

INTERNATIONAL MIGRATION OF
HIGH LEVEL MANPOWER

by

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B.S., Mathematics
Southwest Missouri State College, 1966

3735

A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARTS

Department of Economics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1970

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ACKNOWLEDGEMENTS

The author would like to express sincere appreciation to Dr. E. W. Nafziger for his interest, assistance and patience throughout the preparation of this report. A special thanks is extended to the author's wife, Janet, both for typing of the manuscript and for constant, unfaltering encouragement and support.

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INTRODUCTION

The Problem

A phenomenon which has received extensive attention in recent years from scholars, academicians, and various governments around the world, is that of the international migration of high level manpower. Migration of people from one region to another has occurred throughout history, but only in the past few years has the particular occurrence of the flow of highly skilled personnel been analyzed in the literature. The reason for the upsurge in interest lies in the genuine concern of many as to the implications of this type of migration. Many scientists, physicians, engineers, and other highly educated persons in less developed countries, whose potential contribution to economic development and social welfare in their home countries may be sorely needed, have obtained employment in the economically developed regions of the world. It is argued that this movement constitutes a "brain drain" from less developed to developed economies, thereby depriving the former, in an uncompensating fashion, of a strategic resource, namely human capital.

Purpose

It is the general purpose of this paper to analyze the alleged problem of the brain drain by means of a review of the literature. It will be shown that although there is widespread

agreement as to the causes of the problem, there is at the same time much disagreement regarding its urgency and what policies should be adopted in an effort to alleviate the situation. It is hoped that the discussion will enhance understanding and enable a more objective awareness of the problems associated with the international migration of high level manpower.

Scope and Definition

It is the intent of this paper to deal in general with the migration of the highly skilled from less developed to developed economies, and more specifically with the flow from these less developed countries to the United States. Although the phenomenon is world wide in nature, it is the author's contention that the most significant element is that affecting the developing economies, as it is there that the emigration of human capital is most damaging. The United States is used as the focal point for this discussion primarily because of the availability of fairly reliable immigration statistics, together with the fact that the United States is the major recipient of highly trained foreign manpower.

For the purposes of this paper, "developed" countries will refer to the United States, the European countries, Canada, Japan, South Africa, Australia, and New Zealand. "Less developed" or "developing" countries are all other countries. The distinction is made in this manner so as to conform to the data available from government publications.

The terms professional, high level, or highly skilled (edu-

cated) manpower, will refer to people trained in those occupations commonly listed under the heading "professional, technical, and kindred workers" in these publications. Unless otherwise indicated in the text, discussion will be confined mainly within this heading to scientists, engineers, and physicians.

Content

The approach used in this paper is a survey of the literature. The major parts will include first a brief review of labor migration from an historical viewpoint. The magnitude and composition of the recent migration of high level manpower will then be analyzed to the extent that published data permit. Labor migration theory in general will next be considered, followed by the causes of the migration of the highly skilled in particular. A review of attempts to evaluate the effects of the brain drain from the standpoint of economic analysis will follow. A few case studies of particular countries or geographical areas will be examined, and finally, various policy alternatives will be proposed.

CHAPTER I

Labor Migration from an Historical Perspective

In earlier days, international migration played an important role in economic growth. Brinley Thomas in referring to the mass migration of the nineteenth century noted that:

International migration was in essence a vast secular transfer from agriculture to industry facilitated by the rise in agricultural productivity which was an indispensable condition of economic growth. Manufacturing could develop only if labor was released from the land, and labor could not be released from the land unless agricultural productivity was increasing faster than the demand for food.¹

It has been estimated that between 1846 and 1924, some 50 million people moved to North and South America from the rest of the world. Between 1820 and 1924, the United States received approximately 36 million immigrants. This mass movement had left about one-eleventh of the world population comprised of native Europeans living outside that continent. The patterns of the flows of migrants during the period are outlined in Table I.

International labor movements were an important element in determining growth rates in both the sending and receiving countries:

Overseas migration and foreign lending fluctuated together, and they bore a significant relation to the rate of capital

¹Brinley Thomas, International Migration and Economic Development (UNESCO: 1961) p. 9. A more complete treatment of past migration can be found in Thomas, The Economics of International Migration (London: MacMillan, 1958).

TABLE I
WORLD INTERCONTINENTAL MIGRATION

Emigration: 1846-1932 *		Immigration: 1821-1932 *	
Country of emigration	Total (000's)	Country of immigration	Total (000's)
<i>Europe</i>		<i>America</i>	
Austria-Hungary	5 196	Argentina (1856-1932)	6 405
Belgium	193	Brazil	4 431
British Isles	18 020	British West Indies (1836-1932)	1 587
Denmark	387	Canada	5 206
Finland (1871-1932)	371	Cuba (1901-32)	857
France	519	Guadeloupe (1856-1924)	42
Germany	4 889	Dutch Guiana (1856-1931)	69
Italy	10 092	Mexico (1911-31)	226
Malta (1911-32)	63	Newfoundland (1841-1924)	20
Holland	224	Paraguay (1881-1931)	26
Norway	854	United States	32 244
Poland (1920-32)	642	Uruguay (1836-1932)	713
Portugal	1 805		
Russia	2 253	TOTAL (America)	53 826
Spain	4 653		
Sweden	1 203	<i>Asia</i>	
Switzerland	332	Philippines (1911-29)	90
TOTAL (Europe)	51 696	<i>Oceania</i>	
<i>Other countries</i>		Australia (1861-1932)	2 913
British India	1 194	Fiji (1881-1926)	79
Cape Verde (1901-27)	30	Hawaii (1911-31)	216
Japan	518	New Caledonia (1896-1932)	32
St. Helena (1896-1924)	12	New Zealand (1851-1932)	594
		<i>Africa</i>	
		Mauritius (1836-1932)	573
		Seychelles (1901-32)	12
		South Africa (1881-1932)	852
GRAND TOTAL	53 450	GRAND TOTAL	59 187

Source: Brinley Thomas, International Migration and Economic Development (Unesco: 1961), p. 12.

formation in the sending and receiving countries. There was a long-run community of interest which expressed itself in an inverse relation between the rate of capital construction in Great Britain and the countries of new settlement overseas. These . . . long swings in migration and capital exports had a span corresponding to that of the business cycle, there was an upswing in construction . . . in the receiving countries . . . and a downswing (in the sending countries): in the downward phase of the lending-migration cycle, there was a downswing in capital construction in the receiving countries and an upswing in (the sending countries).¹

Following World War I, nationalistic policies led to the imposition of a system of restricted immigration into the United States known as the national quota system. The system was fashioned so that the total number of immigrants from a particular country (excluding the western hemisphere countries) was limited by the proportion of the United States population composed of persons from the country in question. The system had the effect of severely restricting immigration from countries other than those of Europe.

The mass migrations of the past were characterized primarily by a movement of common labor. However, beginning as early as the ancient period, there was some international movement of high-level manpower.² There have been few studies on the migration of this category of labor, perhaps due to its heretofore statistical insignificance. The mass migrations of the nineteenth and early twentieth century have given way to a "new migration" characterized

¹Ibid., p. 11.

²Stevan Dedijer, "Early Migration," in Walter Adams, The Brain Drain (New York: 1963), pp. 9-28. See also Dedijer, "Past Brain Gain Policies: An Historical Divertissement," Journal of World History, Vol. 10, No. 4 (1967), pp. 635-52.

by a change in its composition from what was earlier predominantly unskilled labor to what can today be regarded as containing a "conspicuous proportion of persons with specialized abilities, skills, and professional qualifications."¹ Over the past decade, the proportion of highly skilled immigrants (at least in the United States) has increased; but what is perhaps more important, the developing countries of the world have become the major countries of emigration.

Empirical evidence for such a statement is the substance of the following chapter.

¹Edward P. Hutchinson, "The New Immigration," The Annals of the American Academy of Political and Social Science, Vol. 367, (September, 1966), p. 2.

CHAPTER II

The Magnitude and Composition of the Recent Flow

Data Problems

A major constraint confronting researchers studying the migration of the highly skilled has been the incompleteness and inadequacy of data. The movement is world-wide in nature, with the general trend being from less developed to more advanced countries. There are, however, flows among less developed countries, as well as among advanced countries.¹ But, there is a serious lack of uniformity in data gathering techniques, definitions, and procedures, which inhibit statistical comparison of the countries involved, and thereby prevent a complete empirical assessment of the problem.

Within each individual country, different definitions of high level manpower make comparison of international migration statistics virtually impossible. The situation at present is such that "attempts to use migration statistics to clarify the magnitude of migration or re-migration involve considerable problems:

¹For discussion of the brain drain from Great Britain, Canada and other European countries, see Brinley Thomas, "The International Circulation of Human Capital," Minerva, 5(4), (1967), pp. 479-506; Herbert G. Grubel, "Foreign Manpower in the U.S. Sciences, Review of Income and Wealth, (March, 1968), pp. 57-75; Herbert G. Grubel and Anthony D. Scott, "The International Movement of Human Capital: Canadian Economists," Canadian Journal of Economics, II (August, 1969), pp. 375-88; and Gordon Sutherland, "The Brain Drain," Political Quarterly, Vol. 3, (1967), pp. 51-61.

sampling is sometimes inappropriate, accuracy of reporting is questionable, occupational titles are misleading (what is an engineer?)."¹ It was pointed out that migration data from developing countries is so spotty and subject to bias that its use is worthless for research purposes. It is generally agreed that the United States is the major recipient of the immigrants in question, especially from the developing nations. The United States' immigration figures will be used in an effort to determine the magnitude and composition of the brain drain, bearing in mind that it is possible that other countries might also be recipients of high level personnel.

It should be emphasized that one important element in the statistical picture cannot be ascertained; namely the return flow of professionals who have spent some time in a foreign country. Substantial numbers do perhaps return and would thereby reduce the gross outflow figures. There are, however, no statistics available on this aspect of the situation.

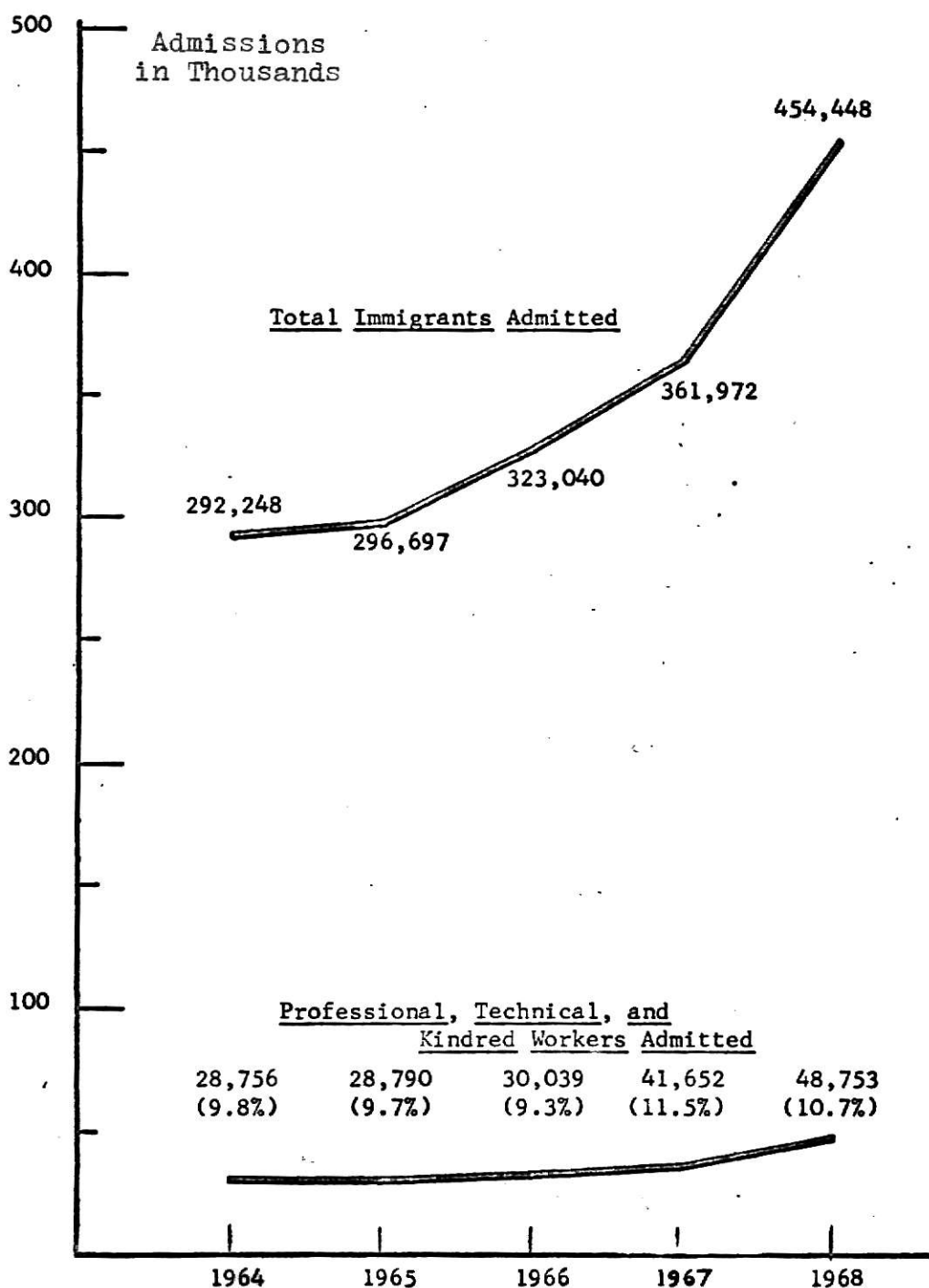
The Empirical Evidence

The United States absorbed about 360,000 immigrants in 1967 and 450,000 in 1968. Of this total, an average of between 10 and 12 percent were listed as "professional, technical, and kindred workers" (see Chart 1). The total number of immigrants in recent years listed under the category of "professional, technical, and

¹Robert G. Myers, "Brain Drain and Brain Gain," International Development Review, (December, 1967), p. 5.

CHART 1

IMMIGRATION OF PROFESSIONAL, TECHNICAL AND KINDRED
WORKERS, AND TOTAL IMMIGRANTS ADMITTED TO THE
UNITED STATES, FISCAL YEARS 1962-68



Source: U.S. Department of Justice, Annual Indicator of the Immigration into the United States of Aliens in Professional and Related Occupations, Fiscal Year 1968, (Washington, D.C.: Government Printing Office 1969), p. 1.

kindred workers" in the United States Government publications is given in Table 2, together with the subdivision "scientists, engineers, and physicians" ("scientific manpower").¹ Using 1956 as the base year, there had occurred as of 1968, an increase of about 156 percent in the former category compared to an approximate 195 percent increase in the latter, so that over 15,000 scientists, engineers, and physicians entered the United States in both 1967 and 1968. Immigration of scientists, engineers, and physicians as a percentage of "professional, technical, and kindred workers" has varied from a low of around 25 percent in 1962 to a high of almost 37 percent in 1967. Further breakdown of this group of immigrants is presented in Table 3. The figures for 1968 indicate that the highest percentage rise since the base year has been in the case of engineers at 235 percent. Scientists and physicians follow with some 190 percent and 127 percent respectively. A categorical listing of immigrant scientists, engineers, and physicians by country of origin is given in Appendix I.

Changes in United States immigration laws are in part the reason for the rather dramatic upsurges which occurred between the years 1962-63, 1965-66, and finally the very steep rise between 1966-67. There was in 1962, a liberalization in the former immigration law such that those people having special education and skill qualifications and having immigration applications on file as of April 1, 1962, were permitted to enter the United States

¹See note accompanying Table 2 for definitional restrictions.

TABLE 2

IMMIGRATION OF SCIENTISTS, ENGINEERS, AND
PHYSICIANS COMPARED WITH IMMIGRATION OF
ALL PROFESSIONAL, TECHNICAL AND KINDRED
WORKERS, FISCAL YEARS, 1956 AND 1962-68.

Fiscal Year	(1)		(2)		(2) as a percent of (1)
	<u>Immigration of pro- fessional, technical and kindred workers</u>		<u>Immigration of Scientists, engi- neers, physicians</u>		
	Number	Index (1956=100)	Number	Index (1956=100)	
1956	18,995	100.00	5,373	100.0	28.3
1962	23,710	124.8	5,956	110.8	25.1
1963	27,930	147.0	7,896	147.0	28.3
1964	28,756	151.4	7,810	145.4	27.2
1965	28,790	151.6	7,198	134.0	25.0
1966	30,039	158.1	9,534	177.4	31.7
1967	41,652	219.3	15,355	285.8	36.9
1968	48,753	256.7	15,896	295.8	32.6

Note: "Scientists" do not include social scientists; "physicians" include surgeons and dentists. "Scientists, engineers, and physicians" include college or university-level instructors of science, engineering and medicine.

Source: Years 1956 and 1962-66 are from--U.S. Congress, House, The Brain Drain into the United States of Scientists, Engineers, and Physicians: a Staff Study for the Research and Technical Programs, Subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong. 1st sess., (Washington, D.C.: Government Printing Office, 1967), p. 2. (Hereafter referred to as Staff Study.)

Years 1967-68 are from--U.S. Department of Justice, Annual Indicator of the In-migration into the United States of Aliens in Professional and Related Occupations, Fiscal Year 1968, (Washington, D.C.: Government Printing Office, 1968 and 1969). (Hereafter referred to as the Annual Indicator.)

TABLE 3

IMMIGRATION INTO THE UNITED STATES OF SCIENTISTS, ENGINEERS,
AND PHYSICIANS, FISCAL YEARS 1956 AND 1962-68.

Fiscal Year	Total		Scientists		Engineers		Physicians	
	Number	Index (1956=100)	Number	Index (1956=100)	Number	Index (1956=100)	Number	Index (1956=100)
1956	5,373	100.0	1,022	100.0	2,804	100.0	1,547	100.0
1962	5,956	110.8	1,104	108.0	2,940	104.8	1,912	123.6
1963	7,896	147.0	1,612	157.7	4,014	143.2	2,270	146.7
1964	7,810	145.4	1,676	164.0	3,725	132.8	2,409	155.7
1965	7,198	134.0	1,549	151.6	3,455	123.2	2,194	141.8
1966	9,534	177.4	1,852	181.2	4,921	175.5	2,761	178.5
1967	15,355	285.8	2,976	291.2	8,822	314.6	3,557	229.9
1968	15,896	295.8	2,980	291.6	9,402	335.3	3,514	227.1

Source: 1956 and 1962-66 figures are from Staff Study, p. 2. 1967-68 figures are calculated from Appendix I.

without regard to national quotas. The 1965 United States Immigration Law abolished immigration based on national quotas with the resultant increase noted in 1966. This new law staged the departure from the national origin basis for immigration in two steps which took place in fiscal 1967 and fiscal 1968. The effect of these changes has been to increase the inflow of scientists, engineers, and physicians from 9,534 in 1966 to 15,896 in 1968, an increase of 67 percent.

In Table 4, a breakdown of the data is given by geographical area. The largest relative upward trends have occurred in Asia and Africa as indicated in Table 5, and Chart 2. The European figures are a reflection of the flow from developed countries by our definition. The flow from North America has shown a tendency to rise although not to the relative degree of Asia or Africa. The South American countries have sustained somewhat constant outflow since 1963.

Summarizing thus far, as indicated by the data, there has been a substantial rise in the flow of scientific personnel into this country over the last decade. The intention of this paper is to examine mainly the stream of migrants from the developing countries of the world. Table 6 gives the change, over the years indicated, in the percentage share of the developed and developing countries in the immigration of scientific manpower to the United States. The percentage of scientific personnel from developed countries has fallen from a high of 67.1 percent in 1956 to 48.0 percent in 1967. By contrast, over the same period the percent-

TABLE 4
IMMIGRATION INTO THE UNITED STATES OF SCIENTISTS, ENGINEERS,
AND PHYSICIANS, BY GEOGRAPHIC AREAS, FISCAL YEARS
1956 AND 1962-68.

Geographic Area	1956	1962	1963	1964	1965	1966	1967	1968
Europe	2,365	2,187	2,829	2,984	2,874	3,496	5,185	5,450
Asia	458	686	1,520	1,141	696	2,521	5,677	5,456
North America	1,920	2,271	2,481	2,474	2,603	2,503	3,249	3,425
South America	499	667	841	1,008	827	773	835	954
Africa	68	84	113	118	101	122	251	431
Total	5,373	5,956	7,896	7,527	7,198	9,534	15,355	15,896

Source: 1956 and 1962-66 figures are from Staff Study, p. 4. 1967-68 figures are calculated from Appendix I.

TABLE 5

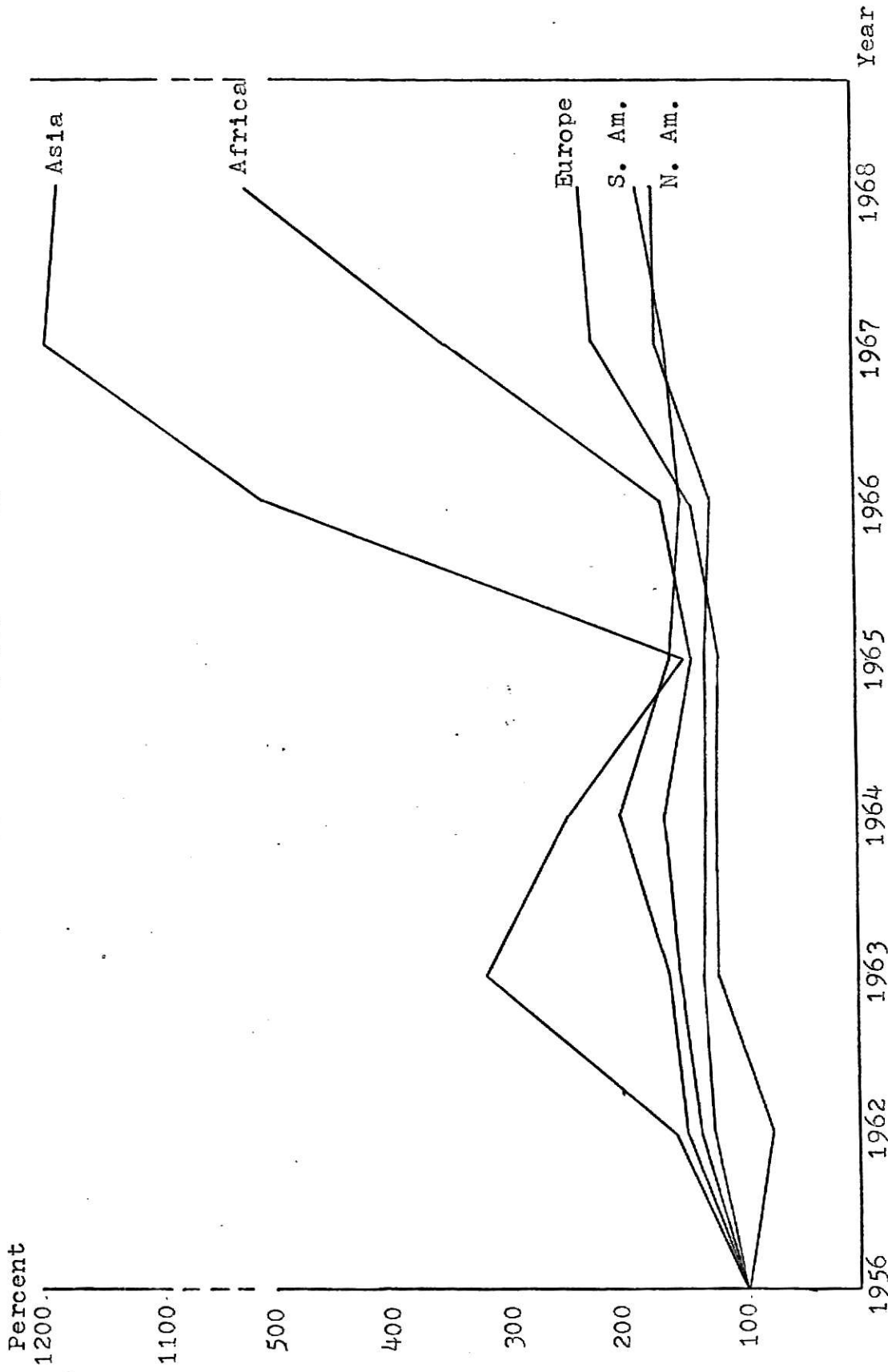
PERCENTAGE INCREASE IN IMMIGRATION INTO THE UNITED STATES OF
SCIENTISTS, ENGINEERS, AND PHYSICIANS BY GEOGRAPHICAL AREAS,
FISCAL YEARS 1956 AND 1962-68.

Geographical Area	1956	1962	1963	1964	1965	1966	1967	1968
Europe	100.0	92.5	119.6	122.4	121.5	147.8	219.2	230.4
Asia	100.0	149.8	331.9	249.1	152.0	550.4	1239.5	1191.2
North America	100.0	118.3	129.2	128.8	135.6	130.4	169.2	178.4
South America	100.0	133.7	168.5	202.0	165.7	154.9	167.3	191.2
Africa	100.0	123.5	166.2	173.5	148.5	179.4	369.1	633.8

Source: Calculated from Table 4.

CHART 2

PERCENTAGE DISTRIBUTION OF IMMIGRANTS BY
GEOGRAPHICAL AREAS, 1956 AND 1962-68



Source: Table 5

TABLE 6

IMMIGRATION INTO THE UNITED STATES OF SCIENTISTS, ENGINEERS,
AND PHYSICIANS, FROM DEVELOPED AND DEVELOPING COUNTRIES,
FISCAL YEARS, 1956 AND 1962-68.

Fiscal Year	<u>Total, All Countries</u>		<u>Developed Countries</u>		<u>Developing Countries</u>	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
1956	5,373	100.0	3,604	67.1	1,769	32.9
1962	5,956	100.0	3,573	60.0	2,383	40.0
1963	7,896	100.0	4,534	57.4	3,362	42.6
1964	7,810	100.0	4,607	59.0	3,203	41.0
1965	7,198	100.0	4,548	63.2	2,650	36.8
1966	9,534	100.0	5,144	54.0	4,390	46.0
1967	15,355	100.0	7,365	48.0	7,984	52.0
1968	15,896	100.0	7,806	49.1	8,087	50.9

Source: Staff Study, p. 6; and Appendix I.

age share from the developing countries burgeoned from 32.9 percent to a high of 52.0 percent in 1967, followed closely by 50.9 percent in 1968. Thus, there has been a marked upward trend in the proportionate share of developing countries in the emigration of highly skilled to the United States. Again, although there are no statistics to support the contention, it appears reasonable to assume that a similar pattern could be detected in the movement to other advanced countries such as Great Britain and other European nations, Australia, and Canada. Based on the admittedly one-way flow data from United States publications, however, it would seem that there is sufficient cause for concern among both sending and receiving countries.

Flow from Developing Countries

Referring now to the developing countries specifically, a further classification of the scientific flow into its three major components is given in Table 7. In 1956, the total percentage share of developing countries was 32.9, with 34.9 percent of the scientists, 25.4 of the engineers, and 45.2 of the physicians having entered the United States from developing countries. This can be compared with the figures for 1968, during which the percentages had substantially risen to 48.1, 45.2, and 68.5 for the respective groups. Between 1956 and 1968, the largest increase occurred in the case of physicians, from 45.2 percent to 68.5 percent.

A source of concern by some interested in the problems associated with the brain drain is the ironical situation faced by the

TABLE 7
PERCENTAGE SHARE OF DEVELOPING COUNTRIES IN IMMIGRATION
BY SCIENTISTS, ENGINEERS, AND PHYSICIANS INTO THE
UNITED STATES FOR FISCAL YEARS 1956 AND 1962-68.

Fiscal Year	Total Three Groups	Scientists	Engineers	Physicians
1956	32.9	34.9	25.4	45.2
1962	40.0	26.9	33.5	57.6
1963	42.6	34.9	40.9	51.0
1964	41.0	32.6	36.8	53.3
1965	36.8	27.0	30.4	53.8
1966	46.0	41.2	40.9	58.5
1967	52.0	52.0	47.9	62.2
1968	50.9	48.1	45.2	68.5

Source: Staff Study, p. 6; and Appendix I.

United States with regard to foreign aid policy. It is held that United States' efforts to stimulate development in many countries through foreign aid is offset by a subsequent outflow of resources (human capital) from these same developing countries. This phenomenon will be discussed further in Chapter 3, but relevant statistics are given in Table 8. Two groups of countries are shown as a basis for measurement; Group 1 is comprised of the nine major recipients of United States bilateral foreign aid as of 1966; Group 2 represents four countries recently added (as of 1966) to major aid recipients.¹ The nine countries of Group 1 received some 79 percent of such aid in 1966.

The total scientific immigration figures for the countries listed indicate an increase from a low of 570 in 1956 to some 5,251 in 1968. This represents a rise from 32.2 percent of the total from all developing countries in 1956, to a most significant 64.9 percent of the total scientific immigration from all developing countries in 1968. Thus, there is apparently good cause for discussion of the paradox concerning the offsetting flows of resources. It has been estimated that

. . . scientific professionals have cost their countries at least \$20,000 per person in education and training. By this measure, the 4,390 scientists, engineers, and physicians immigrating from the developing countries in fiscal year 1966 represent a contribution of some \$88 million to the United States. Of this amount, the 13 countries which have been the major targets of the United States aid program, contributed more than \$50 million to the United States in the form of 2,563 scientific professionals. The estimated "reverse foreign aid" more than offsets \$40,285,000 spent in the United States aid funds

¹Staff Study, p. 7.

TABLE 8

IMMIGRATION INTO THE UNITED STATES OF SCIENTISTS, ENGINEERS,
AND PHYSICIANS FROM SELECTED DEVELOPING COUNTRIES,
FISCAL YEARS 1956 AND 1962-68.

	1956	1962	1962	1964	1965	1966	1967	1968
<u>Group 1^a</u>								
Brazil	121	87	100	85	98	96	97	93
Chile	29	34	49	50	51	33	31	55
Columbia	65	131	179	268	193	205	211	269
Dominican Republic	28	122	111	61	58	115	71	71
India	43	79	349	111	100	896	1,456	1,265
Korea	6	71	155	43	30	139	273	229
Pakistan	n.a.	16	20	22	11	40	89	73
Turkey	25	73	179	67	68	114	196	104
Viet Nam	n.a.	6	8	3	3	5	11	15
<u>Total Group 1</u>	317	619	1,150	710	612	1,643	2,435	2,174
<u>Group 2^b</u>								
China (Taiwan)	117	36	190	455	47	234	1,072	796
Iran	27	83	66	86	73	179	288	265
Israel	71	86	112	91	83	116	206	217

TABLE 8: (Continued)

	1956	1962	1963	1964	1965	1966	1967	1968
Philippines	38	141	220	89	90	397	1,067	1,799
<u>Total Group 2</u>	253	346	588	721	293	926	2,633	3,077
Total 13 Countries	570	965	1,738	1,431	905	2,563	5,068	5,251
Percent of all Developing Countries	32.2	41.0	51.7	44.7	34.2	58.4	63.5	64.9

^aGroup 1 countries together received 79 percent of all United States bilateral foreign aid in fiscal 1966.

^bGroup 2 countries were recently (as of 1966) added to the major recipients.

Source: Staff Study, p. 7; and Appendix I.

to give technical training to about 16,000 persons from the developing countries, of whom perhaps 25 to 30 percent were scientists, engineers, and similar specialists.¹

The significance of the brain drain is not to be found in the absolute numbers, as mentioned earlier. An outflow of certain magnitude is critical for some countries, relatively unimportant for others. One measure of significance which has been cited is that of the annual outflow of the highly skilled over the annual number of graduates from local universities in those disciplines concerned. The migrants are comprised of persons who graduated from foreign universities as well as those located in the home countries. In some cases the stock of professionals in a developing country may contain only a small percent of local graduates. However, the comparison does indicate an approximate measure of the impact of the outflow in terms of capability to replace the emigrants through educational output.

An attempt of such a measure is presented in Table 9. Comparing local graduates to numerical losses of scientific manpower, among the more significant percentage losses in the scientist category were Brazil, 21.7 percent; Columbia, 18.2 percent; Costa Rica, 50.0 percent; Guatemala, 18.2 percent; and Venezuela, 15.0 percent. Engineer losses in Chile amounted to 20 percent; Dominican Republic, 58.5 percent; Israel, 33.4; Lebanon, 17.6; Haiti, 43.5; Costa Rica, 23.5; Honduras, 85.7; and Nigeria, 11.1. In the physician category, Columbia, 15.4; Dominican Republic, 39.4; Lebanon, 13.5;

¹Staff Study, p. 7.

TABLE 9

IMMIGRANTS FROM SELECTED DEVELOPING COUNTRIES IN 1966 AS A PERCENTAGE
OF ANNUAL GRADUATES IN 1965 FROM EDUCATIONAL INSTITUTIONS
IN THE HOME COUNTRIES

	Scientists			Engineers			Physicians		
	Grads	Immigrants	Per cent	Grads	Immigrants	Per cent	Grads	Immigrants	Per cent
<u>Asia</u>									
Israel	732	23	3.1	459	153	33.4	366	53	15.8
Philippines	628	31	4.9	3,592	546	15.2	6,311	419	6.6
Burma	667	1	-	87	11	12.6	159	7	4.4
Iraq	126	14	11.1	368	16	4.3	287	7	2.4
Lebanon	256	13	5.1	148	26	17.6	185	25	13.5
<u>North America</u>									
Dominican Republic	(d)	(d)	-	65 ^b	38	58.5	231 ^b	91	39.4
<u>South America</u>									
Brazil	60 ^b	13	21.7	1,373	45	3.3	3,305	29	0.9
Chile	86 ^b	9	10.5	90	18	20.0	334	7	2.1
Columbia	44 ^b	8	18.2	575	41	7.1	533	82	15.4
Haiti	none	4		23	10	43.5	49	62	126.5
Costa Rica	6	3	50.0	34 ^b	8	23.5	66 ^a	17	25.7

TABLE 9 (continued)

	Scientists			Engineers			Physicians		
	Grads	Immi- grants	Per cent	Grads	Immi- grants	Per cent	Grads	Immi- grants	Per cent
<u>South America</u>									
Guatemala	11	2	18.2	34	4	11.8	89	31	34.8
Honduras	none	2		7 ^a	6	85.7	24 ^a	25	104.2
Venezuela	40	6	15.0	233 ^c	23	10.3	349	19	5.4
Ecuador	55	6	10.9	128	8	6.2	245	57	23.3
<u>Africa</u>									
Nigeria				36	4	11.1	45	3	6.7
Ethiopia		none			none		26	4	15.4

^aData from 1961^bData from 1962^cData from 1964^dIncluded in Physicians

Source: Unesco Statistical Yearbook, Table 2.13, "Education at the third level: distribution of graduates by field of study," (1967), pp. 239-58. The most recent available data is for 1965; exceptions as noted.

Haiti, 126.5; Guatemala, 34.8; Honduras, 104.2; Ethiopia, 15.4; Nigeria, 6.7.

A similar measurement was made in a United Nations study;¹ however, it gave a more complete picture in that flows of emigrants into France and Canada, as well as into the United States, were included. Information for the annual number of graduates in the developing countries was from around 1960. The more significant examples of losing countries are given in Table 10. The ratios given were an attempt to show the degree of educational investment lost as a result of emigration. (It will be noticed also, that the United Nations study included nurses and social scientists in the calculations.) Thus, countries such as Iran, Costa Rica, and Guatemala, were found to lose almost one-half of their engineers, while the Haiti and Honduras loss exceeded output entirely. Similarly, high percentage outflows among natural scientists were apparent in Costa Rica, Venezuela and El Salvador. Israel, the Dominican Republic, Lebanon, Haiti, and Columbia experienced substantial losses of physicians.

Foreign Student Non-Return

One of the components of the brain drain is non-returning foreign students. A comparison of the number of foreign student admissions with those who adjusted their status from temporary to permanent is diagrammed in Chart 3 for the years 1964-68. A

¹United Nations, General Assembly, November 5, 1968, Report of the Secretary-General, Outflow of Trained Personnel from Developing Countries, pp. 78-79.

TABLE 10

RATIO OF THE ANNUAL NUMBER OF EMIGRANTS* TO THE ANNUAL NUMBER OF GRADUATES
FROM THE RELATED FIELD OF STUDY BY COUNTRY OF ORIGIN OR LAST
PERMANENT RESIDENCE OVER THE PERIOD 1962-66

	Engineers		Natural scientists		Physicians		Nurses		Social scientists U.S.
	F + U.S.	F + U.S. + C	F + U.S.	F + U.S. + C	F + U.S.	F + U.S. + C	U.S.	U.S. + C	
Europe									
Greece	23.9	26.6	10.3	12.2	5.9	7.7	5.1	8.3	0.2
Turkey	6.5	6.9	12.6	15.9	9.8	15.2	1.9	2.8	0.1
Asia									
Burma	n.a.	n.a.	n.a.	n.a.	1.3	2.9	0.7	1.0	n.a.
Hong Kong	264.2	514.2	31.6	59.3	22.2	65.1	n.a.	n.a.	12.3
India	4.4	6.1	n.a.	n.a.	0.6	1.6	0.1	1.1	0.1
Indonesia	n.a.	n.a.	n.a.	n.a.	-	0.1	n.a.	n.a.	n.a.
Iran	47.5	51.9	12.3	14.1	7.7	10.0	3.3	3.9	n.a.
Iraq	7.5	9.2	n.a.	n.a.	4.3	4.9	n.a.	n.a.	0.1
Israel	12.7	15.7	15.8	18.6	43.8	54.3	9.4	11.4	n.a.
Jordan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	14.1	21.8	n.a.
Lebanon	33.1	35.5	9.4	10.5	15.2	24.9	n.a.	n.a.	0.5
Malaysia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Pakistan	3.2	9.2	0.2	0.5	0.5	1.4	n.a.	n.a.	0.01
Philippines	0.4	2.3	3.6	18.5	12.0	19.3	3.6	35.3	0.03
Republic of Korea	4.0	n.a.	2.4	n.a.	3.1	n.a.	1.1	n.a.	1.5
Republic of Viet-Nam	76.3	n.a.	17.6	n.a.	1.0	n.a.	n.a.	n.a.	n.a.
Syria	54.2	56.5	10.9	11.7	6.7	9.3	n.a.	n.a.	0.8
Thailand	1.0	n.a.	0.1	n.a.	2.9	n.a.	2.6	n.a.	0.04
North America									
Costa Rica	52.4	n.a.	92.0	n.a.	n.a.	n.a.	n.a.	n.a.	10.0
Dominican Republic	46.5	n.a.	n.a.	n.a.	46.6	n.a.	n.a.	n.a.	0.7
El Salvador	19.0	24.0	24.0	15.2	15.2	14.7	n.a.	n.a.	1.8
Guatemala	50.0	16.7	16.7	14.7	14.7	14.7	n.a.	n.a.	16.0
Haiti	121.3	n.a.	n.a.	n.a.	36.6	n.a.	n.a.	n.a.	10.7
Honduras	111.4	n.a.	n.a.	n.a.	15.3	n.a.	n.a.	n.a.	11.4
Mexico	7.3	7.7	12.5	12.8	9.4	9.7	n.a.	n.a.	0.07
Nicaragua	n.a.	n.a.	n.a.	22.7	n.a.	n.a.	n.a.	n.a.	n.a.
Panama	n.a.	n.a.	n.a.	n.a.	24.0	n.a.	n.a.	n.a.	n.a.

TABLE 10 (continued)

	Engineers		Natural scientists		Physicians		Nurses		Social scientists	
	F + U.S.	F + U.S. + C	F + U.S.	F + U.S. + C	F + U.S.	F + U.S. + C	U.S.	U.S. + C	U.S.	U.S.
<u>South America</u>										
Argentina	5.1	5.2	7.4	7.5	7.0	7.2	n.a.		0.8	
Bolivia	n.a.		n.a.		n.a.		n.a.		n.a.	
Brazil	3.2	3.6	3.3	3.4	2.0	2.1	4.7	4.7	0.2	
Chile	26.3	30.3	19.2	21.2	3.4	3.7	20.8	21.8	1.9	
Colombia	24.1	24.8	13.1	13.5	21.9	22.8	45.8		8.6	
Ecuador	32.0		16.4		16.1		n.a.		7.4	
Paraguay	23.3		1.8		3.9		n.a.		n.a.	
Peru	13.2	14.5	2.1	2.5	4.1	4.4	n.a.		1.6	
Uruguay	13.6	14.2	n.a.		2.9	3.6	2.9		-	
Venezuela	12.8	14.0	41.3	47.8	8.5	8.6	52.2	53.5	0.4	
<u>Africa</u>										
Algeria	n.a.	n.a.	n.a.		n.a.		n.a.		n.a.	
Ethiopia	4.1		4		∞		0.8		n.a.	
Ghana	13.3		1		∞		n.a.		0.5	
Kenya	n.a.	n.a.	n.a.		∞		n.a.		n.a.	
Morocco	n.a.	n.a.	n.a.		∞		n.a.		n.a.	
Nigeria	11.2		1.3		9.5		0.4		0.9	
Tunisia	∞		12.5		∞		n.a.		5.0	
United Arab Republic	1.8	1.9	2.1	4.6	1.6	3.7	0.7	1.1	0.06	

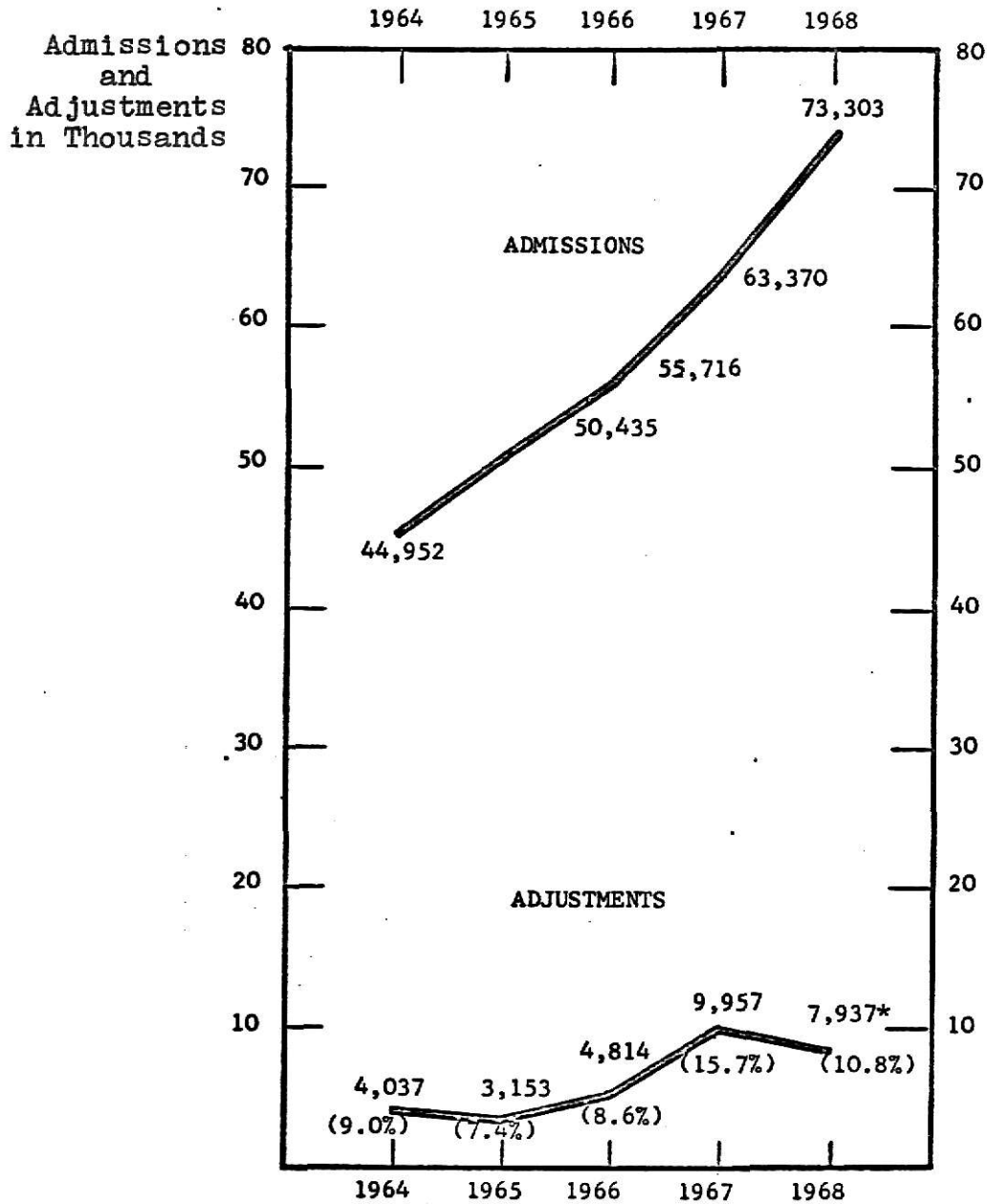
* Simple annual average over the period covering 1962-66.

Note: Abbreviations are F, France; U.S., United States; C, Canada.

Source: Outflow of Trained Personnel, pp. 78-79.

CHART 3

NUMBER OF STUDENTS ADMITTED TO THE UNITED STATES
AND NUMBER OF STUDENTS WHO ADJUSTED STATUS FROM
TEMPORARY TO PERMANENT, FISCAL YEARS, 1964-68



Source: Annual Indicator, p. 116.

significant percentage jump occurred in 1967. This is a reflection of the previously mentioned changes in immigration law, which allowed many students from low national quota countries to become permanent immigrants. A measure of the relative importance of non-returning students from developing compared to developed countries is given in Table 11. Some 3,648 scientific immigrants from all countries adjusted their temporary student status to permanent status during 1967. Of these, 3,370 were from developing countries, representing over 40 percent of the total scientific immigration from those countries. The majority of these students were from Taiwan and India, although high percentage figures were noted in Korea, Iran and Israel.

The problem of determining foreign student non-return rates has been illusive. The estimated ratios given below have been made based on varying definitions of just what should and should not be included in the calculation. Examples of estimates of non-return rates have included 8.3 percent,¹ obtained by dividing the number of students who adjusted their status from temporary to permanent between 1961 and 1966 by the number of students who arrived in the United States during that same five year period. A figure of 10.4 percent has been calculated by dividing the number of students adjusting status during 1962-66 by the number admitted

¹U.S. Congress, Senate, Committee on the Judiciary, "Statement of Charles Frankel," International Migration of Talent and Skills, Hearings, before a subcommittee on Immigration and Naturalization of the Committee on the Judiciary, United States Senate, 90th Cong., 1st sess., 1968, p. 20.

TABLE 11

PROPORTION OF SCIENTIFIC IMMIGRANTS WHO ENTERED THE
UNITED STATES ORIGINALLY AS STUDENTS, FISCAL 1967.

Source of Immigration	Total, Scientific Immigrants (A)	Scientific Immigrants who Adjusted Status from Student to Immigrant (B)		Percent-Col. B of Col. A (C)
All Countries	15,272	3,648		23.9
Developed Countries	7,359	278		3.8
Developing Countries	7,913	3,370		42.6
<u>Selected Developing Countries</u>				
Taiwan	1,321	1,137		86.1
India	1,425	1,074		75.4
Korea	269	193		71.7
Iran	286	144		50.3
Israel	206	71		34.5

Source: U.S. Congress, House, Committee on Government Operations, The Brain Drain of Scientists, Engineers and Physicians from the Developing Countries into the United States, Hearings, before a subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 2nd sess., 1968, Table IV, p. 3.

between 1959-63.¹ It was felt that this measure was more appropriate in that most students adjusted status after a period of about three years following original admission into this country. Robert G. Myers has estimated the non-return rate as 15.9 percent.² This figure was calculated from 1964 data by dividing the number of non-returning students with immigrant visas plus the number of non-returnees with non-immigrant visas by the total of the non-returnees plus returnees. However, if non-returning students with immigrant visas was deleted from this calculation, the non-return rate became only 5.7 percent.³ In 1966-67, the Institute of International Education reported that 13,000 foreign students (of a total 100,000) declared their intention of remaining in the United States.⁴

A study of United States doctorate recipients in 1967 revealed that approximately one-seventh were granted to foreign citizens. Of these, some 65 percent were from developing countries, with 42 percent of those from these countries concentrated in physical science and engineering, 25 percent in biological sciences, and 15 percent in social sciences. Of those doctorate recipients from foreign countries, 51 percent expressed the intention of re-

¹Ibid., "Statement of Walter F. Mondale," p. 91.

²Robert G. Myers, "The 'Brain Drain' and Foreign Student Non-Return," International Education and Cultural Exchange (Fall, 1967), pp. 67-72.

³The rationale for deletion of this item was that these non-returnees could not be considered "foreign" since they had previously obtained immigrant visas.

⁴United Nations, Outflow from Developing Countries, p. 32.

maining in the United States. Recipients of the degree from Taiwan represented the highest rate of intended stay (90 percent), while those from Pakistan were the lowest (14 percent).¹

Further information regarding the percentages of foreign student non-return was made in a recent study of foreign student graduates from all areas of the world at the University of California. The sample used was some 676 advanced degree recipients in engineering over the period 1954 through 1965. The results of a 1967 survey pertaining to post-graduate residence are indicated below:²

Returned immediately and remained most of the time -----	35%
Returned after a brief residence in the United States and remained on a permanent basis -----	22%
Returned for a short time, then left again for the United States -----	5%
Returned for a short time, then left again for a third country -----	6%
Still in the United States, but plan to return -----	9%
Still in the United States, and plan to remain -----	23%

An interesting result is that some 37 percent of those surveyed were United States residents.

¹U.S. Congress, House, Committee on Government Operations, "Statement of John C. Shearer," The Brain Drain of Scientists, Engineers and Physicians from the Developing Countries into the United States, Hearings, before a subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 2nd sess., 1968, p. 22.

²Charles Susskind and Lynn Schell, Exporting Technical Education (New York: Institute of International Education, 1968), p. 18.

Summary

The investigation into the magnitude and composition of the brain drain from developing countries has necessarily been incomplete. The numerical losses incurred by the sending countries have been examined, but any conclusion regarding "net" losses is virtually impossible because neither immigration rates to these countries, nor student return rates can be calculated with available data. Nevertheless, there has been a substantial rise in the immigration of scientific personnel from developing countries into the United States over the last decade. The significance of the brain drain is difficult to ascertain from the data available, as reflected in the attempt to evaluate it on the basis of the ratio of annual graduates to annual emigration. The use of such a measure is limited in that no account is taken for differences in educational quality, nor is consideration taken of how university output relates to demand for manpower in specific countries. Foreign student non-return is evidently an important component, but precise measurement is again precluded by a lack of data. Neither the precise number of these students who fail to return, nor how many return home for a time only to re-emigrate to the United States at a later date is known with any certainty.

The statistical picture has thus been presented insofar as is possible with available data. As imperfect as that picture is, it can be inferred that there has been a transition in the composition of the brain drain such that today over one-half of these immigrants into the United States come from developing nations.

Moreover, the number of scientific immigrants has been large and has, in recent years, been increasing at an accelerated rate.

Whether or not the international migration of high level manpower constitutes a problem for the developing countries is a question to be discussed below. Attention will be focused on an analysis of the effects of the brain drain in the following sections.

CHAPTER III

Theoretical Aspects of the Migration of Labor

Introductory Comments

A widely accepted theory of international trade is what is described as the Hecksher-Ohlin model. The essential assumptions of this model as summarized by Harry G. Johnson¹ included the following relationships among countries: identical quality of the factors of production; identical production functions; constant returns to scale; identical consumer tastes; relative factor intensities of industries did not reverse within the relevant range of international factor price variation (an assumption shown to be necessitated by the factor-price equalization theorem); and international immobility of the factors of production.

Based on these assumptions, the sequence of reasoning used to explain international trade has been initiated by first classifying the production of goods in terms of the relative factor intensity used in the production process. Individual nations were endowed with comparatively differing amounts of the factors of production, and would tend to specialize in and trade goods which required relatively intensive input usage of the most abundant factor. The factors which were of primary concern are labor and

¹Harry G. Johnson, "Comparative Cost and Commercial Policy Theory in a Developing World Economy," The Pakistan Development Review, Vol. IX (Spring, 1969), pp. 2-3.

capital.

International movement of labor, the subject of this paper, is precluded from the Heckscher-Ohlin model by assumption. As indicated in this paper, there is evidence that the international migration of labor has been of significance. Ellsworth contends that it is necessary to concede the existence of labor migration, and amend the assumption.

International factor movements are larger than theory envisaged. In general, however, they seem to require at least the expectation of returns higher than those that can be obtained from their employment at home. Given such favorable expectation . . . , capital, enterprise, and technical and skilled labor will respond to the lure. This amounts to qualifying the assumption as to factor immobility, which could be restated as follows: There are obstacles to international mobility, so that for equal returns, factors will tend to stay home. But given a sufficient differential in the return to capital, labor, or enterprise, any of these factors will migrate abroad.¹

Having thus modified the theory to allow for international labor movement, what are the implications? In theory, international movement of labor would continue as long as unequal returns to common labor existed in the world. However, such continuous movement is prohibited by various types of institutional restrictions, political restrictions, cultural ties, family considerations, climate, apprehension, and a host of other economic and non-economic factors. Moreover, as Kindleberger has pointed out, "there is doubt that the factor-price equalization model is relevant for intercontinental migration. This migration . . . follows well-worn grooves rather than (spreading) evenly over the world in

¹P.T. Ellsworth, The International Economy, (New York, 1967), pp. 148-49.

response to economic signals."¹

There has been expressed in the literature a need for an analytical framework from which to approach the problems associated with the migration of high level manpower. This section will include a presentation of several such attempts. It is in this manner that the policy implications can be discussed in a meaningful way. As mentioned earlier, the reasons for the international movement of these professionals have been generally agreed upon, there is, however, considerable disagreement as to its consequences in terms of economic welfare and growth, gain and loss, advantages and disadvantages, and other ramifications. First will be presented migration theory as it applied to labor in general, followed by discussion relating specifically to high level manpower.

The Decision to Migrate: Unskilled Labor

Grubel and Scott have presented a model for determinants of migration, regardless of skill level.² The initial assumptions included the following: (a) the decision unit was the individual; (b) the decision to migrate was made independently, with the parameters of the model beyond the individual's control; (c) the individual had full knowledge of opportunities and alternatives;

¹Charles P. Kindleberger, International Economics, (Homewood, Illinois, 1968), p. 236. The "grooves" mentioned by Kindleberger referred to such migratory flows as the West Indies to Britain, Britain to the United States, Algeria to France, and others.

²Herbert G. Grubel and Anthony D. Scott, "The Determinants of Migration: The Highly Skilled," International Migration, (May, 1967), pp. 127-38.

(d) the goal of the decision unit was to maximize welfare as measured by maximization of the present value of net future benefits. The form of the calculation performed when considering a one-way migration is shown below:

$$\sum_{i=1}^{N_o} \frac{Y_{o,i}}{(1+r_o)_i} + \sum_{i=1}^{N_o} \frac{P_{o,i}}{(1+p_o)_i} \geq \sum_{i=1}^{N_d} \frac{Y_{d,i}}{(1+r_d)_i} + \sum_{i=1}^{N_d} \frac{P_{d,i}}{(1+p_d)_i} - C$$

where:

Y_o = expected income in the country of origin.

Y_d = expected income in the country of destination.

N_o, N_d = expected number of years of life.

P_o, P_d = expected psychic income in the respective countries

r_o, r_d = rates of discount applied to future real income streams.

p_o, p_d = rates of discount applied to future psychic income streams.

C = cost of moving, including foregone earnings while unemployed.

The decision to migrate then depended on the direction of the inequality.

Actual real income calculations require the conversion of salaries by means of the current exchange rate--a complex procedure involving allowance for purchasing power differences between the two countries. Problems arise if there exist widely divergent relative prices of commodities. As noted by Grubel and Scott:

For instance, beef is much more expensive in the United States than in Australia. However, anyone who spends a dollar on meat may derive more satisfaction in the United

States than in Australia if he strongly prefers chicken to beef since chicken is much cheaper in the United States than Australia. Thus, before being able to arrive at a judgement about the satisfaction one is able to derive from incomes in the two places, it is necessary to relate one's own set of tastes to the existing pattern of relative prices.¹

Other factors which must be accounted for in the calculation included employment conditions, hours worked, commuting costs, climate, taxes, and government services, all of which have a bearing on the magnitude of real income.

Psychic income calculation was equally complex, as such variables as the following must be considered: relative prestige of occupational opportunity, the personality and competence of associates, family ties, culture, patriotism, travel discomfort, adjustment to new environment, and so forth.

While recognizing the difficulty, if not virtual impossibility, of quantifying the variables involved in the calculation of real and psychic incomes, Grubel and Scott noted that "the model is nevertheless useful in that it identifies those variables which policy-makers have to influence if they wish to alter the direction or magnitude of actual flows."²

Another model which is similar in nature to that of Grubel and Scott was formulated by Dorai.³ Since his primary emphasis

¹Ibid., p. 128.

²Ibid., p. 132. The authors also have attempted to add realism to the model by incorporating "uncertainty" with regard to future incomes. See pp. 130-31.

³G.C. Dorai, "Economics of the International Flow of Students: A Cost-Benefit Approach," (unpublished Ph.D. dissertation, Wayne State University, 1967), pp. 4-21.

was on migrants from underdeveloped countries, Dorai suggested the following favorable conditions for migration:

(a) Country A has a comparatively low average per capita quantity of non-human resources; a high rate of increase in population; a low rate of capital formation, and a substantial percentage of unemployment.

(b) Country B, a developed country, is characterized by the opposite of each condition stipulated in (a) above.

(c) If labor migrates from A to B, then an increase in world economic welfare occurs as measured by income per capita of both the non-migrating population in A and the migrants from A; with the stipulation that no undesirable effects are felt in B.¹

If the above conditions were satisfied, the decision to migrate became a function of the net economic benefit that the potential migrant expected to receive as a result of a move to the developed country. If D represents the migration decision, then

$$D = \sum_{n=j}^{\infty} \frac{Y_B - Y_A}{(1+r)^{n-j}} - \sum_{n=j}^{\infty} \frac{C_m + C_p + C_f}{(1+r)^{n-j}}$$

where:

Y_B = expected annual real income in B.

Y_A = expected annual real income in A.

C_m = the money costs associated with migration.

C_p = a measure of the psychic costs of migration.

C_f = foregone earnings while searching for employment in B.

r = rate of discount.

j = the age to which the costs and benefits are discounted

¹Undesirable effects could have been falling wages in B due to increased competition--this might be negligible if there was sufficient factor mobility in B, or if B was underpopulated in the "optimum" sense; that is, the population size was less than that which maximized income per capita. Ibid., p. 5.

$n = j, j+1, j+2, \dots, D.$ (maximum working age).

The value of D then would vary positively with the incentive to emigrate. If welfare was defined in terms of income per capita then the welfare of the migrants would be maximized by equating incremental benefits with the marginal costs of migration. The welfare of those remaining in A would be increased as a result of the emigration due to an increase in the marginal product of labor. If the population of B is below an "optimum", then immigration would result in enhanced welfare, because of increased income per capita. Even if it was assumed that population of B was optimal, the welfare of those residents of B , would still rise. An example of this result would be: if the ratio of active labor participants to total immigrants exceeded the participation ratio of B 's population, then welfare would have increased, because the increase in output exceeded the population increase. Secondly, immigration may have precipitated an increased capital formation rate, having thereby laid a foundation for a potentially higher growth rate.¹

Dorai concluded that his migration model led to the same conclusions as the Hecksher-Ohlin model discussed earlier. In the Hecksher-Ohlin analysis, trade was in part a substitute for international factor mobility, because with trade the rate of return

¹As Reder pointed out, "an increased annual rate of labor force increase will tend to lower the real wage rate which will increase the yield derivable from a given rate of investment which in turn, will stimulate a greater rate of investment". Melvin Reder, "The Economic Aspects of Increased Migration," Review of Economics and Statistics, (August, 1963), p. 222.

to the abundant factor or production increased, while that of the relatively scarce factor fell. In this way, the reward rates for homogeneous factors of production became equal. Similarly, Dorai's migration model resulted in at least partial equalization of returns,¹ as a consequence of the efforts of the migrants to maximize welfare implying continued movement until relative marginal products and marginal returns for homogeneous labor were equalized.

Factors Contributing to the Migration of High Level Manpower

Having presented theoretical aspects of labor migration in general, attention is now focused on high level manpower in particular. This can perhaps best be approached by first identifying the characteristics peculiar to both highly skilled individuals and to the market for their services which tend to make them relatively more mobile. This section then will be primarily concerned with the factors which influence their decision to migrate.

Each individual person who leaves his home country would doubtlessly list a number of reasons for departure; however, the relative importance of these factors in the decision-making process would be considerable varied. For the majority, it is quite probable that the economic motive was most influential; on the other hand, there might be some who would indicate non-economic considerations as perhaps the only reasons for leaving. It is

¹Complete equalization was prohibited by monetary and psychic costs. Dorai, "International Flow of Students," p. 13.

essential that these factors be fully understood and investigated in order that reasonable and practicable policy judgements can be made with regard to alleviation of the problem. An extensive, but by no means exhaustive, list of such causes is given below (the order in which the causes are presented does not necessarily imply priority as to importance).

Salary Differentials

The opportunity for substantially increased income and a higher level of living is very probable for highly skilled manpower from underdeveloped countries migrating to developed countries. This differential can outweigh all others in the decision to migrate. Actual estimates of salary differentials for comparable occupations among various countries is not the purpose of the present study. A rigorous study of wage and salary divergencies throughout the world is an extremely complex undertaking because, as mentioned earlier, such factors as price levels, employment conditions, public policies, and a host of other influences would necessarily have to be accounted for to have meaningful estimates.

Absolute salary differentials are enlightening however, as for example the comparison of average remuneration for comparable graduates between the United States and India. In India as of the middle 1960's, medical and engineering graduates received \$90 and \$70 per month, respectively;¹ while in the United States the

¹Indian rupies were converted to United States dollars at current exchange rates.

median annual salaries ranged from \$11,000 to \$15,000. "Even considering substantial differences in purchasing power, the strong desire of many to remain at home and the fact that India has exceptionally low salary levels, such differentials are too great not to encourage substantial emigration."¹

Watanbe has stated that low income per head is a fundamental cause of the flow from poor countries to rich countries. This stimulated emigration since it is the cause of low salaries. Also "the lack of purchasing power and/or mal-allocation of manpower in (a) country due to miserable conditions of life in rural areas will cause unemployment and underemployment among high-level personnel in spite of the social need for their services."²

Advantages Perceived in Professional Opportunity

Highly skilled persons are pulled to developed countries by the lure of opportunity for advancement, as well as, the advantages inherent in the initial position taken. Vertical mobility in many institutions in developing economies is apparently extremely rigid. The bureaucratic design of such institutions prohibits rapid promotion, regardless of merit.

The pervasive influence of traditionalism, conservatism, and bureaucracy act as a "push" force, encouraging departure. Watanbe has emphasized the fact that many positions in some countries are dominated by "old-timers", perhaps stymying oppor-

¹United Nations, Outflow from Developing Countries, p. 36.

²S. Watanbe, "The Brain Drain from Developing to Developed Countries," International Labor Review, (April, 1969), p. 420.

tunity for young graduates.¹ Even though the younger professionals have superior education and skills, the conservative attitudes of those with power serve to suppress the manifestation of their talents. In Adams' term, the rigid hierarchical structure in the educational system acts as a cartel with restrictive entry policies.² This is not the case in the United States, where promotion and advancement is more often than not based on performance and merit. In addition, the emigration of professional and scientific manpower is stimulated by a lack of such complementary factors as managerial and organizational talent in the home countries, particularly in the emerging African nations.

Moreover, in many such countries, there is a lack of employment opportunity, or an absence of jobs requiring specific knowledge obtained by the highly skilled. In such cases, emigration in search of employment is a logical course of action.

Logistical Support

Another type of advantage is particularly applicable but not restricted to scientists. This is what Oteiza referred to as a "logistical support differential."³ Many scientists ponder migration because of a deficiency of research facilities, computing facilities, and equipment, inadequate complementary factors

¹Ibid., p. 422.

²Walter Adams, ed., The Brain Drain, (New York, 1968), p. 6.

³E. Oteiza, "A Differential Push-Pull Approach," in The Brain Drain, pp. 120-135.

such as competent support staff, or, to a lesser extent, the lack of world wide communication due to inadequate library facilities. In training, persons become accustomed to expensive and technical equipment as well as a professional environment. The absence of the factors increases the propensity to migrate.

Moreover, there are few opportunities to engage in research in many countries, as very little government funds can be allocated to that end. Contrast this with the situation in the United States where huge sums are devoted to, for example, space and defense programs. In Brinley Thomas' words,

. . . there are two powerful forces pushing the American demand curve for human capital continuously to the right. First, there is the endogenous force - the tendency of private investment to require increasing doses of human capital to sustain its rate of growth. Then, superimposed on this there is autonomous public investment - the large scale expansion in space and defense programmes, involving an intensive use of professional manpower.¹

This situation has served to augment the flow of foreigners into the United States.

Closely related and lending further support to this contention is the fact that a lengthy period of time is required to increase the rate of output and the stock of highly skilled manpower. A sudden shift in demand for unskilled labor can be satisfied with comparative rapidity because of the shorter training period required. However, as mentioned above, the long period of education and training for the highly skilled, make

¹Brinley Thomas, "The International Circulation of Human Capital," Minerva, (May 4, 1967), p. 499.

such an immediate response unfeasible. In the words of Grubel and Scott,

Sudden shifts in demand for professionals within countries develop not only in response to government policies, but are also brought about by technical breakthroughs in industry and in the sciences. The development of computer technology, transistors, and jet engines have undoubtedly increased the demand for some special types of engineering skills, which the United States' market was able to fill only slowly and which was in part met by the inflow of migrants. The excess demand for college teachers caused by the unusually large generation of students of college age is another case in point.¹

Irrelevant Education

A major cause of the brain drain lies in the fact that the education received by foreign students in this country is not relevant to the manpower needs of their home countries. As a result, many skills obtained by foreigners while studying in the United States cannot be used. In Adams' words, some of the training may not be useful in "societies beset by pre-industrial, agricultural development problems characteristic of early development stages."²

Moreover, within the developing countries, there is need for coordination between educational structure and manpower requirements. It is possible that in many countries, the supply of graduates in many disciplines exceeds the demand. "This is often due to irrational factors governing educational planning. For example, universities are in many cases established for reasons of

¹Herbert G. Grubel and Anthony D. Scott, "The Determinants of Migration: The Highly Skilled," International Migration, (May 2, 1967), p. 136.

²Adams, The Brain Drain, p. 6.

national prestige, modeled on the educational system in developed countries without regard to local requirements."¹

We might ask with Walter Adams:

Do certain countries, like the Philippines for example, produce too many medical doctors in relation to effective demand for such talent at home? Do some of the African or Asian countries produce a disproportionate number of scientists in relation to the number they can possibly use at their current stage of development? Is there a serious lack of proportion in the "mix" between human and physical capital in the development plans of underdeveloped countries?²

John Shearer has stated that the key to foreign student brain drain is the lack of relevance of training to home country needs and employment opportunities.³ Based on his research and field investigations primarily in Latin America, Shearer concluded that for most underdeveloped countries, selection criteria reflected little relevance for domestic needs. A particularly significant case was in Argentina with regard to graduates in veterinary medicine and agronomists. Referring to Argentine graduate students in the United States, "of the 221 Argentine students in 1963-64 with a stated specialty, only one (.5 percent) was in veterinary medicine and only six (2.7 percent) were in agronomy. In previous eight years, none of the 499 entrants

¹Watanbe, "Brain Drain from Developing to Developed Countries," p. 421.

²Adams, The Brain Drain, p. 7.

³U.S. Congress, House, Committee on Government Operations, "Statement by John Shearer," The Brain Drain of Scientists, Engineers, and Physicians from the Developing Countries into the United States, Hearings, before a subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 2nd sess., 1968, p. 22.

were in veterinary medicine and only two (0.4 percent) were in agronomy. This dismal picture is representative of the frequently poor utilization of foreign (United States) training to help satisfy urgent needs for high level human resources."¹

Watanbe has pointed out that in many underdeveloped countries, the maladjustment of the educational system may be due to economic factors.

Where the economy depends largely upon investment by foreign companies, it will be very difficult for the government to plan education in accordance with manpower requirements, since these will be largely governed by the decisions taken by foreign investors. In any case, where education is not geared to the manpower requirements of the economy, graduates will find themselves unemployed or underemployed and will if possible, seek opportunities abroad.²

Still another closely related indication of the problems involved in use of skills obtained in training is that of salary differentials. R. K. Gardiner has stated that in some African countries, highly trained individuals forego careers for which they have been prepared such as law, medicine, or teaching, in favor of more lucrative positions in politics, public service, or government corporations.

When a tradition is created which puts a premium on bureaucratic as against careers in commerce and industry which can use entrepreneurs, managers, etc., more productively, very little incentive is left for working hard and taking risks.

This undesirable drain of skills into bureaucratic occupations has occurred largely because African countries have not evolved rational wage policies and a system of incentives by which remuneration for work done is based not on tradition.

¹Shearer statement, Drain from Developing Countries to the United States, p. 22.

²Watanbe, "Brain Drain from Developing to Developed Countries," p. 421.

heritage from colonial regimes, family status, or political connections, but on the relative importance of jobs in terms of the needs of development.¹

Restrictive Policies of Organizations in the United States

Yet another cause cited in the literature is what has been termed the monopolistic restrictive policies of certain organizations in the United States. Most often mentioned in this regard is the American Medical Association and how its policies in fact encourage the inflow of foreign medical personnel. This has been discussed in terms of the inadequate educational capacity of developed countries. There is evidently an excess demand for physicians in the United States.² The effective economic pull is not simply salary differentials, but vacancies, as well as an additional factor, the tempo at which United States universities expand. This latter situation creates faculty staffing problems.³ In fact, the reality of the brain drain is most evident in the case of physicians. It was pointed out in a recent study by the American Medical Association that of 47,082 students in graduate medical training in the United States, 13,829 were from foreign countries and some 25 percent planned to stay after graduation. In addition, over 50 percent of all physicians in Delaware, New Jersey, North Dakota, and West Virginia were foreigners who

¹R.K.A. Gardiner, "Africa," in Adams, The Brain Drain, pp. 198-99.

²Watanbe, "Brain Drain from Developing to Developed Countries," p. 450.

³H. Myint, "A Less Alarmist View," in Adams, The Brain Drain, pp. 237-38.

earned their degrees abroad. Eighteen percent of the annual increase in medical manpower in this country was accounted for by immigration. It has been estimated that this country would have to "build and operate about twelve new medical schools at an operating cost of some \$8 million per year per medical center" in order to produce the graduates domestically provided presently through immigration. Even more important is that some 75 percent of foreign medical students are from developing countries, few of which can afford the loss.¹

Charles Kidd has emphasized that physicians constitute a special case within the broad framework of high level manpower migration. He said that it would be virtually impossible to eliminate the demand for medical doctors from abroad by increasing the supply of graduates from existing United States medical schools. Furthermore, less desirable opportunities in the United States would even still be superior to those in the home country.²

Statistically, about 40,000 foreign physicians now practice in the United States. Twenty-five percent of all interns are foreign medical school graduates. Kidd estimates about 1,500 physicians emigrate to the United States annually. "We are the

¹R. L. Worsnop, "World Competition for Skilled Labor," Editorial Research Reports, Vol. I (1967), p. 446.

²U.S. Congress, House, Committee on Government Operations, "Statement by Charles V. Kidd," The Brain Drain of Scientists, Engineers, and Physicians from the Developing Countries into the United States, Hearings, before a subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 2nd sess., 1968, p. 51.

beneficiaries of a large pool of foreign physicians who are permanent residents in this country and also of the services provided by another group of large size composed of physicians who come to this country and then return home."¹

Slow Development Rates

A fundamental cause usually cited is simply the slow rate of development of many of the countries losing valuable high level manpower. "This not only gives rise to unemployment or underemployment among newly qualified high level personnel and limits their chances of material improvement, but also causes frustration due to such factors as lack of opportunities for initiative, poor prospects of promotion, uncertainty about the future, and so forth."² These conditions help provide the material for the brain drain.

Non-economic Factors

There are also factors with considerable impact on the brain drain which might be termed purely non-economic, political, or sociological causes. Included in a list of non-economic causes would be discrimination in terms of nationality, caste, tribe, political affiliation, family, etc. Discrimination of this type is very much a reality in many developing countries and serves to enhance the tendency to migrate.

¹Ibid.

²Watanbe, "Brain Drain from Developing to Developed Countries," p. 421.

Increased flows in migrants would quite likely tend to be closely correlated with political unrest and upheavals in home countries. As Watanbe mentioned, these conditions hamper implementation of development plans and create uncertainty. "The lack of political freedom and security affects highly trained personnel particularly, for they are more sensitive and vulnerable in this field. These factors seem to be specifically dominant in certain Latin American countries."¹

There may be, in some cases, simply a preference for urban life. If in the home country the market in a certain occupation is saturated in urban areas, individuals would be induced to emigrate.

A related cause which can be mentioned here is the offering of rewards, other than monetary, to potential migrants, by both industry and government in the receiving country. Influential factors of this type might include "general status in society, involvement in affairs of state or of cultural importance . . . (which) provide the individual with satisfaction and may have a value for him."²

Lack of Knowledge of Home Opportunities

Another circumstance which should be included in a list of causes of the brain drain is the fact that there is a lack of communication between foreigners studying in the United States

¹Ibid., p. 422.

²Grubel and Scott, "Determinants of Migration," p. 137.

and their home countries concerning employment opportunities. Naturally, if a foreign student is not aware of jobs available in his home country, the probability of his remaining in the United States is greater than it would be with more job market information. An example of the type of program which might be beneficial in this regard is the cooperative agreement initiated in 1966 between the University of Pennsylvania and Pahlavi University in Iran.¹ An effort has been made to recruit Iranian students and professionals in the United States for positions with Pahlavi University. Information was disseminated to Iranians through the University of Pennsylvania and interviews were held on that campus. A significant number of Iranians have been repatriated through this program. Its success has been attributed to these factors: (1) Pahlavi University was "Americanized" by exchanging professors, developing joint research projects, reciprocal recognition of degrees, etc. with the University of Pennsylvania; in an effort to influence potential migrating students to stay in Iran. (2) Higher salaries were offered. (3) Information in the form of journals, department curricula, salary scales, etc. was transmitted into the United States through the University of Pennsylvania. This type of program could be significant in encouraging students to return to their homeland.

Presented next is a set of causes which Watanbe terms "per-

¹A. Copeland, "Brain Drain," International Development Review, (September, 1968), pp. 21-3.

missive;" that is, those factors encouraging persons to migrate by removing barriers to their movement.

United States Immigration Law

The first and most important of these influences is immigration law in the United States. Into the 1952 Walter McCairan Act on Immigration and Nationality, was incorporated a preference system with regard to selection of persons allowed to enter this country. Persons with high education or exceptional ability were given priority within national quotas. The rather sharp increase following 1962 (Table 2, page 12)¹ was a reflection of a liberalization in immigration law, whereby skilled people were admitted without regard to national quotas. National quotas were removed with the passage of the Immigration Act of 1965, but the preferential system was retained. It has been stated that the liberalization of United States immigration has substituted discrimination on occupational grounds for discrimination based on national origin.¹

There have been structural changes in the economy of the United States which have led to an increased demand for high level manpower. The new immigration laws were an attempt to correlate the talent and skills possessed by immigrants with requirements of the domestic labor market; thereby making "immi-

¹U.S., Congress, House, Committee on Government Operations, The Brain Drain of Scientists, Engineers, and Physicians from the Developing Countries into the United States, Hearings, before a subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 2nd sess., 1968, p. 6.

gration policy an active instrument of national manpower policy."

A high priority has been assigned the professional category:

. . . qualified immigrants who are members of the profession, or who, because of their exceptional ability in the arts, will substantially benefit prospectively the national economy, cultural interests, or welfare of the United States.²

It was noted that the preference for highly skilled persons was incorporated because of a fear of an inpouring of unwanted labor from underdeveloped countries following abandonment of the national quotas system.

Visa Requirement Waivers

A second permissive factor is the practice of waiving the requirement of two years foreign residency following expiration of a temporary visa. This has been done in cases where permanent residence was deemed in the interest of the United States, or in hardship cases. The number of such waivers is shown in Chart 4.

International Skill Market

A final permissive factor is the reality of a truly international market for highly skilled personnel. With decreased transportation costs, the market for skilled labor is world wide. Watanbe discussed this market as follows:

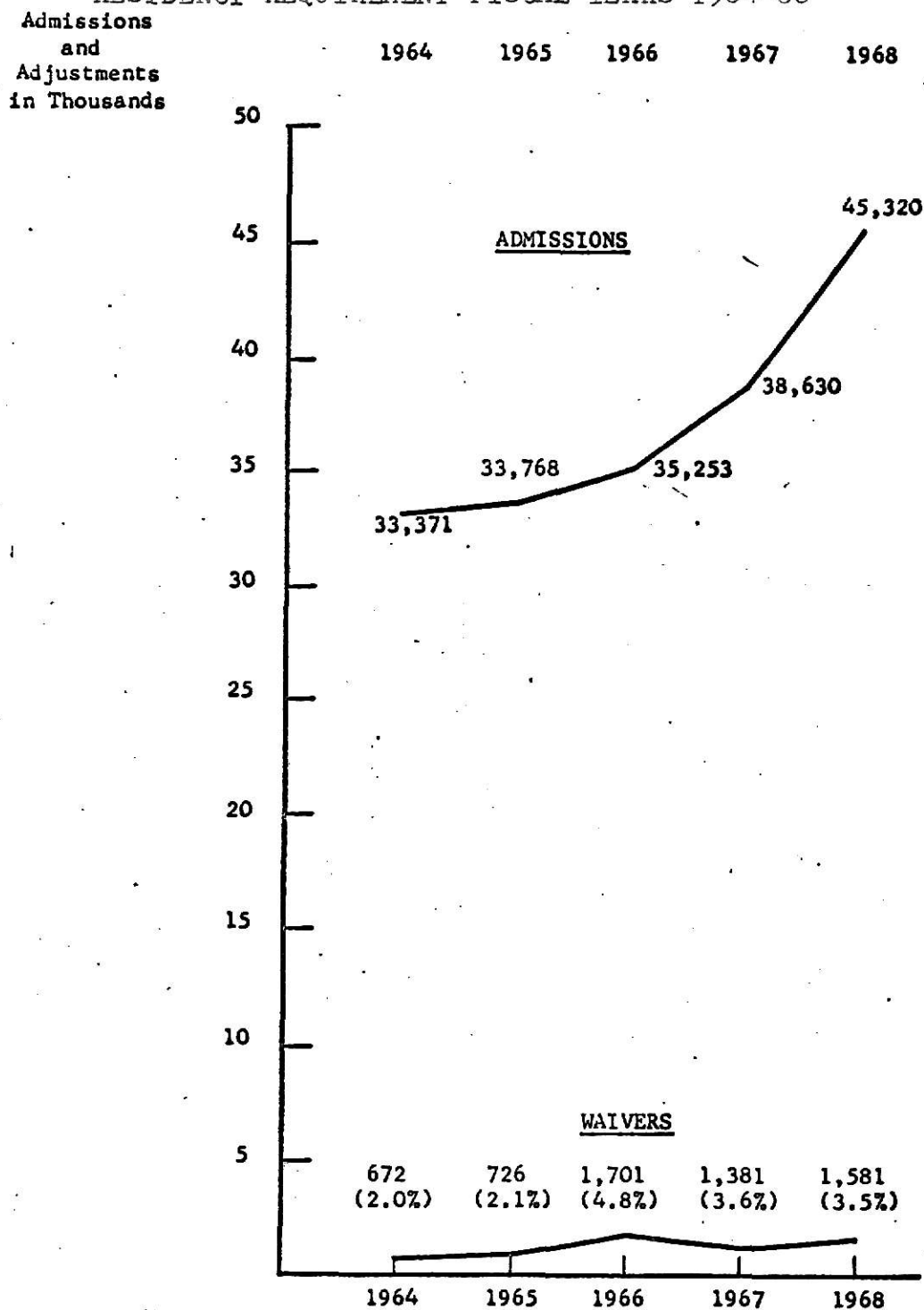
. . . there is a universal demand for their skills and knowledge without regard to their race, religion, colour and so forth; their knowledge of foreign languages; the greater opportunities they have for international contracts, through

¹S.P. Awasthi, "Manpower Aspects of American Immigration Law," Manpower Journal, (October/December, 1967), p. 68.

²Ibid., p. 69.

CHART 4

NUMBER OF EXCHANGE VISITORS* ADMITTED TO THE UNITED STATES WHO OBTAINED WAIVERS OF THE TWO YEAR RESIDENCY REQUIREMENT FISCAL YEARS 1964-68



* Includes students, teachers, research scholars, professors and others.

Source: Annual Indicator, 1968, Chart 25.

which they may have a chance to find attractive job openings abroad; and the greater ease with which they can travel (in view of their higher income) or get foreign employers to pay the costs for them.¹

The significance of these factors has been noted as follows:

As a consequence, many professional people migrate with employment contracts signed in their pockets, where the average unskilled worker has to rely on more or less imprecise information about entering the job market in a foreign country. The professional employment contracts often provide for payment of transportation costs by the employer, which at any rate are a much smaller proportion of a professional's annual earnings than they are of an unskilled worker's.²

Arising from the international market is greater mobility relative to unskilled labor because of such factors. The over-all knowledge of professionals "tends to make it easier to adjust to the environment of the country to which they migrate and may even make them derive positive utility from the adventures of travel and meeting the challenges of a new environment."³

Some Case Studies

It is necessary to analyze the outflow of high level manpower on an individual country basis. Much more research is needed on a disaggregate level in an effort to both identify the conditions giving rise to the brain drain and to evaluate the migration in terms of its effect on economic welfare and growth. The supply-demand relationships within both sending and receiving

¹Watanbe, "Brain Drain from Developing to Developed Countries," p. 426.

²Grubel and Scott, "Determinants of Migration," p. 135.

³Ibid.

countries for specific categories of human resources must be determined. Some efforts in this direction have been made, although they have been limited in scope, again due to data inadequacies. The following includes a brief review of the problem in some particular countries.

India

It was noted in earlier discussion that dramatic increases in Asian scientific immigration have occurred over the past few years. The underlying causes of the problem in India for example have been identified as:

. . . the prevailing status and income structure for the intellectual professions which is unequal in relation to the rest of the economy and also within the intellectual ranks. As a consequence, there is a mad scramble for university education and more education the ultimate of which is a scramble for going abroad for supposed advanced training. This results in an excess supply of the highly educated or the university-degreed and a surfeit of high specialization. The economy cannot absorb all their numbers at the price they expect.¹

A case in point is that of the unemployment of engineering graduates. It has been reported that some 40,000 technical people including 6,500 engineers were unemployed in 1968, a figure which represented about 13 percent of the total technical personnel in the country.² Sufficient opportunities did not exist for employment. This situation naturally served to augment the supply of potential migrants. It has been stated that for India,

¹V.M.Dandekar, "India," in Adams, The Brain Drain, p. 227.

²R.A. Sharma, "The Problem of Unemployment Among Engineers," A.I.C.C. Economic Review, (July, 1968), p. 25.

"the critical question is not whether there should be a shift of emphasis from the humanities to the sciences, but how education can be more closely correlated with the needs of the economy and the society."¹

An attempt has been made to indicate the types of data that would be necessary in evaluating the extent of the brain drain from India.² The information needed included the following

1. The number who go abroad during a year or stipulated period;
2. the migrant's purpose in going abroad including the nature of his activity while abroad;
3. the educational qualifications and skills of those who go abroad;
4. the migrant's duration of stay abroad either actual or probable;
5. the number of nationals returning from abroad with their educational qualification and skills;
6. the number of foreigners with their educational qualifications who are working in India in various fields;
7. the extent to which the migration of Indian nationals retards the development of the country.

As pointed out however, studies as exhaustive as this have not been carried out. The first six items of the above information list could be determined with a concerted effort at improving data-gathering techniques and procedures. The last point would

¹Eli Ginzberg, "An American Professor at Asian Universities International Educational and Cultural Exchange, (Summer, 1969), p. 18.

²P.M. Abraham, "An Outline for a Study of the Brain Drain from India," Manpower Journal, (October/December, 1967), p. 43.

be of much greater difficulty to specify. An assumption must be made regarding the "critical level" of education at which the brain drain constitutes a loss. One author has suggested that for India the level could be set as a first degree in any branch of engineering, technology or medicine, or a master's degree in science. Such a critical level would vary from country to country and its designation would necessarily be somewhat arbitrary. However, this type of approach is necessary in order to study the problem.

Remedies proposed to stem the outflow from India have included the following:¹

1. place a greater emphasis on the employment of scientific personnel in industry (only about 10 percent of graduates in science are presently employed by industry);
2. establish research and development departments in larger industries for improving products and processes, through the service of scientists;
3. induce greater participation of scientists in mineral, agriculture, forest and other resources surveys and assessments;
4. fill vacant scientific posts without delay;
5. selectively attract into teaching and technological jobs those scientists who are unemployed or have drifted into non-technical jobs.

Taiwan

Taiwan is another Asian country which suffers a substantial outflow of trained personnel. Between 1962 and 1967, some 14,300

¹P.M. Abraham, "Scientific Manpower in India," Development Digest, (April, 1969), pp. 69-76.

Engineers, technicians, teachers, and other specialists left Taiwan for better positions abroad, and most of these graduates were in the upper 15 to 20 percent of their graduating class.¹ More than 2,000 college graduates leave yearly with more than 80 percent destined for the United States. The most severe losses from this country have been in the fields of education, industry, and medicine. In speaking of universities in particular, one local professor has noted that "at present, the senior members of the faculties of the colleges and universities in Taiwan are over 60 years old. The junior faculty, who average around 23-24 years of age are recent graduates who have become teaching assistants There are in effect no faculty members above 23-24 and below 60."² In medicine, over 200 doctors have been leaving annually and hospitals were beginning to feel the strain.

For the year 1966, 54 percent of the students from Taiwan studying in the United States were engineers and scientists. It has been estimated that 90 percent of them would fail to return.

Other Asian Countries

Hong Kong lost over three times as many students as were admitted to Hong Kong universities in 1968. Some 1,300 students enrolled in the universities while 4,484 graduates of Hong Kong citizenship migrated to Canada, Australia, Great Britain, or the

¹"Taiwan Worried About a Brain Drain," New York Times, July 14, 1967, p. 14.

²"Republic of China Suffers from Brain Drain," Labor Developments Abroad, Vol. 13, No. 12, (December 1968), p. 9.

United States. The problem was felt to be serious because the colony was trying to achieve greater technical sophistication. The effort to lessen the outflow was hindered in that professional credentials from the United States often do not receive official recognition, because the government accepts only Commonwealth university degrees.¹

In Thailand and Malaysia, a shortage in the supply of professionals is regarded as a deterrent to the realization of planned growth rates. Educational plans are underway to augment the supply of these in the future.

Africa

Very little information is available on the African situation at this time, but the African contribution to the international pool of high level manpower seems small. Thousands of African students annually go abroad mainly to France and other European countries for study, but overall the continent has remained a net importer of foreign trained skills. It should be emphasized however that "the new countries of Africa plagued by disease have been left with a handful of doctors and practically no nurses, while hundreds of their nationals practice in Europe."² It was estimated for example that of the 150 Cameroons trained as doctors 100 were working in France. Reason for increased concern is evi-

¹"Hong Kong Suffers Student Brain Drain," Labor Developments Abroad, (July, 1969), p. 7.

²Nuri Eren, "Supply, Demand and the Brain Drain," Saturday Review, (August 2, 1969), p. 10.

dent in the data in Appendix I, especially for 1967 and 1968. Ghana, Kenya, and Egypt have incurred rather dramatic rises in scientists, engineers, and physicians emigrating to the United States.

It has been noted that "the migration of educated, skilled, and qualified persons in Africa has been influenced by . . . revolutionary change in political regimes, inducing a desire to escape from political reprisals."¹ On the other hand, it has also been observed that "in all probability one of the major contributions of the developed countries in diminishing the 'brain drain' from African countries has been made by the racial tension and discrimination within their borders."²

Colombia

A study of net emigration figures for Colombia in 1964 has yielded the results in Table 12. It should be noted first that two out of three emigrants leaving Colombia went to countries other than the United States, although it was possible that many subsequently moved to the United States after making intermediate residences in other countries.

It was pointed out that the country of emigration would have to be determined for those moving to countries other than the United States. "If other Latin American countries are . . . the

¹Gardiner, "Africa," p. 198.

²D. Patinkin, "A 'Nationalist' Model," in Adams, The Brain Drain, p. 95.

destination of the bulk of these emigrants, the focus of the problem would be changed; for although emigration always results in a loss of a valuable asset to the country of origin, removal to another developing country of the area, sharing an interest in the over-all development of the region, has different implications from emigration to a highly developed country. Such a pattern of migration would call for an evaluation not merely of the out-flowing human capital, but also of the possible gains and losses to the region as a whole, and to particular countries, of a more efficient allocation of its high level manpower."¹

TABLE 12

COLOMBIA: MIGRATION OF THREE CATEGORIES
OF HIGH LEVEL MANPOWER, 1964

	Emigration		Immigration	Net Migration
	Total	To the US		
All three categories	732	254	494	-238
Engineers	311	65	277	- 34
Natural Scientists	172	31	154	- 18
Physicians & Surgeons	249	158	63	-186

Source: Gustavo R. Gonzalez, "The Migration of Latin American High-Level Manpower," International Labor Review, (October, 1968), p. 561.

The total number of persons returning to Colombia in 1964 with qualifications which placed them in the category of engineers

¹Gustavo R. Gonzalez, "The Migration of Latin American High-Level Manpower," International Labor Review, (October, 1968), p. 562.

natural scientists, and physicians and surgeons, was 6,523. The total outflow of such persons numbered 6,105. However, for particular professions, the situation was more alarming. For example, the emigrant physicians represented some 39 percent of the domestic output of medical graduates.

Using an estimated figure of \$800 as the annual recurrent expenditure per student at the university level, an attempt was made to determine the value of the exported human capital. Institutional costs were thus set at \$4,000 for scientists and \$4,800 for engineers and physicians. Income foregone during schooling was estimated at \$6,920 and \$8,420 respectively. By these crude and incomplete estimates, the value of human capital lost through emigration was estimated at \$9.3 million and the value of the imported human capital was set at \$6.2 million.¹ A much more detailed study would be necessary before placing any degree of reliability on these estimates.

Argentina

The emigration of engineers from Argentina has been studied in some detail.² The importance of this category of high level manpower was put in the following terms:

Engineers play a crucial role within the top grade professions, since they are directly involved in opening up new fields of knowledge, developing the useful application of new ideas and discoveries and initiating and operating

¹Ibid., p. 564.

²Enrique Oteiza, "Emigration of Engineers from Argentina," International Labor Review, Vol. 92, No. 6, (December, 1965), p. 450.

rapidly changing techniques. These contributions have continuous influence on production, transportation, communications and domestic life, as well as on other activities of importance to an advanced modern society.¹

Engineers were considered important in the process of economic development, because they were closely related to productive economic activities. In Argentina, engineers were felt to have great influence on methods, process, and design, adapting those which had been developed in more advanced countries.

Engineer graduates accounted for 12.5 percent of all university graduates in Argentina in 1965. In 1962, one-half of the engineers graduating in Argentina worked in industry, whereas in advanced countries, three-fourths are employed in industry. This comparison was used as a basis on which to expect an increased demand for engineers as development ensued.

As of 1962, average annual salaries for engineers in Argentina were about one-third that received by their counterparts in the United States. In many cases, the employment conditions were such that engineers were subordinate to supervisors of much less education, giving rise to professional dissatisfaction. A 1967 study revealed that in Argentina, 81 percent of engineering graduates were "in occupations normally employing this type of professional, the rest being in occupations unrelated to their training."² The corresponding figure for developing countries was 94 percent. These conditions, together with political instability

¹Ibid.

²Gonzalez, "Migration of Latin America," p. 567.

and inflation encouraged emigration.

Summary of Causes of the Brain Drain

As evidenced by this discussion, the outflow of high level manpower is caused by a variety of circumstances firmly rooted in the economic and social conditions in the developing countries and in the immigration policies of the advanced countries. In the developing countries, professionals face low salaries, unemployment, and limited opportunities. They are pulled to the developed countries by high salaries, research grants, professional opportunity, and logistical support. Individual studies are needed, such as one recently done on professionals from Chile residing in the United States. The results of a questionnaire survey regarding reasons for emigration are given below:¹

- | | |
|---|-----|
| 1. Better remuneration ----- | 24% |
| 2. Professional advancement ----- | 29% |
| 3. Greater recognition of technical or
scientific work ----- | 16% |
| 4. Wider opportunities for research ----- | 13% |
| 5. Enhanced prestige upon returning to Chile -- | 7% |
| 6. Family reasons ----- | 6% |
| 7. Better prospects of finding job ----- | 4% |

¹"The Emigration of High-Level Manpower: The Case of Chile," Pan American Union, 1966; reprinted in U.S. Congress, Senate, Committee of the Judiciary, International Migration of Talent and Skills, Hearings, before a subcommittee of Immigration and Naturalization of the Committee on the Judiciary, United States Senate, 90th Cong., 1st sess., 1968, Exhibit 4, p. 325. Each person was asked to check one or several alternatives.

A similar study of Indian emigrants in the United States revealed 31 percent of those surveyed indicated "better opportunities for research" as a principal reason for staying. Some 25 percent answered "better occupational advancement," 20 percent said "better standard of living," and 19 percent stated "better salaries."¹

It will be noticed that "professional advancement" and "better opportunity for research" were the most frequent reasons given. It is possible that similar patterns of response might be detected from emigrants of other nationalities.

Economic Effects of the Migration of High Level Manpower

Thus far, theoretical aspects of labor migration have been considered, followed by discussion of the characteristics of the highly skilled which make them relatively more mobile and which can therefore be considered as the causes of the brain drain. Discussion will be continued now on what has been essentially theoretical analysis of the problem by several writers. The goal of this section is to analyze specifically the flow of highly skilled migrants in terms of its economic effects on both the sending and receiving countries.

As pointed out earlier, the distinguishing characteristic of the highly skilled assumed for the purposes of this paper is in terms of the embodiment of (significant amounts of) human capital.

¹K.D. Sharma, "Indian Students in the United States," International Educational and Cultural Exchange, (Spring, 1969), p. 52.

Human capital can be defined as the knowledge and skills in human acquired through education and/or experience. There has been in the literature of recent years increased emphasis on the importance of human capital to economic growth and development; a proposition that will not be debated in this paper--rather its importance will be assumed as valid for the analysis to follow.

The education, health, alertness, and motivation of workers constitute a major factor in economic development. The role of science and technology is that innovation in products and in production techniques turns the process of change itself into an important factor of economic growth. When these two factors, the significance of work force quality and the effects of science and technology are considered together, the critical importance of scientists, engineers, and physicians to national development becomes evident. While, on the one hand, a balanced, high-quality total work force is important and necessary, on the other hand, scientists, engineers, and physicians comprise a group of singular significance to developing nations. In addition to having an economic value, these highly trained people constitute the small slice of population that provides intellectual, political, and cultural leadership.¹

As Kenneth Boulding has written, "it is clear that a society, a country, or a region which is exporting skilled, trained adults with high learning potential is losing human capital and it is usually the case that societies which are receiving these people are gaining human capital and gaining potential growth."² No attempt is made at this point to ascertain net effects on individual countries, but the point is that human capital is a strategic resource critical for development and further analysis of

¹U.S. Congress, Senate, International Migration of Talent and Skills, p. 183.

²Kenneth Boulding, "The National Importance of Human Capital," in Adams, The Brain Drain, p. 113.

the brain drain will be made with that in mind.

It can be said that in some cases, it is quite possible that human capital may be a more decisive force in determining the economic growth rates than physical capital. Boulding cited as an example the rapid re-development of both Germany and Japan following World War II. The fact that even though physical capital was destroyed, remarkable recovery occurred in a relatively brief time period, is attributed to the human capital which remained intact, enabling those countries to "recover not only their former extent of physical capital, but to generate a rate of development which far exceeded what they had had before."¹

Human capital, by general consensus, is important to developing countries. How does the international migratory movement of human capital relate to problems of these countries in terms of development and/or welfare? It is to this aspect of the problem to which the discussion is directed next.

Cosmopolitan Approach

Harry G. Johnson has approached the problem of the economic aspects of the brain drain by initially assuming that emigration, being a free choice of individuals, was a beneficial process to the world as a whole.¹ He further assumed that migrants move in response to an economic gain. World welfare would increase ex-

¹Ibid., p. 112.

²Harry G. Johnson, "An 'Internationalist' Model," in Adams, The Brain Drain, p. 75.

cept in the case where a miscalculation was made in the social costs involved in the move, which might therefore have exceeded economic gain. In order to have had a loss in world welfare resulting from migration, social costs to those remaining in the home country must have exceeded the sum of the private gain of the migrant plus any gain which accrued to the recipient country. If such a loss did occur, the recipient country could compensate, in some manner, the donor. "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."¹ Johnson emphasized the discussion should be concentrated on the determination of the net effect on world welfare, and secondly, the specific effects on those members of the donor countries who remained at home.

Johnson stated that an economic loss could occur if the ratio of the emigrant's social contribution to his private income in the country of emigration was relatively higher than in the country of immigration. This might occur in two different ways: first, if the tax structure was relatively more progressive in the sending country; and secondly, if externalities associated with the emigrant personally were greater in the home country. However, Johnson believed that income differentials between developed and developing countries were large enough to make the former type of loss virtually impossible. In addition, on the

¹Ibid., 76.

average it was likely "that the more progressive fiscal structures and income policies are to be found in the developed countries, with the result that the gain in world social product from this type of migration will exceed rather than fall short of the gain in private income."¹

Having thereby minimized the probability of the first of the potential sources of economic loss, Johnson turned to the question of externalities by having recognized four possible situations:²

- (1) Emigrants who were potential inventors, innovators, or managers may have been employed in more routine work in the developed country. However, as discussed earlier in this paper, the developed country may be the only location where a significant contribution to world output could be made.
- (2) Emigration of members of certain professions may have resulted in a loss of the externality realized in the form of informal education through instruction and example to fellow citizens. Johnson felt that losses of this type were questionable because it was debatable how much of this type of service was performed.
- (3) The emigration could have caused a significant decline in the number of professional people in developing countries, thereby having lowered the incomes of cooperating factors. Johnson argued that this loss was unlikely because the reduction in the marginal products of cooperating factors

¹Ibid., p. 80.

²Ibid., p. 81-82, summarized.

would have had to exceed the emigrants income gain.

- (4) By having decreased the number of professional people in the developing country, diseconomies of scale of production might have been incurred. This result would depend, however, on the assumption that the stock of professionals fell; a contention necessitating empirical verification.

Johnson did not believe that any of these situations warranted concern in that it was highly improbable that any one of them was realistic enough, or of sufficient quantitative significance, to impose a world loss. None of the types of losses were of such magnitude as to offset the income gain of the emigrating factor.

It was emphasized again, however, that the sending countries were doubtlessly destined to lose as a result of the emigration of high level manpower. It has been argued that tax revenues would have declined in the sending country, and to the extent that these exceeded the public services consumed by the emigrants, a loss was incurred. Johnson elaborated on this point by identifying two results; first, the redistribution effects, and secondly, the argument concerning the loss of tax revenues which would have gone for retirement pensions. The redistribution effects would have been in proportion to the loss of the share of the emigrant's income received by those remaining behind through government expenditure policy. He conceded the validity of the second as well.¹

¹Harry G. Johnson, "International Economics: Discussion," American Economic Review, LVI, No. 2, (May, 1966), p. 283.

Referring to the potential loss because of the reduced incomes of those remaining behind, Johnson made the following analysis:

According to the . . . international trade theory of the relation between international trade and factor prices, a country can adjust to changes in the ratios of factors of production available to it, without any change in the prices of the services of the factors themselves, by altering the ratios in which it produces goods that use the available factors with relatively different intensities, while avoiding the losses entailed by consuming the commodities in question in less preferable ratios by exchanging abundant for scarce goods through international trade.¹

Losses of this type were thus considered negligible.

Johnson's analysis has by his own admission been quite general, and "rather skeptical" about possible losses. In response to those lamenting the effects of the brain drain on developing countries, he replied, "it is true that if and when these countries become fully developed, they will need and be able to employ much larger numbers of educated people; but this does not imply that in their present circumstances additional educated people would necessarily contribute significantly to their development."² Johnson can be considered a champion of free migration policy.³

Herbert G. Grubel and Anthony D. Scott have also attempted

¹Johnson, "An 'Internationalist' Model," in Adams, The Brain Drain, p. 85.

²Ibid., p. 86

³For graphical analysis of the effects of emigration of professionals on the welfare of those remaining behind, see Harry G. Johnson, "Economic Aspects of the Brain Drain," Pakistan Development Review, (Autumn, 1967), pp. 398-409.

to analyze the brain drain from a theoretical point of view.¹ They formulated their analysis based on the following assumption: a country is an association of individuals whose collective welfare its leaders seek to maximize. They rejected as "outmoded" the idea that if the goals of society were maximum economic and military power, then emigration was harmful due to a fall in the quantity of manpower. Military power, in today's world, was not dependent so much on the number of able bodied men. Economic power did not depend on a total national output as much as on the value of goods and services available for consumption, export, or income per person. Furthermore, the authors pointed out that "while the level of individual welfare is determined by many factors, including items of collective consumption such as military might and foreign economic influence, the most important determinant of human welfare in the long run is the standard of living; that is, the quantity of goods and services available for consumption."²

Primary emphasis thereby having been placed on income changes precipitated by emigration, Grubel and Scott assumed that emigration did no harm when the following conditions held: a) the emigrant improved his own income (assumed to be the case if movement was voluntary), b) no loss in income was imposed on

¹Herbert G. Grubel and Anthony D. Scott, "The International Flow of Human Capital," American Economic Review, LVI, No. 2, (May, 1966), pp. 268-74.

²Ibid., pp. 271-72.

those who remained in the home country.

As noted in their discussion, traditionally labor emigration has been believed to increase the long run average income of those remaining in the home country, due to an increase in the capital-labor ratio. However, the migration of highly skilled manpower will limit this effect to the extent that the capital embodied in the migrants exceeded the total per capita human and physical capital in the sending country. It was pointed out that in market economies, any reduction in average income would be only a "statistical phenomenon . . . with no influence on the welfare of the remaining people," because the migrants removed not only their contribution to national output, but also the income giving rise to a claim on a share of that output. Grubel and Scott concluded that redistribution of income effects were minimal due to the relatively small numbers of people involved in the migration.

Two major consequences of the brain drain were identified, these were: first, short-run adjustment costs, and secondly, market failures in allocating resources following emigration. With respect to the first of these consequences, due to the loss of human capital, short-run production losses would be encountered to the extent that complementary factors were unemployed or ineffectively employed. It was possible, for example, that such inefficiencies could have occurred when highly skilled persons left functioning groups without leadership. Grubel held that foreign students in the United States "rarely leave behind production units whose efficiency is reduced by their decision to

remain in the United States, simply because the economy had never become dependent on their skills."¹ The magnitude of these types of short run losses would be a function of the degree of substitutability of factors of production, as well as the speed with which replacements for the departed human capital could be trained.²

With reference to the "market failure" consequence, long-run costs would be manifested in the inability of the free market to allocate resources efficiently due to the emigration. One category of such costs concerned externalities with respect to the productivity of other inputs or the utility levels of other consumers. Specifically with high level manpower, some individuals might not have received compensation commensurate with contribution to society. Thus, for example, "if a typical doctor's work contains a large measure of social benefits for which he does not get compensated, these benefits are lost to society only for the length of time required to train another person to take his place as a doctor."³ As the authors pointed out, "this argument assumes the existence of a market mechanism, supplemented by rational government action to adjust for the externalities through the provision of subsidies in the training of doctors, which causes society to

¹Herbert G. Grubel, "Nonreturning Foreign Students and the Cost of Student Exchange," International Education and Cultural Exchange, (Spring, 1966), p. 22.

²Grubel and Scott do not pursue the issue of short run costs beyond the above observations. This aspect of the brain drain is felt by some to be of considerable importance.

³Grubel and Scott, "International Flow," p. 271.

have a determinant stock of physicians that tends to optimal, given society's alternative uses of resources and tastes."¹

Another category was concerned with the changes in the costs of providing public services which were imposed on the citizens remaining behind. One argument held that emigrants owed a "debt to society" and should repay the cost of their education, a contention discounted by Grubel and Scott as a "misapprehension." They felt that education was most rationally viewed as a process whereby the current generation taxed itself to educate the young, and when emigrants left, they took their children along. Thus, the per capita burden of education costs remained unchanged.

Grubel and Scott believed that there was evidence that the enjoyment of the most quantitatively significant government services was proportional to taxpayer's income. They concluded then that emigration produced no adverse welfare effects in that respect. According to Grubel, "there are strong indications that above-average taxpayers also use more roads and other services--as well as demand above-average education for their children--than do average taxpayers; and that only a relatively small margin of their taxes goes toward redistribution of income."² High income groups only subsidized government services to a limited extent in such examples as parks, or programs to upgrade the standard of

¹Grubel and Scott, "The International Flow of Human Capital: Reply," American Economic Review, (June, 1968), p. 547.

²Herbert G. Grubel, "The Brain Drain: a U.S. Dilemma," Science, Vol. 154. (December, 1966), p. 1,422.

living of the lowest income groups. They even suggest that many services could have been decreased in number proportionate to the loss in tax revenues caused by the loss of high income members of society. Here again, per capita burden would have remained unaffected.

Turning to the potential benefits that could be derived by the sending country as a result of the brain drain, Grubel and Scott identified first the possibility of increased disposable incomes of those remaining behind through remittances. Secondly, knowledge was a "free good" and as a result, the research of scientists and engineers would be available to all countries when published. Moreover, for many of the reasons mentioned elsewhere in this report, the potential productivity of such professionals might never have been realized if emigration had not been possible, since the costly research could never have taken place outside the United States.

Summarizing the Grubel-Scott analysis, emigration was good so long as the emigrant improved his income and no reduction in income was imposed on those remaining behind. Short-run losses might have been felt, but only for the period required for replacement or re-training. Long-run losses could have occurred, primarily associated with income redistribution and/or externalities, but they were apt to be small and rare. Moreover, benefits probably exceeded these losses. The final conclusion reached by Grubel and Scott was that "a good case can therefore be made for

a continuation of present policies and the free movement of human capital throughout the world."

Several writers in commenting on the Grubel-Scott analysis have expressed some disagreement with certain of their conclusions and offered alternative arguments. For example, Burton A. Weisbrod noted that by modifying the second of their conditions for harmless emigration to read, "the migrant's departure does not reduce the income of any of those remaining behind," then the two conditions comprised the necessary and sufficient conditions for Pareto optimality.¹ Weisbrod felt that based on these altered conditions, the redistribution effects might have been of considerable importance.

If, for example, the physicians who emigrate constitute a 'sizable fraction' of all physicians in the 'area'--as in the case of rural town that loses one of its two or three physicians--the redistributive effects among the remaining people may be substantial. Even if the emigrants are a tiny fraction of the national supply of persons with some particular skill, they may be a large fraction for some relevant subnational region.²

Weisbrod believed that this was one of the main economic consequences of the brain drain.

The validity of the Grubel-Scott argument with regard to the absence of welfare loss because the emigrant removed both contribution and claim to national output, has also been questioned. If the emigrants saved and invested in the home country, they

¹Burton A. Weisbrod, "International Economics: Discussion," American Economic Review, LVI, No. 2, (May, 1966), p. 278.

²Ibid.

would generally have removed more resources to other countries than by their former consumption at home. The effects of such a resource movement are stated below:

To the extent, therefore, that the extra incomes of the highly paid professionals can be saved, taxed, or otherwise appropriated, the emigration of these high income receivers and automatic savers cannot, even from a welfare viewpoint (and regardless of their legal claims on that output), be regarded as harmless or beneficial to their country of origin.¹

Brinley Thomas expressed the opinion that the short-run adjustment costs alluded to by Grubel and Scott as being minimal, were quite likely to be of substantial magnitude. Having pointed out the long gestation period of the skilled people comprising the brain drain, Thomas stated that the "immediate adaptation of resources to the removal of highly skilled emigrants (retraining, for example) may entail considerable frictional losses."² Similarly, the loss of a key professional "not only calls for a substitute with the emigrant's technical qualifications, but also with the quality of leadership which was a necessary condition of maximizing the value added by the team."³

A different interpretation of the loss incurred with respect to the effects of the brain drain on the costs of government services was discussed by Weisbrod. This loss should have been associated with the income redistribution effects it brings about.

¹J. Amuzegar, "Brain Drain and the Irony of Foreign Aid Policy," Economia Internazionale, (November, 1968), p. 706.

²Brinley Thomas, "The International Circulation of Human Capital," Minerva, V, No. 104, (Summer, 1967), p. 480.

³Ibid., p. 491

If an emigrant paid more for government services than the marginal cost of what he consumed, then his emigration would shift--that is, redistribute--more of the tax burden to other tax payers. Since those services that are provided publicly tend to be those for which marginal cost is less than average cost, taxes will tend to exceed marginal costs. Thus, net emigration is likely to increase taxes on those who remain.¹

Empirical investigation is needed to properly assess the validity of the argument.

Issue has been taken with the Grubel-Scott contention that the enjoyment of the quantitatively most significant government services was proportional to taxpayer's income. Examples of instances where the highly skilled received less welfare benefits from the government than common laborers were the fact that many of the former's children did not attend public schools; they had their own private health insurance, hospitals, and medical care; they seldom use city parks, public beaches, free concerts, and other free public amenities. "Since the incidence of tax on these people is thus seldom equal to the benefits from government services, the result of their emigration, . . . must be adverse" ²

Professor Kannappan has stated that if the Grubel-Scott argument was to be applied to developing countries, some modifications of their analysis and conclusions were of necessity. He cautioned the following:

When, for whatever reason, future gains are discounted at a high rate, their low present value may lead to outflows of

¹Weisbrod, "International Economics: Discussion," p. 279.

²Amuzegar, "Brain Drain and Irony," p. 706.

trained manpower, with adverse consequences for economic growth. Further, a significant outflow of individuals of a particular category may raise the cost of their services or render them unobtainable, and rigidities in recruitment and remuneration policies may prolong the difficulties of replacement.¹

Furthermore, the proportionality between tax payments and public services consumption may not have existed. Kannappan also felt that foreign students were the recipients of a subsidy from the home country upon embarking on overseas education.² Kannappan believed that the above qualifications lent more support to the credibility of a welfare loss, which appeared to have been higher among those having received their education abroad.

The analyses of both Johnson and Grubel and Scott have led to similar conclusions. By evaluating the effects of the brain drain in terms of world welfare, these writers have pronounced the migration economically efficient because it was in general a move from low to high productivity employment. That is to say, "resources will be allocated on a world-wide basis in the interest of maximizing world output; they will be allocated on the basis of optimal efficiency."³ Recipient countries obviously benefit. Losing countries gain because they can share in the scientific and technological advanced disseminated from the developed coun-

¹Subbiah Kannappan, "The Brain Drain and Developing Countries," International Labor Review, (July, 1968), p. 11.

²This does not refer to students awarded competitive scholarships, as these students cannot necessarily be regarded as receiving a subsidy in the form of resources from home.

³Adams, The Brain Drain, p. 4.

tries, and receive remittances. Any attempts to reduce migration should be viewed with some wariness for these reasons. This type of analysis of the brain drain has been identified as the "internationalist" school.¹

A "Nationalistic" Approach

An indication of a different theoretical view of the brain drain is evident from the criticisms presented of this "internationalist" viewpoint. An opposing school of thought approaches the problem from the standpoint of the nation, and thereby ascertains an economic danger inherent in the loss of the highly skilled. Human capital is regarded as a strategic resource, sorely needed for economic development, any loss of which can seriously imperil the development plans and goals of the developing countries. It is felt by some that the continued flow from underdeveloped to developed will simply perpetuate and enlarge the "gap" between rich and poor countries. A discussion of typical reasoning by the "nationalist" school is presented in the next few paragraphs.

Don Patinkin believed that the concern caused by the brain drain was implicitly a rejection of the viewpoint that the welfare of the world was maximized by a free flow of productive resources among countries.² That is, for example, the developed countries

¹A similar conclusion was reached by R.P. Sinha, "The Economics of Brain Drain," Manpower Journal, Vol.4, (April/June, 1969), pp. 54-74.

²Don Patinkin, "A 'Nationalist' Model," in Adams, The Brain Drain, p. 93.

would not have agreed with the above proposition if the resources in question were the population masses of Asia; and similarly, the developing countries would have rejected the proposition when referring to their highly skilled manpower.

Patinkin emphasized the importance of the existence of nation states in dealing with the brain drain. He rejected the idea that the world should have been considered as an entity, the welfare of which was to be maximized. The world was made up of individual nations, and the loss of the intellectual segment could have endangered economic development prospects. He examined some of the types of losses the sending countries might have incurred. Examples given of possible external diseconomies resulting from the brain drain included that of the departure from a developing country of a distinguished member of a particular university. The loss may have been a serious one both in terms of prestige and the fact that "the difference between a first-rate university or departure within it and a mediocre one lies in a relatively small number of outstanding people who set the criteria and lend the tone."¹ Another underestimated potential loss was that the flow of young Ph.D.'s abroad "decreases the probability that the country in question will really have the pick of its people." Still another loss was in potential political leadership; or on the other hand, intellectual leadership in pursuit of governmental change. Patinkin admitted the difficulty of placing quantitative

¹Ibid., p. 102.

significance on the above types of losses; nevertheless, he believed them to be important considerations. Finally, Patinkin contended that in fact the United States stimulated to a large degree the flow of foreign manpower into that country because of its own "nationalistic" policies as related to United States government defense and space programs, and in the research grant policies followed by the United States government and United States foundations. Specifically referring to the latter, Patinkin felt that "considerations of world welfare should lead to an increased flow of research funds out of the United States, because of the lower salaries of scientists elsewhere in the world." Nevertheless, United States government agencies and United States foundations did not attempt to maximize "world welfare in this way, but instead followed the nationalistic policy of giving highly preferable treatment to scientists already resident within the borders of the United States, or who were willing to join the 'brain drain' and take up residence there."¹

Brinley Thomas rejected the "internationalist" advocacy of unrestricted international movement, by pointing out that in the circumstances giving rise to the brain drain, "there are divergencies between marginal social values and costs in countries at different levels of development; earnings do not correspond to marginal products over the international economy."² He therefore

¹ Ibid.

² Thomas, "International Circulation of Human Capital," p. 493.

felt that control of factor movements was "justifiable." He noted that developing countries would benefit significantly in terms of external economies if their high level manpower supply was augmented, and vice versa if these people emigrated.

Moreover, structural changes were a necessary ingredient in the inducement of economic growth. Pioneering investment in a developing economy might have had to go through a growth period before the realization of external economies dependent upon size (such as transport networks, technical education, research) took place. The consequences of this situation were outlined as follows:

If it is left to purely marginal incentives, skilled workers and highly qualified personnel who cannot be employed at home will emigrate to richer countries, and yet, this human capital is essential in the long run if the poor country's comparative advantage is to be realized. Unless there is interference with market forces in order to provide a breathing space, the developing country will be deprived of a cumulative flow of benefits and will remain poor. It is for these reasons, among others, that reliance on the verdict of the market economy can lead to a widening of the gap between rich and poor countries.¹

A similar conclusion was stated by Professor Gordon Sutherland in these words:

Only when all countries accept the principle that it is their responsibility to provide for their needs by training their own nationals in the fields (of science, engineering, and physicians) will the brain drain and all its attendant problems be alleviated. Just as the international flow of manufactured goods and materials cannot be left to the mercy of unrestricted free trade, so it seems . . . inevitable that some measures for control of the international flow of scientists will have to be introduced by international political agreements to protect the poorer from the richer nations.²

¹Ibid., p. 494.

²Gordon Sutherland, "The Brain Drain," Political Quarterly, (January, 1967), p. 61.

J. Amuzegar, an Iranian economist, in commenting on the Grubel-Scott analysis, conceded the fact that under certain conditions, the migration of professionals from low-wage and population-dense areas to capital-abundant and less-populated areas could have benefited both. In developing countries, however, both from the viewpoint of "domestic ambitions, aspirations, needs and requirements, and also for, the sake of world economic development, the brain drain caused distinct negative effects. For in those countries there were many genuine cases of economically significant externalities, as evidenced by the often catalytic or vectorial influences of one man, one strategic project, or one activity whose losses cause the whole program to collapse."¹

John Shearer has raised objections to the "internationalist" contention that the highly skilled emigrants owe no debt to the sending country. Referring to non-returning foreign students, he indicated that "most students received at least their secondary education at home, and all the costs of gestation, birth, and their food, shelter, clothing, and services throughout all their many nonproductive years were incurred by the home countries."² Shearer regarded these costs as investments made to "increase the individuals' future contributions to society." The sending country was thus deprived of most of the benefit.

¹J. Amuzegar, "Brain Drain and the Irony," p. 707.

²John Shearer, "In Defense of Traditional Views of the 'Brain Drain' Problem," International Education and Cultural Exchange, (Fall, 1966), p. 23.

An interesting point often brought up by writers on the brain drain who disagreed with the Johnson and Grubel-Scott type conclusions, was the irony of the United States' policy of sending foreign aid to many of the developing countries from which was received by immigration substantial numbers of high level manpower. It is known that the rich countries of today are committed to sharing knowledge and production methods with the developing countries--much of which is in the form of techniques and specialists--while a simultaneous outflow of similar manpower is occurring from the countries receiving the aid. This situation was felt to be "ironic because the migration drains of skills and talents occurs in the very countries where economic progress is badly hampered by an allegedly desperate shortage of professional manpower."¹ Moreover, it was self-defeating for the rich countries to attempt to curtail immigration because "one of the primary objectives of foreign aid has always been the education and training of talents and skills in the emerging nations as a pivotal element of economic progress."

Alternative Proposals for Evaluation

Brinley Thomas has suggested an analysis of the brain drain in terms of growth.² He based his approach on the assumption

¹Amuzegar, "Brain Drain and Irony," p. 700.

²Thomas, "International Circulation of Human Capital," p. 494. Also see Thomas "From the Other Side: A European View" The Annals of the American Academy of Political and Social Science, (September, 1966), p. 63-72.

that "in each country the government is seeking to maximize the rate of growth of real output per head over a given time period and pursues a policy of discriminating in favor of highly skilled immigrants." The rate of increase in income depended on both physical and human capital growth rates. Since in the modern world, human capital was highly mobile and "flows to areas where real productivity per head is highest; it constitutes a gift from the areas which incurred the costs of investment." The effect of this movement was stated as follows:

The United States, in view of its size, its advanced technique and high productivity per head, and its relatively large propensity to consume inputs of human capital, naturally exerts a strong pull, whereas less developed countries, whose growth plans also presuppose a given rate of growth of human capital, may be handicapped by an outflow of talent.¹

E. Oteiza has suggested a differential comparison of certain relevant factors in sending and receiving countries, in an effort to discover why the highly skilled migrate, and thereby help resolve policy problems involved in reducing the flow.² He considered the following factors:

- 1) Income Differential (ΔI): This was to be measured by wage differentials for different professions.
- 2) Logistical Support Differential (ΔI_s): This was a measure of the difference in support received enabling an effective working environment.
- 3) Differential of the relative average wages of a professional category in comparison to national average

¹Ibid., p. 495.

²E. Oteiza, "A Differential Push-Pull Approach," in Adams, The Brain Drain, pp. 120-35.

income per capita of the labor force (Δsp): This was a measure of social prestige.

- 4) Differential (Δof): A measure of other factors which was to include for example, political stability, promotion policies, etc.

Oteiza believed that it was by a comparison of the above factors in the two countries, the decision to migrate was made. The final differential called the "preference differential" would be:

Preference Differential $\Delta Pr = F(\Delta I, \Delta Is, \Delta sp, \Delta of)$. If Pr was positive, a supply of migrants was to be expected from the country of origin to the other; if negative, no supply would have been available. By empirical study along these lines, agreements could have been worked out with regard to altering the magnitude of the differentials in an effort to influence the inter-country flow of professionals.

Summary

In essence, the preceding discussion has identified two rather extreme positions, resulting in equally extreme conclusions regarding the effects of high level manpower migration on the countries involved. On the one hand are those rejecting the significance of any "loss" to the developing country; in fact, benefits are to be derived such that free international flow should be continued without interference. Opposed to this view are those who deplore any loss in highly skilled personnel because it inflicts economic and social hardship, both current and future, on the developing countries.

By way of summary, the elements of benefit and loss to the

developing countries could be listed as follows:

Benefits

1. The countries of origin benefit if the cost of training students who return from abroad was borne by the advanced country.
2. Remittances sent home from emigrants increase disposable income to the recipients and are helpful to balance of payments situations.²
3. Knowledge production by the emigrants in the areas of basic research, new products, or production techniques if made available through world-wide dissemination.
4. The problems of developing countries may be put into the proper perspective and may thus enhance understanding and awareness of the plight of particular countries.
5. A pool of nationals is formed abroad which provides a source of manpower from which to recruit when a capacity for utilization is attained.

Losses

1. To the extent that the origin country incurs the cost of maintenance of students abroad, a loss is sustained.
2. The direct education outlays allocated to the student during pre-emigration years at home are thereby deprived of the expected return.
3. Earnings foregone during the educational period as well

¹Grubel has estimated that for the year 1962, the net cost of the United States foreign student exchange program was \$17 million, representing a gain to the rest of the world. See "Non-returning Foreign Students and the Cost of Student Exchange," International, Education, and Cultural Exchange, (Spring, 1966), p. 29; also see Grubel and Scott, "The Immigration of Scientists and Engineers to the United States, 1949-61," Journal of Political Economy.

²One study of the Greek situation indicated that the Greek gross national product would have to be deflated in the absence of remittances if the exchange reserves position was to be maintained at the same level as with remittances. See E. Botsas, "A Note on Migration and the Balance of Payments," Economia Internazionale, Vol. XXII, No. 2, (March, 1969), pp. 247-51.

as future earnings and their contribution to national income are lost.

4. Contributions to subsidize overseas education are lost to the extent that students remain permanently abroad.
5. The sending countries lose the externalities derived from the emigrating professionals, whether they be in terms of leadership ability, innovation potential, entrepreneurship, or other externalities affecting both consumption and production.
6. Employment problems arise and short-run replacement costs are incurred.
7. Inefficiency in production could result if replacements are less capable of performing.
8. The loss of professionals hinder the attempts of the developing economies to stimulate growth through manpower shortages in particular high levels of professions.

An effort to determine the net balance for the developing countries has proven to be a difficult and controversial task because the extent of benefit and loss varies greatly among countries. Admittedly, a great deal of the preceeding discussion has dealt in broad generalities, but it serves to emphasize the need for further research on the problem.

CHAPTER IV

Summary and Conclusions

This investigation into the migration of high level manpower has of necessity been somewhat inconclusive. As one writer put it, "Better information on the international movement of highly trained people is badly needed. It is ironic that we have kept detailed statistics for decades on shipments of coffee, cocoa beans, steel and cotton, but that we have only general approximations to the current flow of human beings."¹ The analysis of the magnitude and composition of the international flows of professionals could only partially be ascertained, but it is evident from data available that the numerical losses suffered by developing countries have been increasing over the past decade, with sharp upsurges noted in the last three years. The few individual countries discussed gave additional support to the contention that some countries incur more pronounced "net" losses than do others, thereby emphasizing the need for further research on an individual country basis.

The decision to migrate was seen to be a function of a wide range of variables: the talents of the emigrants being univer-

¹U.S. Congress, Senate, Statement by F. Hornig, Committee of the Judiciary, International Migration of Talent and Skills, Hearings, before a subcommittee of Immigration and Naturalization of the Committee of the Judiciary, United States Senate, 90th Cong., 1st sess, 1968, Exhibit 4, p. 106.

sally usable, the lure of higher salaries and better living conditions, the opportunity for professional advancement and satisfaction, the inability to obtain suitable employment reflecting the lack of absorptive capacity in the developing economies, political instability in the home countries, and a host of other factors. In addition, the emigration into the United States is encouraged by recent immigration law changes, whereby foreigners are allowed entrance based on skill qualifications.

The causes of the brain drain can be diagnosed and agreed upon; but the effects on the sending countries cannot. The evaluation in terms of economic theory, whereby it was determined that the occurrence of an economic loss either in terms of economic welfare or growth potential was minimal, does not appear adequate when making judgments for individual countries. The advocacy of the free flow of individuals across national boundaries hardly seems appropriate; nor does the contention that every emigrant embodies such talent and potential as to cause serious retardation of economic development appear to be realistic. Distinction is needed between costs and benefits with respect to the international economy and a particular national economy. A pragmatic evaluation of the problem must lie somewhere between the two extremes. Benefits are derived from the international exchange of professionals. As one author stated:

The "brain drain" could become an important stimulus for the sending countries, if it leads to a greater flexibility in education in general, in university trained especially If it promotes the employment of scientific manpower under acceptable working conditions . . . many will

stay there or return to their homeland and contribute by research and development to the economic and social benefit.¹

In general, it can be stated that "the more poorly developed a country is, the more limited its demand is likely to be for educated manpower characterized by a high degree of specialization or advanced technical or scientific accomplishments."² What must be considered is the situation regarding effective demand for high level manpower in specific countries. As noted in the United Nations study:

If need is defined in terms of what is necessary to raise levels of living, then the need or requirement of developing countries for a variety of professional and skilled services is very great. However, the capacity of developing countries, even with aid, to support the employment of specialists and professionals so that they can effectively administer to these needs and also obtain a satisfying return on their personal educational investments, is limited. The gap between needs and economic demands reflects a lack of purchasing power, inadequate mobility of labor within the country or the insufficiency of labor or capital.³

In the words of Harry G. Johnson, it is true that if and when these countries become fully developed, they will need and be able to employ much larger numbers of educated people. However, it should be realized that development is an integrated process involving material, human and intellectual capital. "It is not likely to be promoted by concentrating attention on one type of

¹G. Beijer, "The Brain Drain from the Developing Countries and the Need for the Immigration of Intellectuals and Professionals," International Migration, (May, 1967), p. 233.

²Kannappan, "The Brain Drain from Developing Countries," p. 16.

³United Nations, "Outflow from Developing Countries," p. 42.

capital"¹ Proper assessment involves thorough analysis of the magnitude of the outflow, its relationship to the existing stock of specific categories of professions, the ability of the educational system to satisfy the manpower replacements necessitated by the outflow and also relationship to overall manpower requirements for certain skills within individual countries.

The commitment of the United States regarding immigration is very clear:

Immigration policy should be generous; it should be fair; it should be flexible. With such a policy, we can turn to the world, and to our own past, with clean hands and a clear conscience. Such a policy would be but a reaffirmation of old principles. It would be an expression of our agreement with George Washington that "the bosom of America is open to receive not only the opulent and respectable stranger, but the oppressed and persecuted of all nations"²

It is most improbable that the United States will institute any discriminatory policies relating to immigrants from any particular country. Moreover, few less developed countries restrict the migration of high level manpower. Personal freedom of movement is a fundamental right recognized in most countries.

For countries found to be suffering impeded growth rates because of a loss of key talent and skills through emigration, policy proposals for making these countries more competitive in the market for the highly skilled have included the following:

¹Johnson, in Adams, The Brain Drain, p. 86.

²Quote from John F. Kennedy, cited in Edward M. Kennedy, "The Immigration Act of 1965," The Annals of the American Academy of Political and Social Science, (September, 1966), p. 137.

1. Developing countries should strive to establish education policies which are coordinate with the development needs in various sectors of the economy. This would involve also the installation of better selection procedures in sending students abroad, so that they study in fields which are critical to development in home countries, and thereby enhancing the probability of return. There is a need for establishing manpower plans adjusted to skill needs in an effort to establish better balance between supply and demand of high level manpower.

2. Better cooperation is needed between sending and receiving countries with reference to foreign students. Joint university arrangements should be encouraged along the lines of that discussed between the Iranian university and the University of Pennsylvania. Improved information regarding unemployment opportunities at home could be disseminated. The quality of educational institutions could be upgraded through exchanges of professors, and increased information flow. American educational institutions might adopt additional programs which would keep the foreign student involved in his own culture. Return scholarships could be offered after completion of study in the United States serving as an incentive for repatriation.¹ Perhaps more stringent controls on the two-year-residency requirement governing foreign students should be imposed. Special offices could be established within

¹Alan E. Bayer, "The Effect of International Interchange of High Level Manpower on the United States," Social Forces, (June, 1968), p. 476.

receiving countries to deal with emigrants. Further research is needed on manpower stocks and flows related to foreign students.

3. There is a need for narrowing the income differential for certain professions between developed and developing nations. This would naturally involve raising salaries in the developing countries. The attainment of absolute levels enjoyed in the developed countries is not conceivable, but attempts should be made to correlate compensation with education and qualification. Efforts should be made to improve working conditions. Within losing countries, subsidies might be used to insure a better internal allocation of skills, so that physicians for example do not all congregate in the one or two metropolitan areas of the country. There is a need for striving to improve the social status and prestige of scientific professionals within some economies. The traditionalism and bureaucratic design of institutions should give way so as to facilitate the opportunity for professional advancement for younger professionals.

4. Research and development programs in developed countries could be broadened by establishing research centers in developing nations. In certain underdeveloped regions, research centers could be established where scientists could engage in research aimed at improving conditions in that region. These efforts could transcend national boundaries through intergovernmental cooperation. Also, more research and development should be attempted by local industry to improve products and processes.

5. An international pool of scientific manpower could be formed, financially supported by countries which have benefited from immigration of talented foreigners. Better efforts could be made to recruit nationals in foreign countries for home employment. This could be done by offering subsidies for return, offering customs privileges, or as has been done in India, form a "Scientist Pool" which affords temporary government employment while seeking a permanent job.¹
6. The developed countries could construct compensation schemes for the professionals received from developing countries. Perhaps the emigrant should repay the educational investment costs which were incurred by the losing countries. A tax might be placed on emigrating professionals serving as both compensation and a deterrent for a particular service.
7. The restrictive policies of United States institutions, notably the American Medical Association, should be relaxed, thereby reducing the pull of foreign physicians to this country. More effort should be made to meet the demand with domestic manpower.

In the final analysis, an embargo on the emigration of labor from developing countries would be too drastic. This action would prevent the free flow of scholars and knowledge between nations. As one writer stated, "economic and social development as a positive goal is much more important than reducing or stopping the

¹ Abraham, "Scientific Manpower in India," pp. 69-76.

brain drain as a negative goal."¹ The trend toward international economic integration should not be reversed by restricting the free interchange of talent and skills. The costs of doing so far outweigh the benefits.

The direction of policy should be toward analyzing and solving the problem for individual countries. The brain drain is "both the cause and effect of all the economic, social and political factors which we lump under the term 'underdevelopment.' It points up the sad fact that economic development is not just a matter of producing needed skills, but of producing the opportunities to use these skills."²

The primary responsibility for action concerning the international migration of high level manpower rests with the losing countries. The types of internal policies needed are inherent in the process of economic development.

¹U.S. Congress, House, Committee on Government Operations, "Statement by Charles Kidd," The Brain Drain of Scientists, Engineers and Physicians from the Developing Countries into the United States, Hearings, before a subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 2nd sess., 1968, p. 47.

²Adams, The Brain Drain, p. 262.

APPENDIX I

IMMIGRATION INTO THE UNITED STATES OF SCIENTISTS, ENGINEERS AND PHYSICIANS, 1956, 1962-68.

Country	1956	1962	1963	1964	1965	1966	1967	1968
Total, All Countries	5,373	5,956	7,896	7,527	7,198	9,534	15,355	15,896
Europe:	2,340	2,114	2,650	2,917	2,806	3,382	4,989	5,346
Austria	86	26	51	50	73	88	117	123
Belgium	25	31	41	40	51	46	75	46
Denmark	70	36	49	47	48	66	100	105
Finland	8	6	8	10	3	10	11	38
France	113	73	115	119	133	139	191	210
Germany	548	359	430	517	452	432	560	830
Greece	126	85	124	99	71	126	196	176
Ireland	51	47	64	74	75	63	66	76
Italy	172	112	104	60	82	154	223	174
Netherlands	140	127	89	76	96	82	137	164
Norway	81	65	72	105	80	80	137	152
Portugal	3	12	2	12	4	14	20	12
Spain	12	67	79	143	79	97	106	173

APPENDIX I: (continued)

Country	1956	1962	1963	1964	1965	1966	1967	1968
Sweden	160	64	94	97	129	117	209	214
Switzerland	175	118	166	176	209	256	311	262
United Kingdom	515	781	1,069	1,183	1,094	1,442	2,336	2,339
Other Europe	58	105	93	109	127	169	194	356
Asia:	21	37	118	43	35	107	166	132
Japan	21	37	118	43	35	107	166	132
North America:	1,168	1,340	1,637	1,532	1,586	1,514	1,994	2,103
Canada	1,168	1,340	1,637	1,532	1,586	1,514	1,994	2,103
Africa:	15	26	48	35	32	26	64	48
South Africa	15	26	48	35	32	26	64	48
Oceania:	60	56	81	80	89	115	152	177
Australia	51	45	62	69	76	97	128	151
New Zealand	9	11	19	11	13	18	24	26
Total, Developed Countries	3,604	3,573	4,534	4,607	4,548	5,144	7,365	7,806

APPENDIX I: (continued)

Developing Countries	1956	1962	1963	1964	1965	1966	1967	1968
Europe:	25	73	179	67	68	114	196	104
Turkey (includes Asia)	25	73	179	67	68	114	196	104
Asia:	437	649	1,402	1,098	661	2,414	5,511	5,324
Burma	--	5	5	4	6	17	27	47
China (includes Taiwan)	117	36	190	455	46	234	1,072	796
Hong Kong	41	18	103	34	42	197	n.a.	n.a.
India	43	67	349	111	100	896	1,456	1,265
Indonesia	7	1	1	9	6	7	24	43
Iran	27	83	66	86	74	177	288	265
Iraq	12	27	26	32	29	35	65	40
Israel	71	86	112	91	83	112	206	217
Jordan	9	19	21	17	21	24	30	30
Korea	6	52	155	43	30	139	273	229
Lebanon	23	33	60	47	49	55	106	104
Malaysia	--	5	14	3	25	19	24	14
Pakistan	--	16	20	22	11	40	89	73
Philippines	38	141	220	89	90	397	1,067	1,799

APPENDIX I: (continued)

Developing Countries	1956	1962	1963	1964	1965	1966	1967	1968
Syrian Arab Republic	5	26	25	18	15	21	27	32
Thailand	--	10	10	8	10	15	22	38
Viet Nam	--	6	8	3	3	5	11	15
Other Asia	38	18	17	26	21	18	727	317
North America:	752	931	844	942	1,017	989	1,255	1,322
Mexico	299	140	191	152	218	221	189	133
Other North America	159	123	99	111	110	123	885	936
Dominican Republic	28	122	111	61	58	115	71	71
Haiti	15	20	25	39	67	49	57	95
Other West Indies	270	412	328	476	453	409	(a)	(a)
Costa Rica	13	26	23	31	23	15	12	20
El Salvador	5	14	9	17	14	9	9	20
Guatemala	4	18	9	9	14	14	14	17
Honduras	7	16	17	17	24	13	3	11
Nicaragua	14	12	14	11	14	10	11	10
Panama	7	23	12	9	18	7	4	9

APPENDIX I: (continued)

Developing Countries	1956	1962	1963	1964	1965	1966	1967	1968
Other Central America	2	5	6	9	4	4	(a)	(a)
South America:	499	667	841	1,008	827	773	835	954
Argentina	135	170	267	333	276	216	271	248
Bolivia	16	19	18	49	43	34	40	33
Brazil	121	87	100	85	93	96	97	93
Chile	29	34	49	50	51	33	31	55
Colombia	65	131	179	268	193	205	211	269
Ecuador	24	27	41	41	40	41	39	101
Paraguay	--	10	5	7	7	11	12	4
Peru	66	74	60	77	52	68	54	61
Uruguay	--	2	8	8	10	13	12	13
Venezuela	29	111	100	74	48	43	49	56
Other South America	14	2	14	16	9	8	19	21
Africa:	53	58	85	83	69	96	187	383
Algeria	2	1	1	--	2	2	4	5
Ethiopia	--	2	6	6	2	4	6	2
Ghana	--	1	1	3	5	1	16	16

APPENDIX I: (continued)

Developing Countries	1956	1962	1963	1964	1965	1966	1967	1968
Kenya	--	3	4	6	0	3	9	15
Morocco	--	2	7	0	4	4	9	6
Nigeria	0	4	2	8	7	7	21	29
Tunisia	--	3	1	1	1	2	4	5
U.A.R. (Egypt)	26	23	39	33	20	47	79	238
Other Africa	25	19	24	26	28	26	38	67
All Other Countries	3	5	11	4	9	4	6	3
Total, Developing Countries	1,769	2,383	3,362	3,203	2,650	4,390	7,984	8,087

(a) - Included in "Other North America".

Source: Years 1956 and 1962-22 are from--U.S. Congress, House, The Brain Drain into the United States of Scientists, Engineers, and Physicians: a Staff Study for the Research and Technical Programs, Subcommittee of the Committee on Government Operations, House of Representatives, 90th Cong., 1st sess., (Washington, D.C.: Government Printing Office, 1967), p. 2. (Hereafter referred to as Staff Study.)

Years 1967-68 are from--U.S. Department of Justice, Annual Indicator of the In-migration into the United States of Aliens in Professional and Related Occupations, Fiscal Year 1968, (Washington, D.C.: Government Printing Office, 1968 and 1969). (Hereafter referred to as the Annual Indicator.)

SELECTED BIBLIOGRAPHY

Articles

- Abraham, P.M. "An Outline for a Study of Brain Drain from India (Emigration of High Level Manpower)." Manpower Journal, 3 (October/December, 1967), 15-44.
- _____. "Scientific Manpower in India." Development Digest, VII (April, 1969), 69-75.
- Amuzegar, J. "Brain Drain and the Irony of Foreign Aid Policy." Economia Internazionale, (November, 1968), 697-719.
- Awasthi, S.P. "Manpower Aspects of American Immigration Law." Manpower Journal, (October/December, 1967), 58-74.
- Bayer, Alan E. "The Effect of International Interchange of High Level Manpower on the United States." Social Forces, (June, 1968), 465-77.
- Beijer, G. "The Brain Drain from the Developing Countries and the Need for the Immigration of Intellectuals and Professionals." International Migration, 3-4 (1967), 228-36.
- _____. "Selective Migration for and 'Brain Drain' from Latin America." International Migration, 12 (1966), 28-40.
- Botsas, E. "A Note on Migration and the Balance of Payments." Economia Internazionale, XXII (March, 1969), 247-51.
- Copeland, W.A. "Universities Cooperate to Stem the Brain Drain." Development Digest, (April, 1969), 58-61.
- Dedijer, S. "Fast Brain Gain Policies: An Historical Divertissement." Journal of World History, X (1967), 635-53.
- Eren, Nuri. "Supply, Demand and the Brain Drain." Saturday Review, (August 2, 1969), 10-124.
- Grubel, Herbert G. "Foreign Manpower in the U.S. Sciences." Review of Income and Wealth, (March, 1968), 57-75.
- _____. "Nonreturning Foreign Students and the Cost of Student Exchange." International Educational and Cultural Exchange, (Spring, 1966), 20-29.
- _____. "The Brain Drain: A U.S. Dilemma." Science, 19 (December, 1966), 1420-24.

- _____. "The Reduction of the Brain Drain: Problems and Policies." Minerva, VI (Summer, 1968), 541-58.
- _____. "Determinants of Migration: The Highly Skilled." International Migration, V (1967), 127-39.
- _____, and Scott, Anthony D. "The Immigration of Scientists and Engineers to the United States, 1946-61." Journal of Political Economy, (August, 1966), 368-78.
- _____. "The International Flow of Human Capital." American Economic Review, (May, 1966), 268-74.
- _____. "The International Flow of Human Capital: Reply." American Economic Review, (June, 1968), 545-48.
- _____. "The International Movement of Human Capital: Canadian Economists." Canadian Journal of Economics, II (August, 1969), 375-88.
- Ginzberg, Eli. "An American Professor at Asian Universities." International Educational and Cultural Exchange, (Summer, 1969), 12-19.
- Gonzalez, Gustavo R. "The Migration of Latin American High-Level Manpower." International Labor Review, (September, 1968), 551-69.
- "Hong Kong Suffers Student Brain Drain." Labor Developments Abroad, (July, 1967), 7.
- Hutchinson, Edward P. "The New Immigration: An Introductory Comment." The Annals of the American Academy of Political and Social Science, 367 (September, 1966), 1-3.
- Johnson, Harry G. "Comparative Cost and Commercial Policy Theory in a Developing World Economy." The Pakistan Development Review (Supplement), IX (Spring, 1969), 1-33.
- _____. "International Economics: Discussion." American Economic Review, LVI (May, 1966), 275-83.
- _____. "Some Economic Aspects of the Brain Drain." Pakistan Development Review, (Autumn, 1967), 379-409.
- _____. "The Economics of the 'Brain Drain': The Canadian Case." Minerva, (Spring, 1965), 299-311.
- Kannappan, Subbiah. "The Brain Drain and Developing Countries." International Labor Review, (July, 1968), 1-26.

- Kennedy, Edward. "The Immigration Act of 1965." The Annals of the American Academy of Political and Social Science, 367 (September, 1966), 137-50.
- Mondale, W.F. "How Poor Nations Give to the Rich: The Brain Drain." Saturday Review, (March 11, 1967), 24-26.
- Myers, Robert G. "The 'Brain Drain' and Foreign Student Non-return." International Educational and Cultural Exchange, (Fall, 1967), 63-72.
- _____. "'Brain Drains' and 'Brain Gains'." International Development Review, (December 1967), 4-9.
- New York Times. "Taiwan Worried about a Brain Drain." (July 14, 1967), 14.
- Nussenzveig, H. Moyses. "Migration of Scientists from Latin America." Science, 165 (September 26, 1969), 1328-32.
- Oteiza, E. "Emigration of Engineers from Argentina: A Case of Latin American 'Brain Drain'." International Labor Review, (December, 1965), 445-61.
- Reder, Melvin. "The Economic Aspects of Increased Migration," Review of Economics and Statistics, (August, 1963). 221-30.
- "Republic of China Suffers from Brain Drain." Labor Developments Abroad, 13 (December 1968), 9-10.
- Sharma, Keshav Dev. "Indian Students in the United States." Exchange, IV (Spring, 1969), 43-59.
- Sharma, R.A. "The Problem of Unemployment Among Engineers." AICC Economic Review, (July, 1, 1968), 25-28.
- Shearer, John C. "In Defense of Traditional Views of the 'Brain Drain' Problem." International Educational and Cultural Exchange, (Fall, 1966), 17-25.
- Sinha, R.P. "The Economics of Brain Drain." Manpower Journal, IV (April/June, 1969), 54-74.
- Sutherland, Gordon, "The Brain Drain." Political Quarterly, III (1967), 51-61.
- Thomas, Brinley. "From the Other Side: A European View." The Annals of the American Academy of Political and Social Science, 367, (September, 1966), 63-73.
- _____. "The International Circulation of Human Capital." Minerva, (1967), 479-506.

Watanbe, S. "The Brain Drain from Developing to Developed Countries." International Labor Review, (April, 1969), 401-33.

Weisbrod, Burton A. "International Economics: Discussion." American Economic Review, LVI (May, 1966), 275-83.

Worsnop, R.L. "World Competition for Skilled Labor." Editorial Research Reports, I (1967), 440-52.

Books

Adams, Walter, ed. The Brain Drain. New York: MacMillan Co., 1968.

Dorai, G.C. Economics of the International Flow of Students. Unpublished Ph.D. Dissertation, Wayne State University, 1967.

Ellsworth, P.T. The International Economy. New York: MacMillan Co., 1967.

Kindleberger, Charles P. International Economics. Homewood, Illinois: Richard D. Irwin, Inc., 1968.

Susskind, Charles and Schell, Lynn. Exporting Technical Education. New York: Institute of International Education, 1968.

Thomas, Brinley. International Migration and Economic Development. Paris: UNESCO, 1961.

_____, ed. The Economics of International Migration. London: MacMillan Co., 1958.

Public Documents

Pan American Health Organization. Migration of Health Personnel, Scientists, and Engineers from Latin America: Report Prepared by the Pan-American Health Organization Sub-Committee on Migrating for the P.A.H.O. Advisory Committee on Medical Research. Pan American Health Organization Scientific publication number 142, (1966).

U.S. Congress, House. Committee on Government Operations. The Brain Drain of Scientists, Engineers, and Physicians from the Developing Countries into the United States. Hearing before a subcommittee of the Committee on Government Operations, 90th Cong. 2nd sess. Washington, D.C.: Government Printing Office, 1968.

- U.S. Congress, House. Subcommittee of the Committee on Government Operations. The Brain into the United States of Scientists, Engineers and Physicians: a Staff Study of the Research on Technical Progress. 90th Cong. 1st sess. Washington, D.C.: Government Printing Office, 1967.
- U.S. Congress, Senate. Committee of the Judiciary. International Migration of Talent and Skills. Hearings before the subcommittee on Immigration and Naturalization of the Committee on the Judiciary, 90th Cong. 1st sess. Washington, D.C.: Government Printing Office, 1968.
- U.S. Department of Justice. Annual Indicator of the In-migration into the United States of Aliens in Professional and Related Occupations, Fiscal Year 1967. Washington, D.C.: Government Printing Office, 1968.
- U.S. Department of Justice. Annual Indicator of the In-migration into the United States of Aliens in Professional and Related Occupations, Fiscal Year 1968. Washington, D.C.: Government Printing Office, 1969.
- United Nations. General Assembly, 23rd Session, November 5, 1968. Outflow of Trained Personnel from Developing Countries: Report of the Secretary-General, A/7294.
- United Nations. Educational, Scientific and Cultural Organization. Unesco Statistical Yearbook, 1967.

INTERNATIONAL MIGRATION OF
HIGH LEVEL MANPOWER

by

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B.S., Mathematics
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AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARTS

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1970

Many scientists, engineers, physicians, and other highly educated persons in less developed countries, whose potential contribution to economic development and social welfare in their home countries may be sorely needed, have obtained employment in the economically developed regions of the world. It is argued by some that this movement constitutes a "brain drain" from the less developed to the more advanced countries, thereby depriving the former, in an uncompensating fashion, of a strategic resource, namely human capital. Included in this report is an attempt to determine the magnitude and composition of this migration, discussion of the factors which influence the decision to migrate, analysis of its economic impact on countries of emigration and finally, a discussion of various policy alternatives which might enable less developed countries to stem the loss of the highly skilled.

Although the phenomenon is worldwide in nature, statistical inadequacies necessitated reliance on the data published in the United States in an attempt to measure the magnitude and composition of the international flow of high level manpower. Analysis of this information revealed the fact that during the past decade, immigration into the United States of scientists, engineers, and physicians has been increasing substantially. More importantly however, the proportionate share of these immigrants from the developing countries has increased to over 50 percent in recent years.

The factors which influence the decision to migrate were

found to be numerous. Salary differentials were an important consideration, however such non-monetary factors as a lack of opportunity for professional advancement and for engaging in research were also of major significance. Other factors included irrelevant education, the restrictive policies of organizations in the United States, foreign students' lack of knowledge concerning home opportunities, and non-economic considerations such as discrimination, a lack of status and recognition, and political unrest. Liberalized United States immigration policies were also an important element in determining the reasons for the recent upsurge in the immigration of scientific manpower.

Two schools of thought are identified concerning the economic effects of the migration of high level manpower: The "internationalists" minimize the likelihood of the occurrence of an economic loss and therefore advocate free international migration; while the "nationalists" view the outflow as retarding economic development, and thus recommend restricted migration. More detailed analysis is needed on a case by case basis to determine the extent of these economic effects.

For nations found to be incurring losses of high level manpower which result in retarded development, policies which are suggested to enhance the ability to compete more effectively in the market for the highly skilled include: better coordination of educational plans with developmental needs, selection of students to study abroad in disciplines related to development, revision of salary structures, broadened research programs, and

increased professional opportunity. These policies involve socioeconomic reforms, as opposed to international agreements to control migration.

The brain drain has been noted as both contributing to and resulting from underdevelopment. Further studies should be made in an effort to determine the extent of impact on individual countries.