

**“brain drain,, and
international migration
of scientists:
the case of Greece**

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introduction

One of the most striking byproducts of modern science and technology following World War II has been the ever-increasing mobility of scientific manpower. Not only has there been an internal movement of scientists within the peripheries and regions of a nation, but more profoundly it has become an outward international movement of far reaching proportions that has generated the so-called «brain drain» controversy between and among governments and individual scientists throughout the less and more advanced countries of the world.

More than ever before human talents and professional people are widely regarded as prime national assets. For a nation to survive in a modern competitive world it must encourage its most resourceful citizens—scientists and professionals in general—to contribute to its political, economic, and social development. The rise and decline of civilizations and cultures is partly attributed to the ability of the society to fully utilize and take stock of its human resources and «capital» and to husband its highly skilled manpower as a source of leadership and national development (Subcommittee on Immigration and Naturalization 1968: 138).¹

The issues and ramifications associated with the flow of skilled and talented people from the less developed countries to more advanced ones or from a less advanced to a more advanced one from one time to another are multi-dimensional and complex in nature. The problem of «brain drain» has an individual and social dimension attached to it. It is as much a product of individual human behavior (i.e. motivation, aspirations, ambition, intelligence, innate ability and the like) as it is a product of social structure and culture of the society in general (i.e. social institutions, social groups, occupational structure, history, traditions and the like). More specifically, one finds an interaction between human motivations, policies, purposes and actions between individuals, groups, and nations that generate a diverse pattern of permutations and relationships between the gainer and loser nations (SCIN, 1968: 139).

Regarding the latter, while knowledge and scientific inquiry are transnational in nature—it has no boundaries—yet this international mobility of talent affects differentially the ability of the nation to develop and modernize its social structure and promote the welfare of its citizenry when in fact some

1. The Subcommittee on Immigration and Naturalization of the Committee on the Judiciary, United States Senate, conducted hearings on the International Migration of Talent and Skills in March, 1967. It will subsequently be referred to as SCIN.

of its most talented and resourceful people decide to migrate. In short, the international migration of scientists has raised a number of political, social, economic, and moral issues.

While closed socio-political systems, as for example Russia and its satellites, can manage to circumscribe human mobility, open socio-political systems as those of the United States and Western allies cannot without violating one of their basic human rights of freedom of movement of its citizens so germane to Western type democracies. On the other hand, while the decision to migrate is a professional and individual consideration, yet the decision itself in the context of «brain drain» has political and national consequences (SCIN, 1968:139).

The purpose of this paper is to examine some aspects of brain drain in Greece in the context of international migration of scientists. More succinctly, given the international nature of «brain drain» which flows from the less developed to more developed countries, to what extent has Greece been affected by this outflow of its talents during the last decade or so? And if so, what are the causes and consequences of Greek brain drain upon the social structure and development of Greece? It is through an analysis of secondary data and published reports on international migration of scientists including Greece that an effort will be made to address myself to the «brain drain» issue and its impact on the national development of Greece.

theoretical/conceptual perspectives

In an effort to delineate and appraise some of these issues as they impinge upon specific countries a number of scholars have advanced various theoretical/conceptual frameworks of international mobility of scientists. These conceptual perspectives gravitate between the rights of individual scientists and the needs of states, and there are basically three: the internationalist/cosmopolitan, the nationalist/local, and the differential push-pull explanation of international «brain drain».

The internationalist/cosmopolitan model suggested by Harry G. Johnson (see Adams, 1968) of the London School of Economics and Political Science is predicated on the assumption that the international circulation of human capital—being scientists, scholars, engineers, or professionals—the genus in general is a beneficial process not only to immediate parties concerned—individual scientists and both countries of origin and destination of scientists—but more significantly it is a benefit to humanity itself. The principle of free movement is explicitly involved here, particularly the free choice of the individual scientist to seek what is best for the self-

actualization of his talents and aspirations. This view recognizes the right of the individual scientist to freely choose his career and to pursue that right even if he has to leave his own country. And this of course is in accordance with the democratic ideology of the western world.

The «nationalist» model on the other hand suggested by Don Patinkin of Hebrew University (see Adams, 1968) considers human capital as indispensable to economic, social, and political development of a nation. If the nation, for example, falls below certain minimum levels of human capital through its brain drain, it can retard and endanger the growth potential of all resources in the economy. This model sees the question of brain drain as a serious problem for the loser nation when some among those who migrate are the best of its scientists from which the actual professional and managerial leadership usually comes for the development of the nation.

Adams (1968) of Michigan State University of the United States presents a critical view of both aforementioned models. Regarding the former, the author argues that while it sensitizes us to the externalities in the form of scientific or other advances from which the losing and the highly developed nation benefits, it offers no panacea or prescription in curbing that part of the «brain drain» that justifiably should be checked. As regards to the latter, the author thinks that the «nationalist» model fails to specify a means for achieving optimum allocation of domestically available resources.

Implicitly in the internationalist and nationalist models two points of view also are posed by the migration of skilled and talented people. On one hand «brain drain» is seen by economists as a question of «manpower» involving the principle of supply and demand of human resources. «From this economic point of view the long range growth and development of a nation rest on its ability to develop and revitalize its major sectors of social life that are capable of attracting, stimulating, and rewarding talented individuals» (SCIN, 1968:18). On the other hand, the «brain drain» is seen in terms of needs and aspirations of the individual «scientist to move freely and to seek the actualization of his talents and aspirations in the fullest possible way». According to the latter view the right of the individual to choose his career, his right even to leave his country of origin, can be a stimulant to the development of institutions and incentives that permit him to compete successfully in the human market of ideas (SCIN, 1968:18).

Lastly, there is the so-called differential push-pull approach explanation of international migration of scientists and professionals offered by Entique

Oteiza of Latin America and Charles V. Kidd of the United States (Oteiza, 1965:445-461; SCIN, Charles V. Kidd testimony, 1968:76-84; Adams, 1968:120-134). This explanation is based on the so-called pull and push factors and income differential, logistical support differential, and preference differential factors.

The push factors for example are those which operate as centrifugal forces to many scientists and professionals in their effort to choose a career in their native countries, i.e. antiquated educational systems, rigid bureaucratic structures, political instability, emphasis on ascriptive criteria and nepotism rather than criteria of meritocracy and achievement. While these centrifugal factors push the scientists and other professionals from their native countries, concomitantly there are centripetal forces which operate to pull them toward countries where career prospects and opportunities for self-actualization and advancement are brighter in both economic and intellectual terms.

However, the question of «brain drain» is above all an empirical one. It is in part the consequence of talented persons to be internationally mobile and cosmopolitan in nature and in part a product of the modern science and technology. Whether or not the accountability for the «brain drain» lies in the individual scientist himself or in the nature of the social structure of a nation, the fact of the matter is that a number of factors are at work that motivate the scientists to migrate from one society to another rather than one single explanation.

To some the loss of such a talent is viewed as an anathema which is a severe impediment and handicap to national, economic, cultural, and intellectual development of a nation. To others, the loss of such talent is a blessing for if a nation is not capable of fully utilizing its human resources and talents, then it is in the interests of all concerned (individual scientist, home and host societies) that an international mobility and migration of highly specialized people exists.

international migration of scientists: the case of Greece

Steven Dedijer in his survey of «Early Migration» of scientists (Adams, 1968:9-28) draws five preliminary lessons from history. *First*, migration of scientists is as old as science itself. For example, until about 300 B.C. the center of attraction of scientists and scholars was Athens due primarily to Plato's Academy (388 B.C.) and Aristotle's Lyceum (335 B.C.). Historically, both became the first and long lived institutions of learning and research in Europe. Around 300 B.C., however, Alexandria

became the center of attraction of scientists. It was a «brain drain from Greece to Alexandria». This reversal was primarily due to a conscious government policy by the first king of the Ptolemaios dynasty. *Second*, people in power in the past have acted to stimulate or prevent migrations of scientists with many having had specific policies. *Third*, primarily those in power who had a high degree of appreciation of the social value of science of their time had such policies. *Fourth*, the development of a consistent foreign policy on science and on the migration of scientists is necessary yet very little appreciated. *Fifth*, those countries with the most developed science policy are also striving to develop a consistent set of attitudes and actions on the question of migration. The United States, for example, which today has the most developed and sophisticated science policy also has policies on paper and in action on the migration of scientists.

Since Greece traditionally has been described as a country of «diaspora», it is only natural that she is among the heavy losers of human skills and talents (Coutsoumaris, 1968). Indeed, Greece has been found to be among the countries with the highest record of «brain drain» (Grubel and Scott, 1966; Coutsoumaris, 1968; Committee on the International Migration of Talent,¹ 1970). Other countries that also lose large numbers of their talented people have been India, Iran, Turkey, Pakistan, the Philippines, Taiwan, Korea, Colombia and Argentina. Only a few of the advanced countries—the United States, United Kingdom, Canada, Germany, Australia, and France—have received substantial numbers of these immigrants (CIMT, 1970:21-22).

It has been suggested (Tsakonias, 1967; Geanakoplos, 1962; Nea Estia, 1955) that the Greeks of the Diaspora following the fall of Constantinople (1453) constituted one of the most celebrated chapters in the making of modern Hellenic culture and civilization. According to Kohn the Greeks of the Diaspora were extended from «Odessa up to Livorno, from Alexandria up to Manchester and from Vienna up to Massalia» (quoted in Tsakonias, 1967: 66).

The Greeks of Byzantium (Logioi) who migrated prior to and following the fall of Constantinople contributed greatly to the Renaissance in the West. Later the Greeks of Venice and of Western Europe in general had a profound impact on the western attitudes and philhellenism toward the Greek national revolution and Declaration of Independence from the Ottoman rule (1821-1827). The Company of Friends (Filiki Etaireia) were the first Greeks of Diaspora (Odessus, Russia) to organize and so-

1. The Committee on the International Migration of Talent will subsequently be referred to as CIMT.

licit support for the Greek National Independence. Indeed, Tsakonas (1967) has suggested that the roots of Greek National Independence must be sought among the Greeks of the Diaspora.

From the 1890's to 1930's the transatlantic immigration of Greeks to the New World, particularly to the United States, followed along with that of other Europeans from Southern, Eastern and Central Europe. It has been referred to as the «new immigration» vis-a-vis the «old immigration» of North-western Europeans who had been the first settlers in the New World.

The overwhelming majority of the «early Greek immigrants» to the New World can be designated as working (economic) class immigrants. For instance, it has been reported (Fairchild, 1911:3, 85); Xenides, 1922:81; Saloutos, 1964) that early Greek immigrants as a rule were poor, had little or no education at all, came primarily from agricultural communities, and consisted of young males.

This transatlantic Greek immigration during the first quarter of the twentieth century reached alarming proportions but was offset somewhat by one and a half million Greeks uprooted from Anatolia who settled in Greece following the debacle of Asia Minor in the 1920's and by a substantial number of repatriated Greeks from America who could not make the adjustment in the New World (Saloutos, 1956).

The story of these new argonauts of the New World and their contributions in the development of both the modern Greek nation and their adopted countries has been substantial. Only recently have scholars endeavored to investigate it (Saloutos, 1956 and 1964; Vlachos, 1968; Tavuchis, 1968; Kourvetaris, 1971; Stathopoulos, 1971).

While the Greek immigration to the Anglo-American countries still continues, by the 1950's a new wave of Greek emigrant workers (roughly 300,000) sought work in Northwestern European countries particularly Western Germany (Dimitras and Vlachos, 1971). Furthermore, while up to the middle 1950's the majority of Greek immigrants were designated as working class and/or blue collar immigrants, beginning in the late 1950's a substantial number of Greek students and professional people migrated either temporarily or permanently to the Anglo-American countries (particularly to the United States) and Western Europe either to pursue a higher education or practice their profession.

It is perhaps against this synoptic framework of Greek Diaspora that the phenomenon of Greek «brain drain» must be understood and explained. Indeed, Greek «brain drain» can be treated as a symptom and as an aspect of a larger and more perennial problem of Greek immigration. While

Greek immigration is an exceedingly important national problem and its cause is primarily socio-economic, the present analysis is limited to the «brain drain» aspect of Greek immigration.

Speaking of Greek «brain drain» no comprehensive empirical study has ever been conducted insofar as this author could ascertain (with the exception perhaps of that undertaken recently by the research staff of the National Centre of Social Research of Greece) to determine the magnitude and the impact—both in terms of its assets and liabilities—for the development of the Greek nation.

Despite the absence of empirical studies on Greek «brain drain» there are some statistical data particularly that collected by the United States Department of Justice, Immigration and Naturalization Service, for those countries (including Greece) which annually lose large numbers of scientists to the United States. In this part of the paper an effort will be made to present some figures on Greek scientists and other professionals who have migrated to the United States for the last ten years. Additionally, some statistics from the National Statistical Service of Greece and other secondary sources will be utilized for the purpose of elucidating the magnitude of Greek «brain drain». From the outset it must be made clear that the exact number of Greek scientists who have permanently or temporarily settled abroad during the last decade is not known.

sources of Greek brain drain

For the purpose of this analysis three major categories of Greek «brain drain» may be distinguished that can invariably be seen as sources of Greek «brain drain» as well. These are the actual, the potential and the hidden¹ which are also applicable to other nations with a similar problem of brain drain.

The actual includes all those professionals, technical and kindred workers (including scientists, engineers and doctors) who upon their completion of professional training or thereafter decide to migrate to more advanced countries particularly those of the United States, Canada, Western Europe and Australia, and only secondarily to less developed or equally developed countries (as that of Greece) in Asia, Africa, and Latin America or commonly known as the countries of the third world.

1. Hidden «brain drain» includes all those scientists and other professionals who while working in their respective countries might be employed by more lucrative foreign companies and/or research institutes that have branches or have investment in various countries. For the purpose of this report and because I was not able to collect any data on this source of Greek brain drain, my subsequent analysis will be based on the actual and potential sources of Greek brain drain only.

The question can be asked what is the magnitude of this type of Greek brain drain? It has been estimated (quoted in Coutsoumaris, 1968:169), for example, that between 1957-1961, Greece lost to the United States alone over one fifth of all her first degrees in engineering. Coutsoumaris believes that the total loss is even greater than this if one adds those who left for the other advanced countries of Western Europe and Canada; and even those who migrated to the less advanced countries of the third world. More specifically the magnitude of Greek «brain drain» both in terms of professional specialties and professionals in general for the last decade are given in Tables 1, 2 and 3.

The figures presented in Table 1 by major professional subcategories show both the permanent and temporary nature of migration of professional people. However, it must be noted that a sizeable number of those who declared an intention for temporary emigration eventually settled abroad. Looking at Table 1 nearly 35 per cent of the graduates in engineering, over 27 per cent in sciences and 25 per cent in the medical profession have left the country permanently between 1961-65. Of course, the percentage is even higher if the final outflow of temporary emigrants is added.

Figures presented in Table 2 also indicate that since 1962 to 1969 a total of 1,066 scientists, engineers, physicians, and surgeons were admitted to the United States from Greece. Table 3 gives an overall picture of Greek professional, technical and kindred occupations and total Greek immigrants admitted to the United States in the fiscal years 1962-1971 vis-a-vis total admitted, total professionals admitted, total European immigrants admitted and total European professionals admitted.

Thus figures presented in Table 3 also indicate that for the last decade a total of 4,517 Greek emigrants in different types of professional, technical and kindred occupations have been admitted under different immigration laws to the United States alone. It must be noted however that there is an overlapping in all three aforementioned tables and it is exceedingly difficult to calculate the exact number of Greek brain drain. Thus, although the exact number of Greek scientists and other professionals who temporarily or permanently migrated to other countries is not known, it has been estimated that Greece is losing per year about 1,000 young people with university training (Coutsoumaris, 1968:169).

The next source of Greek brain drain includes all those Greek students who are granted immigrant or non-immigrant visas by foreign consulates to pursue their education abroad and who potentially may be classified as the major source of

Greek brain drain.¹ It has been estimated, for example, by Coutsoumaris (1968:169) that Greece has an annual average of well over 8,000 Greek students abroad of whom about 10 per cent are in graduate and 80 per cent in undergraduate schools. This number represents about 15 per cent of the total student body enrolled in institutions of higher learning in Greece. Despite the fact that no empirical studies have been conducted to determine the percentages of Greek students who receive undergraduate and graduate degrees from foreign universities and the number of them who repatriate upon the completion of their studies, it is safe to speculate that a substantial number of them do manage to graduate, but the majority remains abroad after graduation particularly those studying in the United States and Canada.

In a report by the Institute of International Education it was found that there were 144,708 foreign students enrolled in United States institutions of higher learning in 1970-71. Of this number 37 per cent came from the Far East, 20 per cent from Latin America, 13 per cent from Europe, 12 per cent from the Near and Middle East, 9 per cent from North America (Canada), 6 per cent from Africa, and 1 per cent from Oceania (Open Doors, Report on International Exchange, Institute of International Education, 1971:3). To the question of whether or not they intended to remain in the United States, 33 per cent of all foreign students said they did not plan to remain in the United States, and 18 per cent reported they were undecided. Also a large proportion of the 38 per cent of students who did not answer the question at all do, in fact, intend to remain in the United States (Open Doors, Report on International Exchange, Institute of International Education, 1971:9).

In another study Das (1969) examined empirically a sample of 1,400 international students representing 31 developing countries of the third world. Attitudes of the students toward remaining in the United States upon the completion of their studies and the possible effect on the «brain drain» or «brain gain» in their respective studies were investigated. The author found that most of the African and Latin American students planned to return to their home countries but not the Asian students. Of the latter, those who planned to return were students in fields where there were employment prospects in the home country.

1. In most instances Greek students studying abroad have finished their secondary education or have graduated from an institution of Greek higher education. If the Greek student completed both his undergraduate and graduate studies abroad, it is not clear to me whether or not one can classify him even as a potential source of Greek brain drain.

«brain drain» and international migration of scientists: the case of Greece

TABLE 1. *Greece: Emigration of Scientists and Other Professionals in Relation to Total First-degree Graduates, 1961-1965*

	Stock According to 1961 Census	Total of New Graduates 1961-65	Persons Emigrated Permanently 1961-65	% of Emigration to Graduates	Temporary Emigration 1961-65	% of Temporary Emigration to Graduates
I. Total of Professionals and Scientists	77,600	22,566	3,232	14.3	1,981	8.8
1. Engineers, architects, and similar fields, first-degree graduates of higher education	5,000	1,876	650	34.6	191	10.2
2. Scientists (physicists, chemists, geologists, biologists, agricultural sciences, etc.)	5,700	2,200	600	27.3	233	10.6
3. Physicians, dentists, and trained persons related to medical profession	15,500	3,151	793	25.2	409	13.0
4. Teaching personnel	40,000	11,994	954	8.0	1,072	8.9
5. Lawyers	11,400	3,345	235	7.0	76	2.3
II. Managerial and Higher Administrative Personnel	28,500	5,804	470	8.1	125	2.2
Total of Groups I and II	106,100	28,370	3,702	13.0	2,106	7.4

Source: National Statistical Service of Greece: Statistical Year books taken from Coutsoumaris, 1968: 170.

TABLE 2. *Total, European, and Greek Scientists, Engineers, and Physicians and Surgeons Who Were Admitted to the United States for Fiscal Years 1962-1969*

Fiscal Year*	Total Number			European				Greek	
	Scient.	Eng.	Phys. & Surgs.	Scient.	Eng.	Phys. & Surgs.	Scient.	Eng.	Phys. & Surgs.
1962	1,357	2,940	—	780	1,651	—	17	52	—
1963	1,919	4,014	—	985	2,017	—	39	64	—
1964	2,037	3,725	—	1,041	1,941	—	26	53	—
1965	1,899	3,446	2,012	1,085	1,893	588	20	37	32
1966	2,290	4,915	2,549	1,041	2,371	739	51	57	48
1967	3,702	8,821	3,325	1,301	3,722	854	59	111	59
1968	2,959	9,310	3,128	1,101	3,601	691	29	108	34
1969	2,483	7,098	2,756	642	1,813	579	30	104	36
Grand Total	18,646	44,269	13,770	7,976	19,009	3,451	271	586	209

Sources: National Science Foundation and Department of Justice, Immigration and Naturalization Service.

* Each fiscal year ends June 30.

TABLE 3. *Greek Immigrants in Professional, Technical and Kindred Occupations and Total Immigrants and Professionals Admitted to the United States. Fiscal Years 1962-1971*

Fiscal Year*	Total Admitted		Total Prof. Admitted		Total Europ. Admitted		Total Europ. Prof. Adm.		Total Greek Admitted		Total Greek Prof. Adm.	
	N	%	N	%	N	%	N	%	N	%	N	%
1962	283,763	8.4	23,710	8.4	119,692	42.2	10,979	9.2	4,702	1.7	261	5.6
1963	306,260	9.1	27,930	9.1	125,932	41.1	12,636	10.0	4,825	1.6	364	7.5
1964	292,248	9.8	28,756	9.8	123,064	42.1	12,759	10.4	3,909	1.3	268	6.9
1965	296,697	9.7	28,790	9.7	114,329	38.5	12,941	11.3	3,002	1.0	212	7.1
1966	323,040	9.3	30,039	9.3	125,023	38.7	12,059	9.6	8,265	2.6	374	4.5
1967	361,972	11.5	41,652	11.5	139,514	38.5	14,431	10.3	14,905	4.1	589	4.0
1968	454,448	10.7	48,753	10.7	139,514	30.7	15,955	11.4	13,047	2.9	512	3.9
1969	358,579	11.3	40,427	11.3	120,086	33.5	10,023	8.3	17,724	4.9	586	3.3
1970	373,326	12.4	46,151	12.4	118,106	31.6	10,294	8.7	16,464	4.4	697	4.2
1971	370,478	13.2	48,850	13.2	96,506	26.0	7,983	8.3	15,939	4.3	654	4.1
Grand Total	3,420,811	10.7	365,058	10.7	1,221,766	35.7	120,060	9.8	102,782	3.0	4,517	4.4

Source: United States Department of Justice, Immigration and Naturalization Service.

* Each fiscal year ends June 30.

TABLE 4. *Total Foreign and Greek Students in the United States by Sex, Academic Status, Financial Support, and Major Field of Study: 1970-1971*

Characteristics	Total Foreign Students	Total Greek Students
Sex		
Male	107,609	1,592
Female	34,564	355
No answer	2,535	21
Academic Status		
Undergraduates	71,213	997
Graduates		
Pursuing M. Sc. degree	48,327*	568**
Pursuing Ph. D. degree	17,532	269
Special***	5,132	98
No Answer	2,506	36
Financial Support		
US Gov't	4,504	28
Foreign Gov't	5,297	16
US College or Univ.	23,527	436
Private	8,101	61
Self	53,000	754
US Coll. or Univ. and Private or US or Foreign Gov't	2,715	27
Private and US or Foreign Gov't	626	4
No answer	46,938	642
Field of Major Interest		
Agriculture	3,735	26
Business Administration	18,320	154
Education	7,896	42
Engineering	33,832	612
Humanities	25,334	390
Medical Sciences	6,994	42
Physical and Life Sciences	21,733	355
Social Sciences	17,936	258
All other	703	6
No answer	8,225	83

Source: Open Doors 1971 Report on International Exchange Institute of International Education.

* This figure includes 20,971 students who are pursuing graduate professional degrees of unspecified nature or no degree.

** This figure includes 235 Greek students who are pursuing graduate professional degrees of unspecified nature or no degree.

*** A «special» student is an undergraduate who is not enrolled for a degree.

Note: 446 out of 1,968 Greek students (22.7%) hold immigrant visas (are unlikely to return to Greece upon the completion of their studies) while 26,732 of 144, 708 foreign students (18.5%) hold immigrant visas.

Concerning Greek students overseas only some statistics for those in the United States institutions of higher education will be given here. A report by the Institute of International Education and Exchange indicated that a total of 1,968 Greek students were enrolled in the United States colleges and universities in 1971. (This number includes students who began their studies in 1968 and prior, 1969 and 1970)

A distribution by sex, academic status, type of financial support, and major field of study of Greek students in 1970-71 reveals the following characteristics (see table 4): There are about 2,000 Greek students in the United States colleges and universities, more than three-fourths were male and one

fourth female Greek students, about evenly divided between undergraduate and graduate students, most of the students were self-supported (754), one fifth were financially supported by United States colleges or universities (436 students) but 642 of them did not answer this question at all; finally 612 students considered engineering their field of major interest, with humanities, physical and life sciences, and business administration the second, third, and fourth highest respectively.

As part of the recent survey by the National Centre of Social Research concerning the migration and repatriation of Greek scientists, data were collected on 1,600 Greek students enrolled in United States institutions of higher learning in the academic year 1971-72.

Figures for Table 5 show the total, European and Greek aliens and students who adjusted to permanent resident status in the United States for fiscal years 1966-71 under section 245 of the Immigration and Nationality Act.

A total of 7,619 Greeks of which 1,485 were students adjusted to permanent resident status in the fiscal years cited.

The exact number of Greek students (like Greek scientists and other professionals) who have graduated and adjusted their student visas to that of permanent resident and subsequently remained in the United States in the last decade is not known. My speculation is that the majority of Greek students have remained in the United States by one way or another (some married to American or Greek naturalized citizens, some sponsored by their employers, and still others paid to remain in the United States). Irregardless of how they managed to remain, the truth of the matter is that the majority of them did not return to Greece. The full drama of the Greek student abroad—his financial difficulties, his struggle with the language, the indifference of Greek and Greek-American affiliated institutions and other similar problems of adjustment—has not been told as yet.

Against this outflow of actual and potential sources of Greek brain drain, what is the «brain inflow» of trained and skilled Greek repatriates? To begin with Greece has benefitted from repatriates because of war and political events in their countries of residence. Most of the benefit however came from the entrepreneurial group. To mention only the most salient: one and a half million uprooted Greeks from Anatolia in the 1920's, and in the 1950's a large number of Greeks from Egypt (during and after Nasser took over) and other Middle East countries, and Greeks from Romania and other Eastern European countries.

In a recent study by EKKKE it was found that at

TABLE 5. *Total, European, and Greek Aliens and Students (by place of birth) Who Were Adjusted to Permanent Resident Status in the United States under Section 245, Immigration and Nationality Act, for Fiscal Years 1966-71*

Fiscal Year	Total Number Adjusted	Total Students Adjusted	Total Europ. Adjusted	Total Eur. Students Adjusted	Total Greeks Adjusted	Total Greek Students Adjusted
1966	29,556	4,814	8,974	807	815	227
1967	38,619	9,957	13,025	1,059	1,305	320
1968	33,595	7,937	15,573	1,027	1,241	252
1969	29,257	7,493	11,737	769	1,133	211
1970	41,528	10,489	16,816	1,066	1,587	250
1971	49,239	11,693	16,901	962	1,538	225
Grand Total	221,794	52,383	83,026	5,690	7,619	1,485

Source: United States Department of Justice, Immigration and Naturalization Service.

least 3,619 scientists repatriated to Greece since 1960. In spite of the inflow, there seems to be serious shortages of scientists in certain fields. There appears to be, for instance, more than an adequate supply (compared to actual demand) of physicians, lawyers, architects, civil engineers, and business and government administrative posts. By contrast, there are serious shortages of well-trained people in industrial, managerial, and administrative skills; of scientists in the agricultural sciences, research scientists in economics, and other fields of social science and modern technology (Coutsoumaris, 1968:171).

causes and effects: discussion and analysis

That Greece is losing annually a substantial number of actual and potential scientists and other professionals cannot be denied. Yet the question of Greek «brain drain» as such becomes a rather «mute issue» unless one is able to examine its causes and assess its effects upon the development of a nation. In this section of the paper an effort will be made first to examine the causes of international migration of scientists and the conditions prevailing in less advanced countries (including Greece) that lead to brain drain and second to consider some of the assets and liabilities, a «balance sheet» of sorts of the Greek brain drain.

It has been pointed out earlier in this paper that there are those who look at migration of scientists as a national hemorrhage which robs the nation of its human resources and retards the social, political, and economic development of a nation. On the other hand, there are those who view it as a blessing as long as scientists cannot be effectively absorbed by the socio-economic and occupational structure of their respective societies. The former subscribe to the «nationalist model» of the «brain drain» while the latter perceive it in terms of the «internationalist model».

In their efforts to advance viable causal explanations of international migration of scientists, a number of writers have focused their inquiries upon a multi-factor and multi-dimensional approach. To put it in a somewhat simplified way, there are two broad categories and constellations of factors in the brain drain controversy. There are those who look into the economic, demographic, cultural, institutional and political factors or the so-called objective and/or external forces which push the scientists out of their home countries. On the other hand, there are those who look at the individual scientists and professionals themselves—both attitudinal and behavioral aspects of one's profession—the motives, goals, aspirations, values, professional ethos, and action orientations of the individual scientists and professionals in general.

A number of writers have primarily dealt with the so-called stock explanations: greater mobility for trained persons, greater cultural horizons, the desire to travel, the attractions of a well-informed international market for professionals, higher incomes and the like (quoted in Coutoumaris, 1968: 171). Part of this explanation is the supply and demand economic model for oversupply of highly educated persons in certain fields but not in others is a problem as important as brain drain itself. An oversupply of certain professional skills without an effective absorption and demand in the professional marketplace leads to unemployment, underemployment, and finally to migration of scientists. If this is the case, one cannot speak of «brain drain» in the negative sense for the home countries (including Greece) but rather of «brain outlet» for the otherwise non-utilized human manpower. It has been reported (CIMT, 1970:21-22) that one important common characteristic of the losing countries is that the expanded educational system has produced more graduates than their economies can effectively absorb.

There are also powerful noneconomic reasons

which are equally counter-productive to the effective use of scientists and which retard the social, economic, and political development of a nation. The Committee on International Migration of Talent (1970:46) lists the following noneconomic factors conducive to brain drain in the emerging countries of the third world: the rigidity of government employment systems, the power of entrenched professors, the extreme inertia of institutions, the lack of research funds, professional isolation, nepotism, lack of career mobility, inadequate recognition of talent in younger people, lack of hope for the future, and prejudice and discrimination based upon race, national origin, religion or caste.

Coupled with the noneconomic factors are also professional considerations that further aggravate the situation and contribute to the «brain drain». For example, the quality of intellectual, professional, educational and cultural life in the home country is to a large extent the determinant of brain drain. If there are a pervasive lethargy and cultural stagnation that are frustrating to the individual scientists, the necessity and the need for broad professional contacts and opportunities for both serious scholarship and dissemination of ideas will not be satisfied. The lack of facilities for advanced training, research, and teaching in the home countries particularly for highly specialized scientists leads also to «brain drain».

Another important professional consideration leading to «brain drain» is a feeling on the part of the scientists that their work and contributions are not appreciated and socially rewarded in their respective societies. A system of social hierarchies and stratification exists which is not based on the universal criteria of meritocracy and achievement but rather is based on the ascriptive criteria of birth, age, sex, family, class, race, caste, tribe, religion, geography, and political affiliation and ideology. This differential treatment based on criteria other than merit, achievement, and ability is what social scientists refer to as social discrimination and prejudice which are contributing factors to the migration of scientists.

The rigidity of the stratification system also manifests itself in the lack of career mobility and promotion of young academic and research scientists. Career immobility and promotional freeze of highly talented people operate as deterrents of incentives and discourage competition in scholarship and excellence. The absence of vertical career mobility and promotion in both academic and non-academic professional occupational roles in the home country is an important determinant of migration of scientists.

It has been argued (CIMT, 1970:46) that when professional needs such as opportunities to be crea-

tive, a chance to effectively raise one's professional expertise and talents, to work with respected associates and colleagues, a feeling of social worth and usefulness in the community are met, there is a tendency for professional people to stay home.

In some respects the causes of brain drain in the less advanced countries are similar to and in other respects different from those of more advanced countries. One obvious difference for example is that the former are poor in natural resources and capital required to invest and provide adequate means and acceptable standards for professional and scientific work. Small nations such as Greece which are poor in natural resources and located unfavorably with respect to external sources of materials or large markets find it difficult to compete industrially with the more advanced countries in the West (Triantis, 1967). Immigration in general and that of scientists in particular seems to be a natural outlet for Greece's problem of unemployment and underemployment of its people. In this respect the United States and other more advanced countries provide a positive contribution to the less advanced societies by utilizing the otherwise un-utilized professional talents.

In short, while economic considerations are a powerful factor affecting the migration of exceptional people in less advanced and more advanced countries alike, a constellation of noneconomic factors seems everywhere to be more important particularly in the more advanced countries of Europe.

The impact of brain drain on the development of the nation is different from one nation to another and from one time to another. Generally, the migration of scientists as that of migration in general has both assets and liabilities for the losing nation. Indeed, the shortage of brainpower is not the only obstacle in the national development. An equally serious problem is the oversupply and saturation of certain specialized fields of scientists and other professionals that cannot be effectively absorbed in the occupational and economic structure of the nation.

India, for example, has an oversupply of engineers who until recently migrated to England. Greece also produces more engineers and lawyers than she can absorb. In the last few years there is a «brain drain» in reverse even in the United States. Due to the elimination or cutting of certain programs such as space exploration or military industry, a large number of engineers and physicists were laid off. Thus, a substantial number of American scientists of German extraction accept employment in West Germany. Likewise many Jewish-American scientists move to Israel to work. A number of American public school teachers have recently accepted employment in Australia.

In this respect migration of scientists and other highly skilled people prevents in principle a waste of human resources and provides for effective utilization which may benefit both the home and host countries alike. The former indirectly receives advantages in the form of income remittances and other less tangible gains as well as by allowing opportunity for other scientists who remain behind to be fully and effectively utilized. It is also the receiving country which benefits from the skills and talents of the incoming scientists. This gain in turn particularly in some of the highly specialized scientific occupations benefits humanity as a whole.

To really assess both the assets and liabilities of «brain drain» for a given nation including Greece, one should have a sustaining profile of scientific manpower both in diachronic and synchronic terms. The question of «brain drain» is not so much «how many» scientists or other professionals migrate from one country to another, but rather what kind or what quality of individual scientists do migrate. For example, there are thousands of doctors and physicians in a given society yet only a handful of them have diagnosed the etiology and prescribed the therapy of certain human diseases. A Fermi or an Einstein, for example, cannot be regarded as a statistical category. One particular scientist may be worth one hundred other scientists. A great discovery or invention beneficial to humanity cannot be measured in terms of statistical categories or numbers of scientists who migrate.

recommendations

In view of the present status of «brain drain» and scientific development of Greece, a number of long and short range recommendations may be offered that might genuinely alleviate the stream of «brain drain» and transform it into a stream of «brain gain» or «brain circuit» or even better of «brain exchange» for the rapid process of modernization and development of Greece. These recommendations must be predicated upon two assumptions. *One*, the realization that «brainpower» is a vital and indispensable force for the national development of the Greek nation and *Two*, the willingness and determination on the part of national leadership in both its public and private sectors to re-examine and re-evaluate its domestic policies, shift its priorities and ensure that Greece's «human resources» are utilized in the fullest possible way.

«Brain drain» must not be seen as an isolated phenomenon. The concerted efforts should aim at diagnosing and treating the root of the problem and not its symptoms of which «brain drain» may be considered a manifestation. And the root of the problem, it seems to this writer, lies in the nature

and character of the Greek social structure and the manner in which human resources are utilized and rewarded.

Both the Greeks of Greece proper and those in the diaspora must develop a professional class analogous to the entrepreneurial class. Greeks are known more as a nation of entrepreneurs rather than as a nation of professionals. The professional and academic community in modern Greece was and still is above all a national academic community. Greece has not succeeded in developing a broader scientific and professional base, one which can be used as a «frame of reference» by future Greek and non-Greek scientists and professionals whether these scientists live in the United States, Western Europe, or in the nations of the third world.

While the repatriation of «Greek scientists» should be a desirable and long range objective by private and public agencies alike, it seems to this writer that it is not sufficient to appeal to the national sentiments of the Greek scientists to return home. Greece must above all proceed to plan and solve its scientific manpower problem by revitalizing and restructuring its educational system along the model of more advanced societies particularly the United States.

A repatriation campaign and appeal to recruit Greek scientists working abroad must be based on a rational and realistic assessment of the nation's capabilities and needs. If a nation is not capable of effectively utilizing its human resources, it should not invite more scientists than it can absorb. It is usually in those nations with an oversupply of scientists that the problem of brain drain is a serious one.

Greece should not be known only as a country of leisure and tourism to the outside world but as a country that offers excellent opportunities and facilities for teaching, research, and writing. Scholarship and teaching should be rewarded and must go hand and hand. The subsequent specific and general recommendations are offered both as short and long range guidelines. In no way are these designed as either/or strategies of national development. In other words, these recommendations are not the only alternatives in bringing about directed social change in Greece. Unless an effort is made to re-evaluate and re-conceptualize Greece's human manpower, and on that basis restructure the policies, brain drain will continue to exist in Greece.

Concerning Greece Proper

1. Conduct a careful dispassionate annual review of the numbers and kinds of specialists and/or scientists needed to achieve national development.

2. Develop a sustained national plan of development in which a list of priorities and long range goals of national development would be determined.

3. Stress quality over quantity by concentrating efforts upon the support of productive scholars and the elimination of the incompetent and lethargic. This would include the following aspects: (a) Provide a new system of incentives and rewards based primarily on merit and achievement rather than on ascriptive attributes (i.e. age, sex, class, etc.), (b) Encourage innovation and accomplishment; (c) Alter the ranking system of the professorial chairs by creating additional ranks in a manner similar to the American model of academic ranking and expand the present policies from those founded upon «sponsored mobility» and nepotism to ones based on universal criteria of «contest mobility», achievement, excellence in teaching, research, and administrative abilities of the university professors.

4. Restructure and redefine the role of the modern university and research organizations. Universities should cease to be feudal establishments and must change their curricula, modernize their structures and policies of governance.

5. Expand the research activities of the present science research centers both at the university level and research organizations. Also encourage and promote research at the universities in addition to that carried out by the research centers.

6. When developing new research centers or institutions of higher learning, attempt a program of decentralization in order to establish a better geographical balance.

7. Advance organizational along with professional skills for both are indispensable.

8. Maintain academic freedom and a posture of value free intellectual honesty, objectivity, and responsibility in both the teaching and research aspects of science.

9. Develop a working relationship between the academic world and the larger community.

10. Increase the interest and seek greater professional support of the broader scientific community. For example, various science (physical and social) departments in major universities, grant giving institutions in other countries, and international agencies sponsor scientific training and research and also help disseminate the scientific findings in Greece.

11. Increase the number of scientific and professional journals and expand readership by using English and other languages as media of communication.

12. Expand the scientific base in Greece through membership in national and international associations. Also sponsor and encourage Greek scientists to attend these international meetings, give scientific

papers, and participate in panel discussions and professional symposia.

13. Invite various renowned Greek and non-Greek scientists from overseas to teach and conduct research studies in Greece. This would tend to avoid parochialism in science.

14. Transform the Greek «brain drain» into a «brain gain» or «brain exchange» by encouraging Greek scientists and their colleagues overseas to initiate a series of scientific publications using Greece as the research site and disseminate the findings by Greek and non-Greek scientists concerning modern culture and social structure in Greece.

Concerning Greeks in the Diaspora

1. Establish a Greek-American university in Greece supported jointly by Greece and Greek organizations and professional associations overseas.

2. Establish professional linkages between Greek scientists and institutions of Greece proper with those found in other countries. For example, invite Greek scientists from abroad to come more frequently to Greece and meet their colleagues or vice versa.

3. Encourage joint research projects and teaching seminars between Greek scientists overseas and those in Greece proper.

4. Increase and expand exchange programs and summer course offerings and institutes for Greek and non-Greek scientists concerning various aspects of the social structure of Greece. Initiate an exchange program of scholars and students and organize conferences and seminars to be held in Greece.

5. Organize charter flights to Greece for professional societies and students similar to those arranged by Greek churches and Greek organizations, i.e. AHEPA, Pan-Arcadian Federation, Pan-Macedonian, Byzantine Fellowship.

6. Compile directories of Greek scientists and students overseas.

7. Compile bibliographies of scientific works and studies by Greek and non-Greek scientists concerning various aspects of the social structure of Greece.

8. Establish at the ambassadorial level and in major cities where Greek consulates are located information offices concerning scientific developments and on-going research by Greek scientists proper and Greek and non-Greek scientists in other parts of the world.

summary and conclusion

In this paper an effort was made to dispassionately examine the Greek «brain drain» within the context of international migration of scientists.

Brain drain was analyzed as a symptom and as an aspect of the Greek social structure and the problem of Greek migration in general.

Certain conceptual/theoretical and empirical aspects of «brain drain» controversy as they impinge upon particular countries including Greece were explored. Indeed, the purpose of the paper was primarily exploratory and diagnostic and only secondarily therapeutic and ameliorative in nature. Regarding the latter an agenda of interconnected specific and general recommendations were offered as pedagogical and policy guidelines. These guidelines, however, should not be construed as the only alternatives in bringing about change in Greece.

It is the opinion of this author that whatever changes should be initiated should first spring from within the Greek social structure. A rational long range plan grounded in past, present, and future realities and potentialities of Greek brain power should be initiated vis-a-vis the needs and prospects for the national development of the Greek nation within the European and Middle-Eastern community of nations.

In planning her future development, Greece can benefit and capitalize from Greek scientists in the diaspora without necessarily committing herself to a policy of their repatriation. Indeed, it seems to this writer that Greek «brain drain» can be transformed to a «brain drain» and/or «brain exchange» if the national and educational leadership in Greece adopt a cosmopolitan posture regarding science and encourage both Greek scientists in Greece proper and those Greek and non-Greek scientists overseas who are interested to carry out individual or joint research and teaching in Greece.

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