immigration laws, it is possible to account for the inflow of scientists and engineers to the United States from Asia and Europe by referring solely to these laws. Whether or not the immigration laws are enacted in response to the needs of this country is unknown and cannot be clearly ascertained.
However, the relatively close association between South American, Asian, and European immigration of highly skilled labor suggests the possibility that the passage of United States immigration laws may coincide with the skilled manpower needs of the country.

Before proceeding to an explanation of Asian and European immigration, the reader is urged to refer to Appendix A at the end of this chapter for a brief description of the immigration laws relevant to educated manpower.

The large increase in immigration from Europe in 1956 and 1957 can be accounted for mainly by the expiration of the Refugee Relief Act in December, 1956. It must be borne in mind that the years given in Figure II are fiscal years, so that the expiration of this Act took place in fiscal 1957, the year in which European immigration peaked. In addition, fiscal 1957 was a generally good year in the U.S. in terms of economic conditions and this may have helped to attract immigrants from Asia and Europe. The general decline in immigration from 1958 till 1962 can be explained by the high rates of unemployment in the U.S. for those years and by the generally slack aggregate demand conditions in the U.S. In addition, this was a period of strong economic growth in Europe. Continued effects of the expiration of the Refugee Act may also have exerted an influence.

The passage of Public Law 885 in October, 1962, resulted in an increased flow of immigrants from Europe and Asia in fiscal 1963. (For an explanation of the public laws affecting immigration, see Appendix A.) The gradual decline in immigration during 1964 and 1965 can be mainly attributed to the fall in Asian immigration. Probably the backlog of Asian scientists and engineers waiting to immigrate
was absorbed in 1963 after the passage of Public Law 885, so that
after 1963 immigration of scientists and engineers from Asia resumed
its normal pace. European immigration during this period remained
virtually unchanged. The passage of Public Law 236 in October, 1965,
accounts for the large upsurge in fiscal 1966 and 1967, particularly
from Asia. The easing effect of this law coupled with the escalation
of the Viet Nam war and an acceleration of the Apollo and Saturn
space programs combined to induce a tremendous increase in immigra-
tion of highly skilled individuals.

In analyzing the marked changes in immigration that occurred
during the period 1956-1967, one cannot help but note that all the
abrupt changes coincide with changes in the immigration laws of the
United States. The large upsurge in European immigration in fiscal
1957 coincides with the passage of the Refugee Relief Act; the large
upsurge in Asian immigration in fiscal 1963 coincided with the pas-
sage of Public Law 885; and the tremendous upsurge in both Europe and
Asia in fiscal years 1966 and 1967 corresponded with the passage of
Public Law 236 and the liberalization of immigration quotas.

It is the contention of this study that the United States immi-
gration laws were the main factors affecting the brain drain from
Europe and Asia to the United States. However, it should be noted
that the immigration laws play a permissive role in Asian and European
immigration; other factors must provide scientists and engineers with
the basic reasons for migrating in the first place. For example,
even though Paraguay may have extremely lenient immigration laws,
that fact in itself will not induce a wave of immigration to that
country; there must first exist some underlying cause that either
pulls the immigrant to the country or pushes him out of his home country. Hence, one cannot conclude that the easing of United States immigration laws is the basic underlying reason attracting immigrants to the United States. Whatever the underlying reasons for immigration, whether it is the higher standard of living in the United States or political reprisals in the country of origin, the immigration laws simply permit or prohibit the natural responses of individuals to these underlying causes.

In order to examine some of the underlying causes of the brain drain, a regression analysis was undertaken to determine the significance of some of the variables. The reader is referred to Appendix B at the end of this chapter for a review of the results.

In conclusion, it is extremely difficult, if not impossible, to determine accurately the basic causes of the brain drain. Regression studies do not provide conclusive results because of the intangible nature of many of the important factors affecting the brain drain. Many of these factors cannot be accurately quantified, and thus cannot be fed into a computer. Nevertheless, many of these intangible factors may be vitally important in their influence on the brain drain. At the same time, statistical data tends to be scarce or nonexistent in underdeveloped countries. Thus, the best one can hope to do is to make an educated guess as to what constitutes the most significant causes. However, the close correlation that exists between changes in the United States immigration laws and the immigration of scientists and engineers from Asia and Europe suggests that herein lies the main factor accounting for the brain drain. It is not a
basic or underlying cause, but rather a permissive factor which allows the inflow to take place.

The following chapter formulates recommendations which are aimed at affecting the root causes of the brain drain. It is hoped that these recommendations will aid both the sending and the receiving countries in finding a mutually agreeable solution to the brain drain problem.
APPENDIX A

Immigration Act of 1924: annual quotas for immigration were established and, since 1929, based on the national origins of the population of the U.S. Generally speaking, the quotas were determined by country of birth; independent countries in the Western Hemisphere were non-quota countries.

Immigration and Nationality Act of 1952 (Public Law 414): continued the numerical limitations of 1924, but established a system of preferences within the quotas. This Act provided first preference or highest priority to "qualified quota immigrants whose services are determined by the Attorney General to be urgently needed in the United States because of the high education, technical training, specialized experience, or exceptional ability of such immigrants and to be substantially beneficial prospectively to the national economy, cultural interests, or welfare of the U.S."

Refugee Relief Act of 1953: authorized the issuance of special non-quota visas to refugees and escapees from Communist-controlled areas of Europe. This Act had a December, 1956, deadline, a fact which helps to explain the large jump in immigration from Europe in fiscal year 1957.

Public Law 87-885, October 24, 1962: this Act permitted certain "skilled specialists" (i.e., highly educated or technically trained aliens) who were on waiting lists for immigration before April, 1962, to enter the U.S. as non-quota immigrants.
Public Law 89-236, October, 1965: Congress revised the basic immigration law by abolishing, effective July 1, 1968, the limitations to immigration based on national origins. Since that date, the major consideration in issuing visas has been a system of preferences rather than national quotas. During the period December 1, 1965, to July 1, 1968, the quota system remained in effect, but with important modifications. The new preference system now applies to each country's quota. Effective July 1, 1968, the preference system was applied without regard to national or country quotas. During the interim period, unused quotas were transferred to a "pool" which was available for preference immigrants from countries with oversubscribed quotas.
A regression analysis was undertaken to attempt to single out the most significant variables affecting the brain drain from Europe, South America, and Asia. A serious drawback of this analysis was the fact that many important variables could not be included in the program because they were not quantifiable. Such factors as dissatisfaction with a job or incompatibility with a political regime, although probably highly significant in their effects on the brain drain, cannot be incorporated into an empirical study using a computer. In addition, it should be mentioned that the paucity of statistical data in underdeveloped countries makes it impossible even to examine such basic variables as demand and supply for scientists and engineers.

Aware of these limitations, a stepwise regression analysis was undertaken with the purpose of determining the significance of various variables tested. Two dependent variables and seven independent variables were run through the computer in an attempt to isolate those independent variables which exerted the greatest influence over the dependent variables. The time period under study covered the fiscal years 1956-1967. In order to reduce the autocorrelation that exists between time series data, first differences rather than absolute quantities were used.

The results of this computerized analysis, which are recorded in the following pages, indicate that the factors affecting the emigration of high-level manpower from South America and Europe are
all pull factors, whereas the single factor affecting the emigration of high-level manpower from Asia is a push factor. Other similarities between South America and Europe are also evident. For example, none of the factors tested significantly affected the migration of scientists from Europe and South America. In addition, the most significant independent variable (as determined by the t-test) affecting the emigration of engineers from Europe and South America was found to be the rate of change of gross national product in the United States; research and development expenditures in the United States also exerted an important influence in the case of these two continents. However, in the case of Asia, only the rate of change of Asian gross national product was significant as an explanatory variable for emigration. The fact that the variables affecting Asia are different from those affecting Europe and South America is probably due to the closer cultural and sociological ties between Europe and South America. That is, South American cultural and social characteristics have been heavily affected by European colonial influences. Asia, on the other hand, with the exception of a few isolated cases, notably India and Israel, has not been as profoundly influenced by European mores and values. This fact can probably be given as a basis for concluding that pull factors in the United States, with its close cultural ties to Europe, tend to be more attractive to highly educated individuals in Europe and South America than to the same types of individuals in Asia, where the culture and traditions are more radically different from those of western nations.
IDENTIFICATION KEY FOR VARIABLES

(Absolute Annual Changes)

1 = Engineers (E)
2 = Natural Scientists (S)
3 = R & D Expenditures - Federal Government (R_1D_1)
4 = R & D Expenditures - Industry (R_2D_2)
5 = R & D Expenditures - Universities and Colleges (R_3D_3)
6 = R & D Expenditures - Other Non-profit Institutions (R_4D_4)
7 = GNP in losing countries in constant 1967 prices (GNP)
8 = GNP in the United States in constant 1967 prices (GNP_{U.S.})
9 = Rate of Unemployment in the United States (U_{U.S.})

Variables 1 and 2 are the dependent variables; variables 3 through 9 are the independent variables. Variables 1 and 2 refer to the number of engineers and natural scientists immigrating to the United States from Europe, South America, and Asia. Variables 3 through 6 represent research and development expenditures by the Federal Government, industry, universities and colleges, and non-profit institutions, respectively. Variable 7 represents gross national product in the countries of emigration quoted in constant 1967 prices; variable 7 is the only push variable considered in this regression analysis. Variable 8 represents United States gross national product in constant 1967 prices. Variable 9 represents yearly unemployment rates in the United States.
Data on engineers and scientists immigrating into the United States was provided by the following sources:

Annual Reports of the Immigration and Naturalization Service.


Data pertaining to research and development expenditures in the United States was obtained from the following National Science Foundation publications:


*Federal Funds for Research and Development, and Other Scientific Activities*, NSF 68-27.

Data pertaining to the rates of growth of gross national product for the three continents was computed from the following source:


The data providing the figures for the rates of unemployment in the United States was obtained from the monthly *Federal Reserve Bulletin*. 

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RESULTS OF THE REGRESSION ANALYSIS

EUROPE

Engineers: All variables tested, with the exception of variable 8, were significant according to the t-test at the .01 level. The F-test for the predictive equation was significant at the .05 level. The cumulative RSQ value for all of these variables was .97; the standard error was 162.78; the F value was 17.51. The equation is as follows (t values are beneath the corresponding variables in parentheses):

\[ E = -1663.001 + 1.365 \Delta R_1 D_1 + 1.560 \Delta R_2 D_2 + \]
\[ (5.87) \quad (3.44) \]
\[ + 18.022 \Delta R_3 D_3 + 57.196 \Delta R_4 D_4 - 0.090 \Delta \text{GNP}_{\text{U.S.}} - \]
\[ (3.63) \quad (5.49) \quad (7.54) \]
\[ + 893.369 \Delta U_{\text{U.S.}} \]
\[ (7.51) \]

Scientists: No variables tested were significant according to the t-test or the F-test at the .05 level.

SOUTH AMERICA

Engineers: Variable 8 is significant according to the t-test at the .01 level; variable 4 was significant at the .05 level; variable 3 was not significant within the .05 level. The F-test for the predictive equation was significant at the .05 level. The cumulative RSQ for variables 3, 4, and 8 was .68; the standard error was 43.63; the F value was 4.97.
$E = -84.363 + 0.067\, \Delta R_1 \Delta D_1 + 2.584\, \Delta R_2 \Delta D_2 - 0.004\, \Delta GNP_{U.S.}$

(1.63) \hspace{2cm} (2.68)

Scientists: No variables tested were significant according to the t-test or the F-test at the .05 level.

**ASIA**

Engineers: Only variable 7 is significant according to the t-test at the .05 level. The F-test for the predictive equation is significant at the .05 level. The RSQ value added by variable 7 was .41; the standard error was 519.33; the F value was 6.43. The predictive equation is as follows (t-test value is beneath variable 7 in parentheses):

$E = -596.070 + 0.081\, \Delta GNP_{ASIA}$

(2.53)

Scientists: Only variable 7 is significant according to the t-test at the .05 level. The F-test is significant at the .05 level. The RSQ value added by variable 7 was .45; the standard error was 166.61; the F value was 7.66. The predictive equation is as follows (t-test value is beneath variable 7 in parentheses):

$S = -210.762 + 0.028\, \Delta GNP_{ASIA}$

(2.77)
Definitions

Before proceeding to an examination of the impact of migration on the countries of emigration and immigration, it will be necessary to assess the important contributions made by educated manpower to its country of residence. A highly educated individual contributes to society not only an amount of "physical" output which reflects his personal remuneration, but also an additional non-compensated amount of intangible output which is highly beneficial to the society as a whole. It is the economic significance of such "externalities" which this section seeks to elucidate.

Harry Johnson describes an "externality" as follows: "it contributes something to the welfare or productivity of others in the country of his residence over and above what the individual is paid for doing and for which he would not be paid in a competitive market for his services, and moreover something which is peculiar to him personally and not in his personal capacity."¹ Buchanan and Stubblebine² define the term more succinctly in equation form as follows:

This states that the utility of an individual, $A$, is dependent on the "activities," $(X_1, X_2, ..., X_m, Y_1)$, that are exclusively under his own control or authority, but also upon another single activity, $Y_1$, which is by definition under the control of a second individual, $B$, who is presumed to be a member of the same social group. It should be noted that in the above equation, "firms" may be substituted for "individuals" and "production functions" for "utility functions" without affecting the central idea behind an "externality."

Since this study deals with highly educated individuals, it is necessary to look at education externalities and their effects on society. Externalities in this context arise because of a difference in private and social returns to education. Mary Jean Bowman helps to point out this crucial difference:

The distinction (i.e., between private and social returns to education) is not one of opposites. In fact, since all returns accrue ultimately to individuals, we could state the formal identity:

aggregate social return equals the sum of its individual components. However, if we add what you get from your education to what I get from mine but disregard how my education affects yours, or vice versa, the above identity will not exist. The total social return may be larger or smaller than the sum of individual returns viewed in isolation from each other unless a correction for these interactions is made.3

Social Benefits and Social Costs

The concept of an externality can also be formulated in a social benefit-social cost framework. Thus, the demand for education is

determined by the marginal social valuation derived from consuming an additional unit of education; this is synonymous with saying that the demand for education is reflected in the price or marginal resource cost which consumers are willing to pay for an additional unit of education. On the other hand, the marginal cost of providing an additional unit of education reflects the marginal resource cost which society must incur if it wants another unit of education to be provided. As long as the resource sacrifice consumers are willing to make exceeds the resource sacrifice society must make to secure an additional unit of output, an externality (external economy as opposed to diseconomy) is said to exist. Stated differently, an external economy exists when marginal social benefit is greater than marginal social cost.

Welfare Effects of Education

This discussion of externalities is vital in assessing the welfare effects of education, for education contributes to society a number of desirable qualities, including a better informed electorate, benefits to the students' future children who will receive informal education in the home, benefits to neighbors who may be affected favorably by the social values developed in students, and, particularly for underdeveloped countries, a basic "modernizing" of attitudes in tradition-oriented economies. For example, the discovery of a new drug benefits not only the scientist as reflected in his financial reward, but also the entire society. Thus, the importance of education in "making" this new scientist is not only derived from his routine and
administrative tasks at the "Institute," but also in the possibility that he may add to the "body of science" a useful contribution to society as a whole. According to Richard Musgrave, the most important aspect of the external benefits of education lies in the change in the social and cultural climates, incident to the widening of horizons, which education entails. It must be noted, however, that this social benefit is not an automatic consequence of education; situations could arise where the supply of professional people cannot be productively absorbed into appropriate positions, a consequence which could readily result in an external diseconomy and a source of instability.

The crucial nature of education to the economic and social development of a country cannot be underestimated. Education contributes to a person's productivity and thus adds to the national product. But, in addition, education contributes some extremely important and beneficial "spillover" effects which are economic and social in nature. In fact, the basic economic argument supporting "free" education is based on the premise that the education will provide a "social return" which is over and above the sum of the private returns. From a purely economic perspective, what is lost through marginal analysis are these "spillover" effects or externalities, that is, non-compensated production. Stated somewhat differently, the presence of highly educated people within a country results in their making a contribution to national welfare that goes beyond the money value of the services they perform.

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But to view education only as a form of investment which will provide a certain return in the future is to ignore a second very important aspect of education, namely, the view that education acts as a consumption good which provides direct satisfaction to the person acquiring the education. In other words, the simple fact that a person is going to school to receive a degree will provide the individual with a certain amount of personal satisfaction and the knowledge that his prestige in social circles will probably be enhanced. This provides individuals with the option, if they so desire, to use education for its consumption qualities. Hence, in assessing the welfare effects of education, it is important to regard education as both an investment good which increases productivity and as a consumption good which increases the utility or personal satisfaction of the individual. Thus, to measure the contribution of education to the national well-being by simply looking at the marginal productivities of those persons who are educated is to leave out a tremendously important segment of benefits contributed by non-compensated, intangible production, and the aspects of education as a consumption good which provides direct satisfaction to the person being educated.

In conclusion, the externalities contributed by educated individuals are relatively more important to underdeveloped countries than to developed countries. The latter have already undergone the necessary political, social, and economic transformations required for modernization, and thus the influx of highly educated personnel into their societies is valued more for its contribution to gross national product than for its social contribution. The private contribution
of human capital to underdeveloped countries is certainly of some
moment, but the social contribution, that is, the external benefits,
is probably much more crucial to their overall (social, economic, and
political) development.

The Country of Immigration

Whether immigration will benefit or hurt a country depends on the
country's resource base and the dynamic effects which the new immigra-
tion will cause in the country. In particular, if a country's popu-
lation is below optimal, relative to its capital and land resources,
then immigration will have a tendency to relieve the labor scarcity
in a manner which is beneficial to the country; that is, immigration
will tend to raise per capita incomes. Furthermore, countries with
small populations relative to other resources encourage immigration of
selected types of workers not only to relieve the labor scarcity, but
also because of the stimulus to investment provided by additional
labor. For example, housing, schools, public transportation, highways,
hospitals, etc., will all probably be required capital expenditures as
a consequence of the new immigration. In addition, social overhead
capital in countries with a relatively short labor supply tends to
produce increasing returns; that is, roughly the same amount of invest-
ment in social overhead capital is required whether the population is
small or relatively large.

Another consequence of immigration is the effect on wages and
income distribution. This analysis has been broadly covered in con-
junction with Figure I in the previous chapter. Immigration lowers
the marginal product of labor and hence wage rates, while at the same
time raising the returns to land and capital. There will also be a redistribution of income whereby labor's share of the national income will decline relative to the other factors of production. It should be made clear, however, that even though labor's share of the total product has shrunk, the total product itself has risen so that the total wage bill is now probably larger, depending on the elasticity of the marginal product curve for labor; if the marginal product curve is elastic within the relevant range, then immigration will tend to increase the total wage bill, and vice-versa for an inelastic curve. See Figure I in Chapter III for a confirmation of these facts.

Moreover, the character of the immigrants themselves is of substantial consequence. The country of immigration will gain the most if the immigrants are young, adventurous, and energetic people; on the other hand, if the immigrants are simply outcasts who cannot be productively employed in their home countries, then possibly they will be a burden to their new home country. Ultimately, whether or not the immigrants will benefit the recipient country will be determined by that country's resources which are compatible with labor, for this will determine the productivity of the immigrants and their net contribution to the total product and national economic welfare. It should also be noted that the speed and ease with which these immigrants are assimilated into the indigenous culture will have an important bearing upon the future sources of social disturbances.

In short, the advantages or disadvantages that the country of immigration will derive from immigration hinge upon the nature of the immigrants themselves and upon the nature of the economy involved. But so far, reference has been made to labor in general. This study,
however, concentrates on highly educated or skilled labor. There is less probability that highly educated immigrants will cause social problems to the extent that unskilled immigrants might. In addition, the human capital investment embodied in a highly skilled or educated immigrant represents a windfall gain to the recipient country. The extent of the contribution made by a highly educated immigrant depends of course on the endowments of cooperative factors. Thus, other things equal, one would expect a skilled immigrant to be more productive in the United States where the complementary capital and technology is of a superior nature, than in Argentina where capital and technology is in a more rudimentary stage of development. The fact that United States immigration laws offer no resistance to the entrance of such individuals into the country attests to the desirability of having such individuals in the country. On the other hand, the stringent laws against the free entry of unskilled labor may be an indication that the inflow of such labor is held to be detrimental to the interests of the United States.

A detailed account of the consequences of the inflow of human capital to the country of immigration will not be given in this section. Rather, the implications for the country of immigration will be provided in conjunction with those for the country of emigration in the following chapter.

The Country of Emigration

Introduction

The country of emigration in this study is assumed to be an underdeveloped country. In this section, an evaluation of the problems
imposed on the country of emigration will be undertaken. In particular, an assessment of the nature of the losses involved will be discussed.

**Marginal Productivity of Educated Individuals**

When a highly educated individual emigrates from a country, that country loses an amount of output determined by his marginal contribution to that output. There is a problem, however, in trying to estimate the value of the contribution made by such an individual, particularly if his wage rate does not reflect or is not in line with his marginal contribution. And in underdeveloped countries particularly, wage rates and marginal productivities seldom coincide. Enrique Oteiza, a well-known Argentine economist, stresses that the market for university-trained personnel in underdeveloped countries is very rudimentary, so that wages do not properly reflect marginal productivities, probably because they reflect traditional patterns of evaluation for different occupations.\(^5\) It is a well-known fact that underdeveloped countries for the most part tend to stress such traditional subjects as law and the arts with little emphasis on the more "modern" aspects of education such as science and engineering. In addition, much prestige is attached to a position within the huge government bureaucracies, probably reflecting the influence of their colonial heritage.

Therefore, it is probably safe to assume that in the "brain drain" fields the marginal productivity of university-trained personnel is

higher than is reflected in the wages they receive. If this is true, then one cannot accurately estimate the extent of "loss" which a country has incurred as a result of an outflow of human capital. If wages are taken as a rough measure of their contribution, then surely the overall measurement of "loss" will be understated. But regardless of what measurement procedures are used, there can be little doubt that the country of emigration does sustain a loss.

A number of prominent economists have disagreed with the idea that the country of emigration sustains a loss mainly due to their contention that wages do reflect marginal productivities roughly. Herbert Grubel, for example, has argued that if the emigrant has been fully remunerated for his contribution to the economy before his emigration, that if his earnings have been equal to his marginal productivity, then the home country does not lose on his emigration because he removes an equal amount of his contribution and the remuneration he gets from the economy. This argument, however, is open to serious objection because it takes no account of the externalities contributed by educated individuals (section 1 of this chapter) or the system of taxation (see the following section in this chapter). In addition, Grubel's argument does not consider the potential future loss which the country undergoes when the educated individual emigrates.

Probably even more important than marginal private productivity is marginal social productivity. The social productivity of an educated individual is synonymous with the externalities he contributes.

The vital importance of the mere presence of highly educated manpower can have a profound and desirable effect in changing the political, social, and economic attitudes of a country, even if they do not add significantly to gross national product. But the external contributions of human capital have been discussed in a previous section of this chapter and will not be touched upon further here. Suffice it to mention here that education and highly educated individuals contribute important private and social benefits. Education and the growth and spread of knowledge go a long way to eliminating many of the problems associated with "backwardness," including low labor efficiency, factor immobility, ignorance of available resources and production techniques and customary values and traditional social institutions that minimize the incentives for economic change. An advance in knowledge and the diffusion of new ideas and objectives are necessary to remove economic backwardness and instill the human abilities and motivations that are more favorable to economic achievement. The importance of the "residual factor" in economic growth, provided in the introductory chapter of this study, serves to underline the importance of the "quality" of the labor force in promoting growth and development.

In conclusion, educated individuals undoubtedly provide valuable private and social contributions to underdeveloped countries. The loss of such individuals through migration imposes a severe hardship on the losing countries and, to the extent that these individuals are not replaced, a permanent loss in private and social output.
Effect on National Objectives

If it is postulated that the national goal of a certain country is to maximize the total gross national product because, for example, it is trying to maximize its productive capacity for waging war, then one can say that the emigration of an educated person (and also an unskilled person) will impose a loss on the country; this is so not only because the skilled person removes his contribution to output and the accompanying tax revenues, but also because the individual becomes unavailable for the military service (provided he is of draft age).

However, in this nuclear day and age such a national goal is neither desirable nor necessary. A more desirable goal would be to maximize the welfare of the population concerned. For example, an average per capita income rather than aggregate income is a more relevant criterion if one is interested in the well-being of the average person; probably a modal income or a median income would provide a better measure than a mean income. In this case, too, the emigration of an educated individual will tend to reduce per capita incomes due to his higher-than-average income and will thus be labeled an undesirable movement.

However, in spite of a general lowering of per capita incomes, the effects on economic development of the emigration of academics from underdeveloped countries are likely to be uncertain, both because academic productivity may be in subjects which have little direct relevance to economic development and because of the difficulties of applying in a practical manner the results of such academic research to conditions in these countries. Hla Myint states that the important thing from the point of view of promoting economic development is not the results of pure scientific research which the underdeveloped
countries can in any case obtain from abroad, but in the practical application and utilization of these results.

Public Finance System

Introduction. The tax systems of underdeveloped countries differ most noticeably from the pattern in advanced countries in their heavy emphasis on regressive taxes, particularly commodity taxes. The word "regressive" as used in this section refers to the incidence or burden of a tax with respect to income. Thus, a sales tax in this sense is said to be regressive because the tax rate decreases as income increases. It should be noted, however, that the formal and accepted definition of a regressive tax is one for which the rate decreases as the base increases (the appropriate base in the case of a sales tax is the sale price). Since in this section (public finance) the emphasis will be on tax burdens with respect to incomes, the word "regressive" is being used in this modified sense. In addition, the proportion of government services going to the lower income groups is generally lower in underdeveloped countries than in developed countries. For both of these reasons, the emigration of a skilled individual from an underdeveloped country is likely to be less


damaging to that country than the corresponding emigration of such an individual from an advanced country. But before arriving at any firm conclusion, this issue must be explored more fully. The system of taxation shall be explored first, followed by the system of public expenditures.

**Taxation.** If one assumes that the tax system of a particular country is progressive, and if one allows that educated personnel earn above-average incomes, then it can be concluded that the emigration of such an educated person from that country will result in a more-than-average reduction of tax revenues and a consequent increased per capita tax burden on the remaining population. However, since in actuality the tax systems of most underdeveloped countries are regressive, it cannot be concluded with certainty that the emigration of an educated individual will raise the per capita tax burden of the remaining population.

Nevertheless, the country of emigration does sustain a loss. Harry Johnson illustrates one type of loss undergone by the country of emigration:

If education is financed wholly or partly by general taxation of the resident population, every emigrant takes with him a gift — in the form of the education he has received — from the place he leaves to the place he goes to. To put the point another way, the region of immigration gets the right to tax the high income made possible by an educational investment it has not paid for, while the region of emigration loses the opportunity to recoup by taxation the cost of the educational investment it has made.10

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The potential emigrant thus has acquired a valuable asset (education) free of any direct charge or obligation. If he remains in his home country, he will in a sense pay off his "invisible" debt by contributing to the tax revenues which will support the next generation to be educated. As it is, the migrant pays off his debt to his new country of residence as he raises a new generation of children and educates them. But this is not much consolation to the country losing the educated manpower. It could be argued, however, that the per capita burden of the generation to which the emigrant belongs is not changed by his departure because when he leaves he takes along the children he would have added to the next generation requiring education. What this argument fails to point out is that professionals earn higher-than-average incomes and thus contribute higher-than-average revenues, in spite of the fact that taxation is regressive.

Of course, there are many public goods other than education that the emigrant undoubtedly has benefited from, and these additional benefits add to the "invisible" debt of the emigrant. For example, retired people who have already paid their debt to society in the sense of financing the expenditure of public goods, including of course the educational expenditures that have provided the emigrant with a professional career, are deprived of the contributions to tax revenues necessary to support old-age pensions which the emigrant would be making had he remained behind. In a sense, the country of emigration loses a piece of valuable quasi-property (in the form of the emigrant), while the emigrant reneges on the payment of a tacit debt.

Public Expenditures. Whether or not an emigrant imposes an element of loss on the country from which he leaves depends on the entire public
finance picture. For example, if it is true that the taxes which professional emigrants pay for public services are higher than the marginal cost of the services they consume, then it can be said that the emigration of such professionals does indeed reduce the welfare of those people remaining behind. On the other hand, if it is assumed, as Grubel and Scott do,\(^1\) that educated individuals contribute higher-than-average tax revenues (assuming progressivity), but at the same time absorb a higher-than-average value of government services, then the conclusion is that the emigration of these individuals has a negligible effect on the well-being of the remaining population.

In actuality, it is probably correct to state that the system of public expenditures in underdeveloped countries, while not benefitting the lower income groups to the extent that exists in the developed countries, is, nevertheless, progressive in nature; examples of such progressivity would include public transportation, public education, public housing, public parks, etc., all of which are consumed (with the possible exception of education) to a much greater degree by the low income groups than by the middle and upper income groups. In other words, professional people in general are indispensable in that they contribute elements of subsidy which aid in the provision of public goods from which the poorer classes derive considerable benefits. Looked at in this perspective, the emigration of a professional individual imposes hardships on the average (usually low income) individual left behind.

According to Herbert Grubel, the enjoyment of government services is in proportion to the taxpayer's income and wealth; hence, a government should be able to reduce services by nearly the same proportion as that by which its revenues decline when a person emigrates, the result being that the per capita burden of providing government services for those remaining behind is unaffected. However, as mentioned in the previous paragraph, government expenditures are probably progressive in nature in the developing countries, a fact that would tend to discount Grubel's contention. With respect to public education, Grubel's argument ignores the basic idea supporting it: that the wealthy bear part of the costs of educating other people's children as well as their own.

An interesting sidelight on public education in underdeveloped countries is provided by Ivan Illich, an educator with some rather radical ideas about public education. According to Illich, in developing countries in general, the entire population has been indoctrinated to believe that school has a monopoly on formal education, so that the illiterate can be taxed to provide free high school and university education for children of the rich. According to Illich, then, the top income recipients receive the overwhelming percentage of public education funds, while the masses of the people receive a very small percentage of public education funds. If one were to accept this

12Grubel, op. cit., p. 1423.
14Ibid.
latter statement of Illich's, then the emigration of a professional (presumably a member of the rich class) could be looked on favorably since the public funds formerly devoted to his education could now be diverted to the education of the poorer classes.

In conclusion, let it be said that even though the tax systems of developing countries are regressive, nevertheless, professional individuals earn higher-than-average incomes and therefore probably contribute larger per capita tax revenues than poor people. At the same time, it is probably fair to conclude that professionals consume a relatively smaller share per capita of government services. Thus, when one views the fiscal system taken in its entirety, the emigration of highly educated individuals in all probability reduces the welfare of the population remaining behind.

**Monopsony in the Labor Market**

Emigration is instrumental in breaking the monopsony in the labor market since it tends to give more bargaining power to the educated people whose opportunity cost at the margin is now determined not only by domestic circumstances, but also by international circumstances. This increase in opportunity costs of educated manpower will cause employers to realize that the movement of professional skills is not hampered by lack of alternative avenues of employment and result in their actively competing for the now relatively more scarce human capital. This increased competition among domestic employers for the services of such human talent will not only tend to bid wages for professional manpower up, but will also force employers to increase the efficiency of their operations. Such action would facilitate the
institutional transformation of a traditional society and lead ultimately to the modernizing of the society. In addition, the higher wages paid to the skilled manpower would in itself tend to reduce the outflow to other countries.

Factor Proportions

It is quite possible that the emigration of a significant number of highly educated individuals would appreciably affect the proportions in which the factors of production are combined and thus affect the earnings of the remaining (or complementary) factors of production. In fact, if such an out-migration is quantitatively significant, then the continuation of this process could so reduce the supply of human talent as to result in serious diseconomies of scale in production. Such an outflow of human capital could seriously impair the productivity of other complementary factors. On the other hand, it is entirely possible that the emigration of an educated person will raise the incomes of the cooperating factors of production, especially when there is a surplus of educated manpower to begin with.

A frequent argument favored by underdeveloped countries stresses the crucial importance of reaching a certain critical "minimum mass" of highly skilled individuals before any productive results for a society can be achieved. The implication is that any out-migration of such individuals will tend to diminish the possibility of attaining this "critical mass," with resulting adverse effects on the economy. An accusing finger is thus pointed at the system of selective

\[\text{\textsuperscript{15}}\text{Oteiza, op. cit., p. 133.}\]
immigration followed by advanced countries, a policy which tends to aggravate the goal of reaching this critical minimum. Furthermore, within any body of skilled personnel there are certain outstanding or key individuals who are indispensable to the efficient functioning of the group or team. It is quite obvious that the loss of one of these key individuals through emigration would impose very considerable external diseconomies on the remaining population. And it is probably safe to assume that the loss of a key man is proportionally much more damaging to an underdeveloped country than to a more diversified and sophisticated developed country; and, conversely, it can also be said with a reasonable amount of certainty that the addition of a key man to an underdeveloped country will mean more to that country than the addition of a key man to an advanced country.

Student Nonreturn

The majority of students leaving their homes in developing countries to study abroad in the U.S. fully intend to return to their homeland once their degree has been granted them. However, a great many of them decide to remain in the U.S. after they have earned their degree for a variety of reasons, most of which have been discussed in another chapter.

With respect to student nonreturn, one commonly held view would hold that such a movement does not unduly penalize the home country because the students were not producers there in the first place. However, this view disguises the more important fact that the home country loses the potential contribution to production of students who do not return home. It is the prospect of future productivity which
justifies the investments by the home and host countries in developing the students' abilities. A study by the International Institute of Education estimates that about 43% of all foreign students in the United States in 1965 were graduate students, most of whom received their undergraduate training in their home country. The majority of these students received at least their secondary education in their home country and, to the extent that this secondary education is publicly financed, such costs can be considered as investments by the home country in the hope of increasing the future productivity of the economy. The student nonreturnee deprives the home country of any direct future benefits.

The following chapter discusses the relationship that the brain drain bears to world welfare considerations.

\[16\text{ Institute of International Education, Open Doors, 1965, pp. 16-17.}\]
CHAPTER V

WORLD WELFARE IMPLICATIONS

Maximizing World Output

A basic international trade principle states that if factors move from areas where their productivity is low to areas where their productivity is higher, then overall world output will be maximized. Of course, factors do not move internationally in response to differences in their physical productivities, but rather in response to differences in the incomes they receive. If, however, one postulates that incomes reflect productivities fairly closely, then it is true that if factors seek their highest income levels they will simultaneously be attaining their greatest productivities.

The brain drain is a case in point. If educated individuals are moving from underdeveloped countries to developed countries in response to higher incomes and if incomes closely resemble productivities, then the brain drain phenomenon is adding to world output. Stated differently, the fact that educated individuals are seeking their highest levels of remuneration around the globe should be deemed a beneficial process since it results in a more efficient allocation of world "brain" resources.

However, the question of whether the brain drain does, in fact, increase world output is much disputed. For example, the contention that world output is increased when international migrations of highly educated personnel take place, since wages reflect marginal productivities, is simply not valid if one is confronted with a second-best
situation. The second-best situation that one is confronted with in this case is that wages do not, in fact, reflect true marginal productivities.

Enrique Oteiza, the well-known Argentine economist, believes that the marginal productivity of university-trained personnel in underdeveloped countries is much higher than is reflected in the wages they receive and that, therefore, the movement of this personnel from a low-wage country (underdeveloped) to a high-wage country (developed) does not necessarily mean that the personnel involved have increased their productivity as a result of the movement. Just because highly talented individuals receive higher wages in the developed country does not necessarily mean that they contribute more to output once their migration has taken place.

Hence, before any conclusions can be drawn regarding the effect of the brain drain on world output, it must be determined whether or not wages reflect marginal productivities. In all probability, wages for highly educated manpower do approximate the productivities of these individuals; the fact that the factors used to complement the highly educated individuals are scarcely sufficient, either quantitatively or qualitatively, probably goes a long way to explaining their

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1 The second-best theorem says that a change which would bring about an optimum when all other conditions are optimal may reduce economic welfare when some other conditions are non-optimal.

low productivity and wages. If such manpower were to relocate in an advanced country, its productivity would undoubtedly improve noticeably if only because of the superior quality and sufficient quantity of the complementary factors.

Maximizing World Welfare

It should be made clear at the outset that an increase in world output is not synonymous with an increase in world welfare. In the former case, one is referring to physical units of output and, in the latter case, to a subjective index of human satisfaction.

The international movement of educated individuals involves certain social costs and benefits so that if one is to look at world welfare not only must private gains and losses be taken into consideration, but also social gains and losses must be accounted for. In short, if an international movement of skilled labor is to result in an increase in world welfare, then the private net gain of the migrant plus the social gain of the country of immigration must exceed the social cost to the country of emigration. It is generally agreed that skilled or educated labor is beneficial to the country of immigration and detrimental to the country of emigration, and that the opposite is true for the movement of unskilled labor. However, when looked at from a world viewpoint, the social losses of one country must be balanced against the social gains of another in addition to considering the private gains and losses which accrue to the individual migrants.

If one assumes that the country of immigration does not experience a loss from the reception of highly educated individuals, then one could state that emigration would add to world welfare if the emigrant
improves his own position—as he invariably does if he emigrates voluntarily—and so long as he does not diminish the income of any of those remaining behind.\(^3\) This welfare rule now becomes a statement of necessary and sufficient conditions for Pareto optimality. Certainly, one cannot assuredly say that economic welfare has been increased as a result of emigration unless it can be shown that no single person has been made worse off and that the emigrant is now better off. The problem of interpersonal utility comparisons reduces the task of maximizing social welfare to an ethical question. The problem is not only one of determining the magnitudes of gains and losses, but also, from a theoretical aspect, one of considering the utility indexes of the individuals involved.

A third view expressing the conditions necessary for ensuring that migration will result in an increase in world welfare is provided by Harry Johnson:

... migration may be said to increase potential world welfare, in the technical sense that the gainers from such migration, normally assumed to be the migrant himself and the public of the country of immigration, could compensate the losers, normally assumed to be the public of the country of emigration, and still have something left over. One cannot, however, maintain that the world is actually better off as a result of such migration unless either there are no (or, pragmatically, negligible) losses to be compensated, or some machinery exists for compensating the losers.\(^4\)


This approach to maximizing world welfare is a practical approach since something can be done to ensure that international migrations result in increases in world welfare. The balancing item is compensation.

Compensation

Social Contributions of Human Capital

There can be no doubt that the social contributions of educated manpower to underdeveloped countries are very great indeed; unfortunately, such social contributions (externalities) cannot be precisely measured in monetary terms. Thus, it is possible that the social contribution of human capital more than offsets any differences in private contribution between "rich" and "poor" countries, and that, therefore, any migration of such human talent from underdeveloped countries to developed countries results not only in a loss to the former, but also in a net loss of world welfare. Brinley Thomas indicates the greater social value of human capital in the underdeveloped countries vis-a-vis the developed countries when he states that, with respect to the skilled migrants, there is a great disparity between marginal social products and incomes in underdeveloped nations, whereas the disparity in developed countries is negligible, and that therefore the externalities contributed by the migrants are greater in the developing countries.\(^5\) "Social" in this sense refers not only to "social product," but also to the attitudes

of the population toward the aspects of modernization and to individuals who value education as a consumer good providing utility.

**Preventing Emigration**

The countries of net emigration will suffer a loss of some kind when they lose educated manpower. However, prohibiting the emigration of such individuals is obviously not the answer to the problem. Such a policy is drastic to say the least, not only because it deprives the educated people of part of their freedom, but also because it would tend to alienate the "brains" and induce them to refuse to render to their countries of origin the externalities that constitute the main argument for depriving them of their freedom to migrate. Placing a total ban on the emigration of skilled manpower would appear to be a self-defeating and ruinous policy.

Preventing the emigration of professionals by law may reduce some of the losses in welfare to the society as a whole which would result from free emigration. However, such a ban on emigration results in a loss of welfare to the potential emigrants since they must now remain in their home country regardless of how little they get paid there or how much they could earn by going to another country. This type of ban would provide potential emigrant "brains" with little incentive to contribute anything at all to the country that has deprived them of their freedom. The governments of underdeveloped countries losing skilled manpower must believe that people who could raise their incomes by emigrating ought to sacrifice the potential increases in their incomes to benefit those who cannot gain by emigrating. Certainly, a more practical policy would involve paying potential
emigrants more money to induce them not to emigrate. In this regard, Harry Johnson states that those who cannot gain by emigrating should bribe those who can gain by emigrating not to emigrate by paying them more.  

Indirect Elements of Compensation

One of the arguments frequently employed in supporting free emigration is that such emigrants "compensate" their countries of emigration for their loss by unconsciously bestowing on them certain indirect benefits. The most obvious examples of such indirect methods of compensation include remittances, breaking up the monopsony in the labor market of their home countries, basic research discoveries which they may aid in producing which would then become available to the rest of the world, etc. Thus, in many cases the emigration of talented individuals to the United States has provided them with the environment, equipment, and complementary staff necessary to bring out their maximum potential. As a result, such individuals can contribute significantly to the products of applied and basic research which are made available throughout the world. Herbert Grubel illustrates this point:

... the emigration of scientists can actually increase the availability of the products of basic research to their native countries. Many nations cannot afford the expensive research equipment required by physicists, chemists, and biologists, for example,
and such scientists are likely to be much more productive in the United States where such equipment is more readily available.7

Whether the potential emigrant benefits his country more by staying at home or by going abroad is a question which prompts much discussion. For instance, there are those who believe that in the majority of cases the emigrant will contribute more in the form of indirect benefits to his home country by emigrating than if he had remained at home. On the other hand, there are those who feel that highly educated manpower is much more useful to its home country if kept at home as opposed to its going overseas and indirectly benefiting the home country through remittances, etc. The following section on the technological balance of payments represents an attack on the benefits of one form of indirect compensation.

Technological Balance of Payments

There are those who contend that the migration of highly educated manpower to the advanced countries adds to the stock of human knowledge and that this knowledge then becomes available at zero cost to the underdeveloped countries losing the manpower. Brinley Thomas raises serious questions as to the validity of such an argument by referring to what the OECD calls the "technological balance of payments" of various countries.8 This phrase refers to the total international flow of technical know-how which is priced in the market. There are many cases where a talented individual has migrated from an

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8Thomas, op. cit., p. 494.
underdeveloped to a developed country and has contributed to the discovery of some technological breakthrough which has been of benefit to all mankind. Yet, although the migration of this individual represented a "gift" from the poor to the rich country, if the poor country wanted to avail itself of this innovation it had to pay for it. There are many instances where business firms in a developing country have had to buy the rights to some innovation developed in an advanced country. Of course, it is difficult, if not impossible, to calculate the extent of the contribution which a "foreigner" has made to an innovation in an advanced country. A much more detailed analysis is needed to determine the effects of migration of educated people on the technological balance of payments between countries.

**Direct Compensation**

Whether the indirect elements of compensation prove to be adequate for the losing countries is a matter of value judgment, mainly due to the impossibility of calculating such intangible magnitudes as the social contributions of educated manpower and the extent to which basic research discoveries in advanced countries benefit the countries losing manpower. Thus, even if there did exist an international institutional mechanism to arrange for "just compensation," there would still be the problem of adequately measuring the extent of gains and losses.

In this connection, Harry Johnson outlines a simple method which would guarantee that international migrations of educated manpower would result in a gain of world welfare:

\[ \text{... the establishment of institutional arrangements for such compensation would automatically prevent the} \]
occurrence of flows that entail a loss of world welfare, since the gainers would not be able to compensate the losers in this case without ending up worse off as a result.9

Under Johnson's proposal, the countries of net immigration would have to assess the value (in money terms) of the immigrant and then offer to pay the losing countries an amount which reflects the contribution that the immigrant would make to his new host country. If the country of emigration believes the offer (compensation) to be at least slightly larger (again in money terms) than the emigrant's contribution prior to his emigration, then it will accept the offer and the human capital transfer will take place and result in a net gain in world welfare. If the offer is too low, then presumably there will be no movement of human capital; or, if there is a movement in any case, then it can be identified as one that reduces world welfare.

Probably the simplest and most direct method of compensation would require that either the emigrant, the employer in the country of immigration, or the government of the country of immigration should repay the government of the country of emigration for the cost of the emigrant's education, provided he was publicly educated, plus an amount estimated to be the taxable liability of the emigrant over his lifetime. Closely aligned with this alternative is the possibility of obliging the country of immigration to pay a bounty per immigrant received; the problem encountered with this sort of a proposal is that the different contributions of an educated person to his countries of emigration and immigration are very difficult to determine; quite

possibly the sending country may believe the bounty to be too small (due to his great social value) and the country of immigration may believe the bounty to be too large due to his somewhat smaller social value.

Regardless of what method or mechanism of compensation is used, it would seem that the obstacles to a mutually favorable solution would be formidable. The practical considerations of such a proposed system of compensation would seem to preclude its ever being put into effect.

Nationalistic versus Cosmopolitan Views

This section of this chapter will be used to express the broad diversity of views with regard to the question "does the international flow of human capital from underdeveloped to developed countries result in a decrease in world welfare?" As stated in previous sections of this chapter, it is extremely difficult, if not impossible, to quantify with any degree of accuracy the extent of gains and losses resulting from international migrations of educated individuals; such assessments invariably involve value judgments as to the "social contribution" of educated individuals. As a result, there exists a wide array of views regarding the welfare implications of the brain drain.

The diversity of views can be condensed into one of two main approaches: the Nationalistic Approach and the Cosmopolitan, or Internationalist, Approach. Proponents of the nationalistic approach emphasize the need to look at the welfare of individual countries; consequently, they see the brain drain as a damaging force to the countries losing manpower and they recommend that such an outflow be
stemmed. The cosmopolitan approach, on the other hand, sees the brain drain as a salutary phenomenon since it maximizes world welfare and increases the efficiency of world resource allocation.

Don Patinkin, an ardent supporter of the nationalistic approach, refers to the terms "nationalistic" and "cosmopolitan" as follows: "It seems to me that these terms are even more tendentious and 'loaded' than the term 'brain drain' itself. For who does not want to be 'cosmopolitan' as against 'narrowly nationalistic'? Un- doubtededly, the term "nationalistic" does carry with it a connotation implying narrowmindedness, but this fact alone should not provoke a prejudice against this approach. Rather, it should be realized that the "nationalists" (usually residents of the country of emigration) recognize the brain drain hurts their countries (if not offset by compensation) and therefore they condemn it, whereas the "internationalists" (usually residents of the country of immigration) recognize that the brain drain helps their countries and therefore they support it. Both "nationalists" and "cosmopolitans" offer differing views on the brain drain precisely because of their sense of nationalism. It therefore comes as no surprise that, for the most part, advocates of the cosmopolitan approach are residents of the receiving countries and advocates of the nationalistic approach are residents of the donor countries.

Very simply stated, the nationalistic approach holds that the private and social contributions of highly educated manpower are more

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urgently needed by the developing nations than by the developed nations. It is felt that the production and retention of highly educated manpower is a top priority for any underdeveloped country if its aspirations of modernization are to come anywhere near being realized. The internationalist view, on the other hand, would contend that these skilled immigrants come closer to realizing their true potential if they migrate to the advanced countries, thereby increasing the welfare of the receiving countries and of the sending countries indirectly through increases in world welfare. It is important to note that the nationalistic view stresses the externalities provided by the educated individuals, whereas the cosmopolitan view allocates more importance to the contributions to production which additional talent would provide. Such a difference in emphasis is understandable in view of the socially advanced nature of the developed countries and the custom and tradition-oriented nature of the underdeveloped countries. That is, the advanced countries mainly value human capital for its physical contribution to output, whereas the developing countries tend to stress the social value (or externalities) of human capital.

Advocates of the nationalistic view contend that the marginal social loss to the poor country through this emigration is greater than the marginal social gain to the rich countries receiving the migrants; and, furthermore, they would state that if this observation is indeed correct, then much of the international mobility of skill today is perverse. This conclusion is exactly the opposite of the cosmopolitan contention that international migrations of highly skilled labor should be looked on favorably since for the most part they are responsive to differences in marginal productivities; and if
one accepts the notion that wages reflect marginal productivities (which the nationalistic approach rejects as inapplicable in underdeveloped countries), then it can be said that the movement of skilled labor from regions where wages are low (underdeveloped countries) to regions where wages are high (developed countries) is beneficial to the world taken as an individual entity, since it represents a net addition to world output. It must be made clear that the "internationalists" do acknowledge that the countries of emigration are net losers in some sense, but they argue that the loss is negligible. The reason for taking this position is their belief that the developing countries do not have the absorptive capacity to hold educated personnel in positions where their contributions to output and hence their wages are adequate.

The fact that talented individuals from underdeveloped countries are attracted to developed countries to make better use of their skills is looked upon by advocates of the nationalistic viewpoint as a case of nationalism acting on the demand side of the international labor market. For example, can one be bold enough to state that the main purpose of United States government expenditures on defense and the space program is to increase world welfare? Or, on the other hand, is the main purpose to fulfill some nationalistic goals? Statements by United States foreign policy officials would have one believe that the main purpose of such expenditures is the preservation of world peace rather than United States security. Of course, both goals are closely linked and there is a very fine line of distinction. Proponents of the nationalistic case would claim that such expenditures are prime examples of nationalism. And, therefore, if the developed
countries are not criticized for following nationalistic tendencies by creating a demand for skilled labor, why should not underdeveloped countries follow these same tendencies and restrict the supply side of the international labor market? In other words, if the developed countries, but particularly the United States, are spending vast quantities of money on defense and space exploration and thus creating a strong demand pull for the best talents of underdeveloped countries, why should not the developing countries artificially restrict the available supply of such individuals by imposing a ban on the emigration of such individuals? Or, why should the underdeveloped countries be criticized for demanding compensation for their losses? The cosmopolitan viewpoint would claim that if the underdeveloped countries wanted to keep their highly educated labor at home, they should either pay them higher wages or make more effective use of their skilled labor by transferring it domestically from areas where it is relatively plentiful to areas where it is relatively scarce.

A very strong argument in the nationalistic arsenal against which the internationalists are defenseless has to do with the international movement of unskilled labor. The cosmopolitan approach advocates the free international flow of skilled labor. However, the "nationalists" claim that it is inconsistent to postulate free mobility only of the educated and skilled personnel while ignoring the restrictions often imposed on the immigration of unskilled labor in developing countries and also on the movement of other factors of production.\(^\text{11}\) In other words, looked at from a world welfare point of view, could not the

same cosmopolitan arguments be used to favor the free international
movement of unskilled labor? The movement of unskilled labor from
countries where its marginal productivity is low to countries where
its marginal productivity is high should result in an increase in
world output. One of the effects of such a movement would be that
unemployment and underemployment of unskilled labor in the developing
countries (countries of low-labor productivity) would most likely be
reduced and wages would consequently rise; the converse would occur
in the developed country receiving the unskilled labor. And yet, in
spite of the cosmopolitan arguments for increasing world welfare, most
developed countries make it extremely difficult for unskilled labor
to immigrate, but easy for skilled labor. There appear to be no
records of cosmopolitan arguments supporting the unimpeded flow of
unskilled labor. The harsh immigration barriers imposed by the
developed countries to inhibit the inflow of unskilled labor is taken
by the advocates of the nationalistic approach as positive proof that
the developed countries are not pursuing benevolent policies intended
to maximize world welfare, but rather are following highly national-
istic policies aimed at enhancing their own well-being.

Which particular view one adheres to is going to depend on the
assumptions one makes. Certainly the mistake of equating the phrases
"maximum world output" and "maximum world welfare" should be avoided.
The diversity of views will continue to exist as long as welfare
remains a subjective measurement.
CHAPTER VI

RECOMMENDATIONS

Introduction

All countries, developing and developed, agree that countries of net emigration sustain some kind of loss. At the same time, all countries agree that the countries of net immigration are beneficiaries of some sort of gain. The disagreement, however, comes when one looks at the world as an individual entity and then postulates that the international migration of educated individuals results in either a net gain or a net loss in world welfare. As a general rule, the "receiving" countries will believe international migrations result in gains in world welfare, and the "losing" countries will feel that such movements result in a loss of world welfare. These two divergent views were discussed in an earlier chapter.

In reality, all countries pursue nationalistic goals to further their own individual welfare. Thus, it would be quite unrealistic to suppose that individual countries would be willing to abide by a world welfare criterion if the consequences of acceding to this criterion dictate that some damaging national concessions must be made. In other words, one could expect that a country would favor the establishment of a world welfare function only to the extent that the directives of that function coincide with the national well-being of the country in question. It is probably no accident that many students of the brain drain in the United States favor the free international movement of skilled individuals because this "results in an increase in world
welfare." Even if it were possible to compute gains or losses in world welfare accurately, there would still remain a moral question: should the developed countries take from the developing countries one of their most vital and productive resources? In any case, there are no accurate statistics that could be used to measure the impact that the brain drain might have on underdeveloped countries. Nothing conclusive can be said until more accurate estimates of the brain drain and its impact on the "losing" and "receiving" countries have been made. Thus, if the main underlying causes of the brain drain have not yet been conclusively determined, no given set of recommendations can be formulated to affect the basic sources of causation. At best, what can be done is to specify what one believes to be the basic causes and then specify policy measures to deal with them. This has been the method of approach followed in this chapter.

Establishment of International Institutions

Before proceeding to a discussion of the recommendations applying to the "losing" and "receiving" countries, it will be useful to look briefly at the possible role that international institutions could play in dealing with the international flow of talent. Only through truly international bodies can one soften or eliminate inherent nationalist biases. The creation of an international body specifically relegated to the task of undertaking a dispassionate, careful, and analytical examination of migration would constitute a substantial positive contribution to world understanding and a guide to sound action. Such an institution could publish studies and reports which would be particularly useful due to their unbiased and objective
nature. All too often, official reports prepared by governments reflect biases which are intended to promote nationalist goals.

There are a number of international institutions already in existence which have undertaken studies of the sort prescribed, but no serious consideration has yet been given them. The United Nations, the Organization of American States, the Pan American Health Organization, UNESCO, and the OECD are some of the most influential international institutions which have already undertaken studies on brain drains. One of the real contributions made by these institutions is the improvement of data relating to migration. However, as stated in a previous chapter, the available data are still scanty and much more data needs to be collected if valid results are to be obtained.

Not only could such international institutions be established to deal with the twin problems of gathering relevant and meaningful data and conducting unbiased studies of the brain drain problem, but in addition they may help to solve a recurring problem in developing countries: the lack of staffing and financial resources necessary to provide a diversified network of educational, research, and technological institutions which are large enough to deal with large-scale problems. Underdeveloped countries individually are not possessed of the resources necessary to undertake such large projects. Thus, if some sort of multinational collaboration can be effected, such as a common market, a pooling of resources can take place which would result in the establishment of a large and efficient research center and which would economize on the resources of all countries concerned by avoiding unnecessary duplication of facilities. No doubt, this kind of multinational cooperation would be fruitful and would exert a
profound influence on the economic development of the countries involved; an important side effect, in this case, would be the increased demand for educated labor and the consequent reduction of the brain drain. In addition, many of the problems of science and technology in the underdeveloped countries can only be solved in those same countries. Thus, tropical agriculture and housing for the tropics cannot be fully investigated and developed in the United States or Western Europe. The most immediate consequence of the establishment of effective multinational scientific and technological institutions in the developing countries would be the generation of employment opportunities for skilled manpower, a force which should contribute much to moderating the brain drain. The establishment of such "Centers of Excellence" in underdeveloped countries would constitute a most powerful incentive for educated individuals to remain at "home" rather than emigrating.

Recommendations Aimed at Improving Conditions in the Sending Countries

Introduction

To a very large extent, the problem of the brain drain originates within the developing countries. That is, the source of the trouble lies within the "losing" country. Don Patinkin, an ardent supporter of the nationalistic view states: "The brain drain is a problem whose solution lies first and foremost on the shoulders of the countries losing the manpower."¹ In what follows, recommendations are made

which apply to conditions in the "losing" countries. That is, the countries of net emigration must institute measures which can help minimize the influence of the very factors which encourage, directly or indirectly, the exodus of highly educated individuals.

**Government Leadership and Encouragement**

In order to try and keep its "intellects" at "home," a very important function of government is to encourage a high degree of identification of these individuals with the development of their country. The government must impress upon this manpower that it can fulfill a vital role in promoting the economic development of the country. However, before this can happen, a change in the basic attitude toward scientific work must be forthcoming. In particular, governments must learn to respect the autonomy of universities and research centers as part of the overall respect for scientific work and the modernization process in general. Obviously this required change in values will not occur overnight, as is illustrated by the Council on Education and World Affairs:

> Men's ultimate values, their self-interests, the realities and myths that they live by, the fears that haunt them, and the ties that bind them together are all involved. The process of changing these values, easing the fears, and resolving contending social and political forces is generally slow.²

It is deplorable to think of the present plight of scientists in underdeveloped countries, where most of them are grossly underpaid, where they have no supporting staff or modern equipment, and where

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the general attitude of government toward scientific research is one of utter disrespect. Simao Mathias, probably the most prominent Brazilian chemist today, feels that science in Brazil is subjected to bureaucracy:

In order to obtain the minimum materials and conditions necessary for my work, I had to spend days filling in government forms and paying visits to managers, and directors. This is how I arrive at the conclusion that science in Brazil is subjected to bureaucracy. And it is for this reason that I feel that if there is no administrative reform that can serve the interests of teaching and research in a rational manner, then no university reforms will be of any use.\(^3\)

In brief, underdeveloped countries that want to retain their educated people must provide them with some of the conditions of an elite. Furthermore, these individuals must be allowed academic freedom if their research endeavors are going to prove fully productive. Of utmost importance is the necessity of compensating these professional people on a much higher scale than at present so that they do not feel compelled to hold down another job. In other words, the governments of these "losing" countries must provide their professional manpower with the conditions necessary to fulfill their scientific aspirations to at least a minimum extent. It is interesting to note the opinion of an Indian economist who claims that intellectuals in India are treated very highly with respect to both status and income and that this is bad for the country.\(^4\) Dandekar recommends reducing

\(^3\)Simao Mathias, "I Never Accepted Being a Bureaucrat of Science," in Folha de Sao Paulo, Sunday, May 10, 1970, p. 34.

the high premium placed on education (with respect to both status and income) and then prevent the loss of this personnel by prohibiting emigration. 5 Mention will be made with regard to this point later on in the chapter.

Policies Toward Students Going Abroad for Further Study

It has already been stated that a very strong force tending to keep skilled manpower at "home" is to make sure that this manpower maintains a high degree of identification with its home society and home institutions. If the potential emigrant scientist is made to feel that he plays a vital role in the development of his country, then he will tend to be influenced by strong nationalistic or patriotic forces to remain at home and help improve his country's lot. One of the main causes of the brain drain has been the fact that students go overseas to study and then find upon graduation that the body of knowledge they have acquired is largely irrelevant to conditions existing in their home countries. Hence, in order to reduce the incidence of this type of brain drain it is recommended that students go abroad to study only at a very advanced stage in their program, preferably the doctoral or post-doctoral stage. The advantage of going overseas at the Ph.D. stage rather than at the B.A. stage is that the student will usually be more aware of the needs and conditions in his own country and will consequently devote his time more advantageously to research projects which are relevant to the needs of his country. The individual will likely be more

5Ibid., p. 229.
mature and have more definite ideas of what he wants to do and where he wants to go. Besides, from the point of view of the developing countries, an additional advantage of sending students overseas at a late stage in their educational program is the higher per-student cost of graduate training as opposed to undergraduate training. And in this connection, it is strongly recommended that the governments of these "losing" countries provide counsel to those students going abroad with respect to the relevance of certain curricula in advanced countries. Pinto and Sunkel provide a good example of this lack of relevance.

Would it not have been more advantageous for all concerned if a Chilean graduate student, who worked so hard to gain a master's degree on this or that problem of imperfect competition or the theory of games, had given his attention to the study of the structure of the industry and the functioning of the market for copper in the U.S.?

At the present time, it seems clear that a high proportion of students going overseas are not sufficiently mature to select those courses in foreign universities that will be most significant in their training and in their later professional careers in their home country.

Subsidizing the Presence of Educated Personnel

Given that there are many foreign students who elect not to return to their home countries, what can the governments of these "losing" countries do to recall some of their lost brainpower? Some countries have already taken important steps to try and induce their

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educated manpower to return. Argentina, for example, grants returning professionals customs privileges with respect to the importation of scientific instruments and apparatus, an automobile, and personal effects up to a value of $4,000.\(^7\) Brazil has established a research foundation (FAPESP) which promises to provide all the necessary equipment and staff which a scientist needs as long as the project will contribute something to economic development of the country.\(^8\)

The Union Public Service Commission in India has embarked upon a plan to bring back eminent Indian scientists from overseas locations by offering them traveling grants and suitable employment in India.\(^9\)

All of these measures represent sincere efforts to reattract professional individuals lost through emigration and, since they have proven to be successful in these countries, they point the way to an effective means of reducing the brain drain. Of course, it must be realized that if these policies and conditions had existed all along, then there would have been less emigration to begin with.

If conditions in the "losing" countries are such that scientists, engineers, and physicians do not receive adequate compensation or research facilities, then it is recommended that the governments of these countries develop policies of subsidizing the presence of their educated personnel. Before putting into effect such a policy, however, it would be necessary to undertake a cost-benefit analysis to


\(^8\)Folha de Sao Paulo, Sunday, May 10, 1970, p. 35.

\(^9\)The Economic Times, Bombay, November 13, 1968.
determine whether the additional benefits derived from retaining this educated manpower justifies the additional subsidy cost. If an oversupply condition exists, then the subsidy is probably not justified from a purely economic point of view, though from a social point of view it may still be beneficial.

**Emigration Tax for Educated Individuals**

If a given country cannot keep its skilled manpower within its boundaries voluntarily, then perhaps the government could impose an emigration tax, varying for each occupation according to the national need for its services. However, before this policy is followed, every attempt should be made to improve the remuneration of such manpower so as to reflect the order of the nation's needs. Kenneth Boulding provides a solution to the brain drain by suggesting that human capital be treated like any other kind of capital:

> We then finance education with loans to the student and he emerges from the process with an intellectual estate burdened with a considerable mortgage. This mortgage, however, can be paid-off with interest easily out of the extra income which he earns as a result of his education and towards the end of his life he can expect to have an estate in his own body and mind which is entirely free from encumbrances.\(^\text{10}\)

If this policy were followed, then an individual who emigrated to another country in the hope of increasing his income would still have to pay back the cost of his education with interest to the country of his origin. This would constitute an automatic compensation mechanism and would surely tend to reduce the brain drain. It would

mean that neither the country of immigration nor the country of emigration would have to make a decision as to the amount of compensation required. This policy would leave the decision completely to the potential migrant, so that it is he who must weigh the costs and benefits involved. The country of immigration is freed of the responsibility of offering compensation and the country of emigration is satisfied with the compensation it has received from the emigrant. Possibly one of the reasons that this proposal has not been tried in most underdeveloped countries is the fact that access to education is limited to a very great extent to the higher income groups and ruling hierarchy. A suggestion such as that put forth by Boulding would affect these groups the most.

**Manpower Planning**

One of the most pressing needs in the underdeveloped countries losing skilled manpower is reform of the educational system to produce the "necessary" skills in the "right" proportions. That is, countries of net emigration should take steps to develop manpower policies that will promote an equilibrium between the production of certain types of manpower and a nation's ability to absorb it effectively. In other words, investment decisions with respect to human capital should be made in the light of effective demand as distinct from physical need. All of these countries need skilled manpower to support an increasing rate of growth, but at any point in time the effective demand for skilled manpower is dictated by the absorptive capacity of the economy in its present stage of development, and absorptive capacity is a function of income distribution.
In fact, as mentioned in the previous chapter, one of the reasons given for the oversupply of graduates in underdeveloped countries is that the markets are too limited. G. R. Gonzales states:

"... in contrast to other types of manpower, high-level manpower seems to require a broader market than is usually available in Latin America. Just as national markets appear to be too limited in scope for the national utilization of other development resources, so are they too limited for the efficient allocation of the region's high-level manpower."  

The need for manpower planning in underdeveloped countries is great. Certainly these policies should aim at a combination of expanding the demand for high-level manpower and constraining the supply of high-level manpower in order to relieve the shortage or glut of talents. A possible demand-expanding policy would be to develop the hinterlands of countries so that more urban areas become available and ease the already over-crowded situation in the large cities. Highly educated individuals quite naturally want to live in the large urban areas where there are good schools for their children, adequate medical care and other professionals with whom they can relate to both socially and professionally. Direct attempts to cut or limit university enrollments have not been particularly successful due mainly to the tremendous amount of popular pressure for expanding university enrollments. Any cutbacks made by the universities would fall heavily on the urban elite which is accustomed to having its young well educated.

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Although it is not the purpose of this study to provide a detailed discussion of manpower planning policies, it is hoped that the following account will provide the underdeveloped countries losing skilled manpower with evidence that some kind of manpower policy would help in stemming the brain drain. Table 7 provides data relating to the annual percentage rates of increase of gross national product and university graduates during the period 1960-65. It is interesting to note that in the case of the Philippines, Israel, India, Argentina, Colombia, and the United Kingdom, all among the heaviest losers of skilled manpower, the rate of university graduate expansion far exceeds the rate of expansion of gross national product. On the other hand, in the case of Japan, Iran, Uruguay, and Chile, countries which remain relatively unaffected by the brain drain, the rate of expansion of gross national product exceeds the rate of graduate expansion. It should be recognized that there are probably many other factors which exert a strong influence on migration; however, Table 7 does suggest that the brain drain is a function of the relationship between the rate of increase of university graduates and the rate of increase of gross national product. It would seem that any manpower planning policy should take serious note of this relationship.

**Elementary Education versus Higher Education**

If nothing is done to reduce the oversupply of graduates, serious social consequences may be the result. Wrong investment in physical capital, such as an uneconomic steel mill or factory, can remain underutilized or be scrapped. However, wrong investment in
### TABLE 7

**Annual Percentage Rates of Increase of GNP and University Graduates, 1960-65**

<table>
<thead>
<tr>
<th>Country</th>
<th>GNP</th>
<th>University Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philippines</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Israel</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>India</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Argentina</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>Colombia</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Japan</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Iran</td>
<td>5</td>
<td>-30</td>
</tr>
<tr>
<td>Uruguay</td>
<td>0</td>
<td>-50</td>
</tr>
<tr>
<td>Chile</td>
<td>4</td>
<td>-1</td>
</tr>
</tbody>
</table>

human capital, such as a surplus of university graduates, cannot long continue without creating internal political unrest or providing the material for the brain drain. In this case, the brain drain is indicative of a misallocation of educational resources, the natural consequence being the emigration of individuals whose skills are those in an oversupply condition relative to demand. The misallocation of resources comes in two areas: first, too much is invested in higher education and not enough in elementary education; and second, the distribution of funds within higher education does not reflect the priority of the country's needs. Mention has already been made of the excessive emphasis on traditional disciplines as opposed to modern disciplines such as science and engineering. With respect to elementary versus higher education, it would seem that more funds diverted to the former would not only tend to increase the productivity of the masses of unskilled workers, but would also aid in changing the attitude and entire outlook of the unskilled workers and thus enhance the process of modernization. More funds devoted to the lower levels of education would tend to increase the absorptive capacity of the underdeveloped countries and hasten the transformation of the institutions so necessary for economic development. Thus, it is strongly recommended that all underdeveloped countries, whether or not they are losing brainpower, devote a larger portion of their educational funds to the lower levels.

**Economic Growth and Development**

One of the strongest deterrents to brain drain is a rapid pace of economic growth. The faster a country develops, the greater the
demand for professionals in all fields. However, it is industrialization and the existence of large industrial complexes which plays a key role in keeping skilled manpower at home. Bernardo Houssay, a prominent Argentine economist, emphasizes the important role played by industry:

"It exerts a strong demand for innovations and the development of competent skilled manpower. It creates its own laboratories or aids in research projects at universities. The existence of a vigorous industrial sector has historically been a crucial factor in the development of science and technology in all the great nations."\(^{12}\)

Thus, the brain drain in this case can be taken to represent a symptom of the state of underdevelopment of a country and its capacity to overproduce skilled manpower. It is important not to exaggerate the importance of the brain drain in this context, for surely economic development is an immensely more important priority than stemming the brain drain; the brain drain is simply a reflection of the state of underdevelopment.

There are many more measures that could be prescribed to help stem the overflow of skilled professionals from underdeveloped countries. However, it is felt that the recommendations discussed above relate to the main sources of the problem. The development process is a long and arduous affair. However, it is felt that the best way to keep talent at home is through economic development of the affected countries. It took Japan some sixty years to develop mature scientific institutions and an adequate supply of human capital. Although

a good case can be made to prove that underdeveloped countries today have a surplus of skilled manpower due to their lack of absorptive capacity, economic development and the "take-off" into sustained growth can quickly reverse this situation to where skilled manpower is in great demand. If the underdeveloped countries today pursue their main priority goal of quickening the pace of economic development, the brain drain will surely be reduced as the economy's need for skilled manpower increases.

Conclusion

It can be concluded that any measures taken to limit the brain drain should originate first and foremost in the countries losing the manpower. After all, it is the disruptive conditions in the country of emigration and the attractive conditions in the country of immigration which are responsible for the brain drain. It does not seem logical to expect the countries of immigration to adopt policies which, while helping to stem the brain drain, are inimical to their well-being. Hendrik Casimir facetiously illustrates how the United States might be of help in closing the technology gap and the accompanying brain drain between Europe and the United States:

If America really wants to do something, let it start introducing different currencies in all its fifty states and impose serious boundaries between them. If this experiment were tried, ten or fifteen years from now we (Europeans) might well bridge the gap.13

In other words, if the countries of immigration can adopt policies which provide the dual effect of increasing the nation's well-being...

while at the same time stemming the brain drain, then a practical and workable solution is at hand.

Recommendations Aimed at Improving Conditions in the Receiving Countries

**Immigration Laws**

Some scholars have advocated that, in the absence of compensation to the underdeveloped countries for losses entailed through the emigration of skilled labor, the countries of immigration limit drastically the inflow of skilled labor by changing their immigration laws. This solution to the brain drain, however, is subject to many limitations and criticisms. In the first place, there is a legal question involved. The Universal Declaration of Human Rights (Article 23, Paragraph 1) asserts that "everyone has the right to leave any country, including his own, and to return to his country." In the view of the members of the United Nations (all of which signed the Declaration), this human right overrides the right of nations to forbid migration. However, the Declaration also recognizes (Article 29) that individuals have personal obligations to the community. V. M. Dandekar feels that if a country is losing skilled individuals through emigration it is perfectly within its own rights to close the borders to prevent a drain on human resources.

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14 United Nations, Study of Discrimination in Respect of the Right of Everyone to Leave, Publication 64, XIV, No. 2.

15 Education and World Affairs, op. cit., p. 78.

16 Dandekar, op. cit., p. 229.
other words, Dandekar feels that if the leading democracies are free to pursue discriminatory immigration laws, then there is nothing wrong with underdeveloped countries instituting corresponding emigration laws.

But such an embargo on the international migration of skilled labor would not only provoke legal discussion, it would also deprive the educated citizens of the underdeveloped countries of the opportunity to better their economic position by emigrating, and thus escape from a situation in which their incomes fall short of their true social value. Such a deprivation of freedom would certainly not inspire these educated individuals to add to the national development effort by contributing their personal talents; any sense of nationalism or loyalty to their country would be dashed by such a policy. From the point of view of the "losing" countries themselves, they would hardly improve the morale of their skilled labor force by lobbying for such restrictions; in effect, this is tantamount to asking the aid of foreign countries in order to acquire a monopsonistic position with reference to their own skilled labor force.

Hence, in view of the problem encountered when measures are instituted to restrict the free movement of skilled labor, it is recommended that such policies not be put into effect. It is also recommended that the developed countries consider lowering their barriers to the immigration of unskilled labor; such an action could contribute much to the relief of poverty in the underdeveloped countries, both by relieving unemployment and underemployment in these countries and by allowing the migrants immediate access to the high living standards of the developed countries. Hence, if free and
unrestricted migration is advocated, then it must apply to both skilled and unskilled labor. It is all very well for a country to advocate unrestricted migration of skilled labor on the grounds that anything short of this is in violation of a person's universal human rights. However, this same argument can be used to justify the removal of all barriers to the movement of unskilled labor. If skilled labor is allowed to move freely but unskilled labor is subject to restrictions, then a clear form of discrimination is in evidence. In either case, the "receiving" country (usually the advanced country) benefits and the "losing" country (usually the underdeveloped country) experiences a loss. If advanced countries are sincerely interested in helping the underdeveloped countries to develop, a major contribution could be made by liberalizing the immigration laws to allow entry of unskilled labor.

Overhaul of Foreign Aid Programs

"Foreign aid" in the form of liberalization of immigration laws to allow entry of unskilled labor could be supplemented by the conventional forms of foreign aid. However, a major overhaul of the foreign aid programs of most developed countries is a prime necessity—most economists would agree that at present too many funds are devoted to the military and not enough to education. One of the most important objectives of the United States aid program involves assisting the country receiving the aid to develop to the point where it no longer needs aid. It is highly doubtful that funds going into the military sector of an underdeveloped country will contribute substantially to the economic development of that country.
If, on the other hand, education is accorded a higher priority, then the process of economic and social development will undoubtedly be speeded up and the brain drain reduced accordingly.

V. E. Leichty feels that much of the foreign aid money that the United States provides for education appears to be directly consumed rather than invested:

We supply something that leaves a vacuum when it is removed. Our Fulbright professors teach for a year or, at most, two years, but none of them is there long enough to see a group of students through a graduate program or even to have any long-term effect upon even a continuing undergraduate program.17

Undoubtedly, the developed countries can make a major contribution by greatly increasing the funds available for education at all levels in underdeveloped countries. With respect to higher education, the developed countries could greatly increase the scope of research grants made to university and scientific centers in all countries experiencing brain drains.

Educational Capacity of the United States

Enough has been said about educational requirements in underdeveloped countries. What is not so obvious, and what exerts a major influence on the brain drain, is the need in developed countries, but particularly the United States, to expand educational capacity. It would perhaps be asking too much of the developed countries to expect them to refuse admittance to the human resources they may require at a given moment. What they should be asked to do, however, is to make


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sufficient investments in their own educational systems so that they would not need to have recourse to the educational systems of less developed countries. The problem is not merely one of insufficient investment in education. In fact, the greatest skilled labor shortage in the United States today is commonly held to be physicians, and this shortage seems to be contrived as much by the monopolistic and restrictive practices of the American Medical Association as by the general lack of educational funds for the medical field.

Other scientific fields today, such as physics and chemistry, seem to be provided with an adequate supply of skilled manpower, and this fact alone may be of great help in slowing the brain drain. However, it must be understood that supply has caught up with demand in these fields in only the last few years. During the entire post-World War II period and until 1965 or thereabouts, the demand for physicists, chemists, engineers, and the like far outstripped the supply; as a result, the gap was filled by immigration. The fact that today many physicists and chemists cannot find suitable jobs in this country may be taken as a good sign for those countries which are losing physicists and chemists through the brain drain.

American Medical Association

It is strongly recommended that the monopolistic practices of the American Medical Association (and all other institutions that follow the same policies) be curtailed so that the output of physicians can be increased to meet domestic national needs. In the United States today, the shortage of physicians is exerting a strong pull on the physicians of foreign countries, particularly those
underdeveloped countries where a physician's compensation is meager. It would certainly prove to be a worthy investment if the United States devoted more funds to medicine and increased the output of physicians, thus eliminating a notable deficiency in the supply of an important group of skilled manpower. At the same time, the "losing" countries would benefit because an important "pull" force had been eliminated. Unless this contrived shortage of physicians is done away with, one can expect to see the physician component of the brain drain continue to fill the void brought about by an inadequacy in the investment funds devoted to medical education in the United States.

Conclusion

More than likely, economic differentials will continue to exist for a long time between the advanced and the less advanced countries, and this in itself will continue to provide a powerful incentive to migration. In addition, it seems likely that certain noneconomic cultural, social, and political differentials will continue to be in effect for quite some time to come, and this, too, will tend to instigate migration. Advanced countries will continuously be attracting skilled labor due to such enticing factors as political stability, a wider choice of careers, higher salaries and a higher standard of living, greater relative weight attached to personal qualities, and a host of other factors which have already been discussed in the previous chapter. And in all probability, the developed countries will continue to give preference to highly trained immigrants who shore-up the supply of needed manpower.
In conclusion, it is recommended that both developed and developing countries concentrate their efforts on development goals and minimize controls. With respect to the developed countries, this does not mean that they must immediately demand a change in the institutions and cultural values of a traditional society as the only means by which a developing country can modernize and industrialize. The transition from the traditional society to the modern society is a slow and painful one. However, as this transition is taking place and the country in question enters the "take-off" stage in its economic development, the brain drain should slow down noticeably as more jobs become available; in addition, the professional individuals will probably take note of the economic progress that their country is making and may be encouraged to work harder to speed the process. At the same time, the social development of the country will be providing a climate more suitable and tolerant of science and the entire modernization process.

In order for the underdeveloped or "losing" countries to be able to reduce their losses through the brain drain, it is strongly recommended that they emphasize development goals and not waste time and resources developing intricate migration controls. Admittedly, this is a long-run solution and the brain drain will not be eradicated overnight; but at least the most important overall factor responsible for the brain drain—the economic and social differential between developed and underdeveloped countries—will have come under attack. It is the responsibility of both developed and developing countries to see that the gap is narrowed. Once this differential starts
narrowing, the brain drain itself will cease to take on the importance it has attained today.

Hopefully, the recommendations in this chapter will help the concerned countries to arrive at a satisfactory solution to the brain drain. One can probably expect that those countries that are losing talent are deeply concerned about the brain drain and desirous of doing something about it. On the other hand, it is highly doubtful that the countries receiving talents will take any action that will tend to cut off this supply. It is probably more realistic to expect the countries of emigration to campaign more ardently than the countries of immigration. The following chapter provides some concluding comments based on the evidence of this study.
CHAPTER VII

CONCLUSION

The brain drain from developing countries to the United States has prompted much discussion in recent years. While some analysts contend that the brain drain is inimical to the development aspirations of the developing countries, others feel that it imposes no great problem. The issue has not yet been settled. One of the problems is that the impact of the brain drain differs from country to country, so that a determination of whether the brain drain is "good" or "bad" must be made with reference to a specific country; and certainly the conclusions arrived at will differ widely from different countries. Rather than concentrate on a particular country, this study has emphasized the brain drain from a broad group of countries characterized as "underdeveloped," and as such it is subjected to all of the limitations associated with aggregation. However, the "pull" forces affecting migration would be the same for all countries, although they would differ in order of importance for individual countries, since they originate in the United States. The "push" forces of course would differ from country to country, and it is in this area that this study suffers from the limitations of aggregation; however, it must be remembered that the paucity of reliable statistical data of any kind in underdeveloped countries makes an individual country study extremely difficult and subject to gross inaccuracies. Nevertheless, this does not affect a very important conclusion of this study: the immigration laws of the United
States, rather than individual "push" or "pull" forces, are the single most important factors accounting for the inflow of talent into this country.

It has also been noted that these periodic relaxations of the immigration laws have corresponded with the changing labor needs of the United States, a fact which suggests that immigration policy plays a vital role in United States manpower policies. And since manpower requirements in the United States are closely correlated with swings in the business cycle, it can be concluded that immigration laws correspond closely to "pull" factors originating in the United States. It must be made clear, however, that "pull" factors are mainly responsible for the variation in migratory flow; from the viewpoint of the individuals migrating, the "push" factors are probably more important in explaining migration. That is, the "pull" determinants, and specifically the immigration laws, can be taken to represent the controlling factors allowing migration to take place, and the "push" factors can be taken to represent the ultimate force governing the desirability to migrate in the first place. With respect to the three continents, Asia, South America, and to a lesser extent, Europe, if the upsurges and decreases in immigration from these three widely divergent continents correspond so closely, is not this indicative of a common factor of causality? (See Figure II in Chapter III to confirm the similarities of the migratory flows.) More than likely, "push" factors will tend to be different in the three continents with their widely different stages of development and cultural and sociological differences. All three continents are affected, however, by the same "pull" factors in the United States, although the degree of
response will surely vary. Appendix B in Chapter III indicates that only South America and Europe are significantly affected (as determined by F and t-tests) by "pull" factors. Thus, the most logical explanation for the similarity in migratory variables from the three continents is provided by changes in the immigration laws of the United States.

United States growth policy requires ever-increasing inputs of human capital and, to the extent that this capital is not available domestically, the need for additional inputs creates an effective demand which exerts a strong "pull" effect that reaches across international boundaries. There can be no realistic hope that the forces leading to the international migration of highly educated and talented manpower can be done away with. The forces at work are too deeply ingrained and too powerful. Moreover, the cessation of migration is not only impossible, but also highly undesirable. The international migration of human capital is a productive phenomenon and an indispensable requirement for the advancement of science and knowledge in general, quite apart from the fact that it is one of the basic freedoms which the United Nations is pledged to defend. Any curtailment of the right of the individual to leave his country would be contrary to the principles of a free society and, as such, must be avoided.

It must be remembered that most of the movement of educated individuals around the world is good for them and good for the countries they visit or adopt. If these people return to their home countries, then this movement is also beneficial to the countries of origin; however, if these people permanently leave their home countries, then
there is an element of loss imposed on the countries of net emigration.

It must be pointed out that in many cases it is necessary for students to study abroad if they are to be adequately trained. If these students eventually return home, these countries have gained a valuable asset. In addition, it is important to mention that permanent migration is often imperative if highly trained people are to use their talents effectively. The extreme example of this is provided by the great Nobel prize winners of foreign birth who have practiced in the United States; the fruits of their research could probably never have been achieved in their home countries, and their talents would have been "wasted," yet their inventions and innovations are published and made available to all mankind.

Nevertheless, it is still not possible to forthrightly advocate the free international migration of human capital. There are complications involved. The permanent loss of talented individuals will most likely retard the development efforts, both economic and social, of the less developed countries, thereby frustrating international efforts to narrow the gap between richer and poorer countries. In the words of Brinley Thomas: "The rich countries must seek to resolve the contradiction between the efforts of this free market on the distribution of human capital and their objective of helping underdeveloped countries to attain a higher rate of economic growth."¹ However, it is clear that efforts to reduce the brain drain will be

fruitless as well as meaningless unless the manpower thus saved can find suitable employment in the country of origin. Economic development is not just a matter of producing needed skills, but of producing the opportunities to use these skills. It explains the strange paradox that needed manpower will emigrate from a country even though that country has a crying need for human capital. It is a known fact that many underdeveloped countries tend to overproduce graduates in relation to the effective demand for them. Emigration is a logical consequence.

This fact points to another particularly important conclusion: the brain drain may be regarded as a symptom rather than a cause of the state of underdevelopment of the "losing" countries. In particular, it is a symptom of the disequilibrium that exists between the typical pattern of expansion of higher education in underdeveloped countries and their limited capacity to absorb the expanding number of graduates. In turn, this limited absorptive capacity is a symptom of the underdeveloped state of these countries. Undoubtedly, as the process of development gets underway, the absorptive capacity of the economy increases and the availability of jobs could come more into line with the supply of graduates. The "disease" itself is attacked and the symptoms diminish in intensity accordingly. Adams and Dirlam refer to the brain drain as an index of retarded development. This statement alludes to the close correspondence that exists between the degree of development and the magnitude of the outflow.

In more general terms, the brain drain is a consequence of all the economic, social, and political factors which are characteristic of underdeveloped countries. The developing nations must seek the combination of economic, social, and political factors which will lead to and encourage development. The extent to which these factors are successful in promoting development will be determined by the automatic response of the brain drain; if the rate of development is accelerated, then the magnitude of the brain drain should automatically increase and vice-versa if the rate of development is slowed. What is important at this point, is to recognize that the brain drain itself does not significantly affect development, but rather that the brain drain is a natural reaction to the state of underdevelopment.

Hence, effective policy should be directed at the roots of the problem and not at the symptoms. That is, the problem of the brain drain seems to depend greatly for its solution on the efforts to accelerate the development of the countries losing the manpower. In the short run, the brain drain has no feasible and practical solution. However, in the long run, if more public education funds are allotted at the elementary level of education and less at the college level, both the productivity of the average individual and the productivity of the highly educated individual would improve. A consequence of such a change in educational policy would most likely be an increase in aggregate demand and a leveling off in the output of university graduates. From the viewpoint of the highly educated individual, the change would produce an increased demand for his services and an increase in his productivity, both of which will tend to better his economic position in society. One way in which this change in
educational policy may be brought about would be to bring the supply of graduates more closely into line with the demand for them, and to use the funds thus liberated to bolster education at the elementary level.

Advanced countries should and can do more to assist the development of the less developed countries and thereby help to moderate the forces leading to migration. They should do more both because of long-range economic and political self-interest and out of compassion. There is much to be said for the contention that the fate of the rich parts of the world is linked to the economic growth, political stability, and national development of the poor parts of the world. The brain drain is a trivial or incidental factor when one looks at the problem of development itself. Doing something about the brain drain is far less important than increasing the effectiveness of foreign aid programs, eliminating the dependence on one-crop economies, shortages of physical capital, political instability, inflation, and many other such problems associated with underdeveloped countries. Migration, in this context, is much more an effect than a cause of underdevelopment. Thus, if the effect or symptom is to be eliminated, the root of the problem (underdevelopment) must be attacked.

But in spite of the contention that the brain drain is a consequence rather than a cause of underdevelopment, nevertheless the loss of a large number of talented individuals who comprise the main source of leadership and innovation in a developing economy is bound to have some kind of negative effect in the long run on the country's pace of economic and social development. It is probably more
accurate to say that the brain drain is a consequence which reinforces the basic causes of underdevelopment. In the short run, it is very doubtful that the brain drain inflicts a significant loss on the country of origin. In the long run, however, the element of loss becomes much more prominent and easily recognizable, for as the country proceeds to successive stages of development, larger and larger doses of human capital will be required because a situation of excessive supply of talents has been replaced by a condition of excessive demand for talents; the skilled manpower that emigrated twenty or thirty years ago under conditions of excessive supply will now be sorely missed and will undoubtedly contribute to a weakening in the pace of development.

To the extent that the United States immigration laws encourage the brain drain, the long-run development efforts of the developing countries are partially thwarted. But it must be kept in mind that the brain drain ranks low among the many deterrents to development. To say that the United States is seriously undermining the development efforts of the underdeveloped countries by allowing the brain drain to continue unabated is to grossly overrate the importance of the brain drain in relation to development. The brain drain is more an indicative sign of the state of underdevelopment than a basic factor contributing to underdevelopment.
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Date of Examination:

November 3, 1970