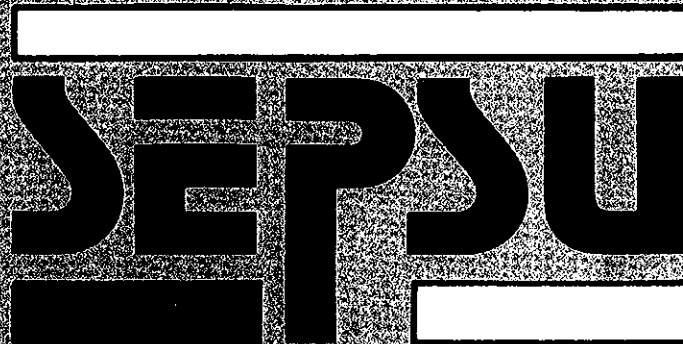


Box 1993



Policy Study No. 8

**THE MIGRATION OF
SCIENTISTS AND ENGINEERS
1984-1992**

SCIENCE AND ENGINEERING POLICY STUDIES UNIT

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For further information, please contact:

SEPSU
The Royal Society
6 Carlton House Terrace
London SW1Y 5AG

Tel: 071-839 5561
Fax: 071-930 2170

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*The Royal Society
of London*

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M J Ringe

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SCIENCE AND ENGINEERING POLICY STUDIES UNIT
of
The Royal Society and The Royal Academy of Engineering

*The Royal Society
of London*

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Foreword

Why should you want to read this report? As the White Paper *Realising our potential* has emphasised, a vigorous research base is a key ingredient in our national well-being. The UK is only a small element of the global research base, so an international approach is essential. Indeed, it is the policy of many funding agencies to foster international collaboration. But, while short-term mobility directly strengthens the national research base, long-term emigration does not. So up to date factual evidence on the state of the 'brain drain' in academe, as presented in this report, will be of interest to all concerned with the health of the national research base: the responsible Ministers and their advisers, the managers of various parts of the system, those who seek to benefit from academe, and academic researchers themselves.

During the 1980s it was received wisdom that substantial numbers of scientists and engineers were leaving the UK, to the detriment of the national research base. SEPSU therefore undertook a study to examine the quantitative basis for this belief, producing hard data on both emigrants and immigrants. Our report, published in 1987, helped to move the discussion onto a firmer and more balanced basis. With the generous support of the Nuffield Foundation, to whom I should like to express my thanks, we have now repeated our earlier analysis of movements to and from academic posts (the main focus of migration). We thus have directly comparable data sets for the two periods 1975–85 and 1984–92.

Between the two periods, our data show that migration from the UK has slowed a little in some subjects and remained similar in others, while migration into the UK has increased slightly. But the down side, as before, is that emigrants tend to take long-term posts while immigrants tend to take short-term posts. Moreover, British emigrants leave for professional reasons but return, if they do, primarily for personal reasons. So we should be careful not to draw too much comfort from the simple numerical head-count. This conclusion is reinforced by the continuing increase in the proportion of Fellows of the Royal Society who live overseas.

Summary

This report describes a study of the migration of scientists and engineers to and from the UK over the period 1984–92. The report follows closely the format of a previous SEPSU study published in 1987 which collected similar data for the period 1975–85.

The report concentrates on five broad fields of science and engineering in the UK — biochemistry, chemistry, earth science, electrical engineering and physics. The main method of data collection was a questionnaire survey of heads of departments and of leaders of university research groups in the five subject areas. This asked for details about migration of young research workers (i.e. recently qualified PhDs), postdoctoral research assistants (PDRAs) and more established, permanent members of staff. In addition to data on migration to and from the UK it also collected data on movement to other UK employment from academia. The response rate was a little under 70%, with a total of 371 replies. In addition a series of interviews was undertaken to follow up the questionnaire findings.

Respondents named 447 UK scientists and engineers who left the UK for overseas posts during the years 1984–92. Of these, 228 were experienced scientists and engineers and 219 were recently qualified PhDs. Respondents also named 462 scientists and engineers who entered the UK from abroad during the same period. Of these 144 were UK nationals returning, along with 318 foreign immigrants.

For postdoctoral research assistants and more senior members of university research groups the average emigration rate during the period 1984–92 was 2.1% annually (similar to the 2.3% reported for the years 1975–85). The rate was much lower for more senior staff from departments, at around 0.3% annually (compared with 0.5% previously reported), whereas the emigration rate for recently qualified PhDs was around 13.5%, virtually identical to that previously reported.

The immigration rate to university research groups (excluding those coming to study for higher degrees) was 4.0% annually, up slightly on the previously

reported 2.9%, whilst immigration to university departments was 0.5% annually, up slightly from 0.4% reported for the previous decade.

Overall such figures suggest that emigration of UK scientists and engineers has, if anything, fallen slightly over the recent period. In addition the number of overseas staff being attracted to the UK has increased slightly, as has the overall proportion of such incomers who are British nationals returning home. However, there are concerns that it is the highest quality staff who are leaving, to the detriment of the UK. Evidence, both from the survey and from other indicators such as the geographical distribution of Fellows of the Royal Society, supports this view.

The survey confirmed the previous findings for 1975–85 that UK staff emigrate for professional reasons (such as career opportunity, levels of equipment) but return primarily for personal reasons.

One interesting change between the earlier survey and the present one is the increasing popularity of other EC countries as a destination for emigrating UK scientists and engineers. If this trend continues it could suggest the increasing integration of the UK and EC research communities.

Migration of scientists and engineers is not in itself the controversial policy issue today that it has been in the past. Respondents thought that the world economic recession had had a significant dampening effect on migration of staff, particularly to senior, permanent positions. It was suggested that once the world economic recovery got underway migration rates were likely to increase, to the detriment of the UK. The research selectivity exercises and the concentration of resources into centres of excellence were thought to have played a part in attracting high quality UK (and other) staff from overseas, but many respondents were concerned about the general expansion of the university system (with its associated teaching commitments), the introduction of quality assessment (for teaching and research) and the increasing demands on limited financial resources. Many thought that these factors would make the academic profession less attractive in relation to other professions and that scientists and engineers would look to other professions or places of employment.

Does migration matter? Clearly intellectual exchange is vital if the UK is to retain the excellence and vigour of its science and engineering base. There are major

benefits, for the individual and the UK, of young scientists and engineers gaining experience and contacts abroad. Indeed, there are many publicly funded schemes promoting such movement. There is, however, concern that the UK academic environment is becoming less attractive than overseas employment and therefore less able either to attract the most talented staff back from overseas, or to stop them moving to non-scientific and engineering employment. This matters, both for the intrinsic cultural life of the nation and because UK industry needs a healthy UK science and engineering base as a source of skilled scientists and engineers who generate creative ideas and provide a route through which to access and participate in the development of the global knowledge base.

The 1980s were a time of change for the UK Science and Engineering Base. The 1990s seem set to be a time of greater change. It is important to monitor the effects of this change. Migration provides one relevant, albeit complex, measure for this purpose. Our work shows that between 1975–85 and 1984–92, the scale and pattern of migration changed in modest but significant ways. Whether this remains the case over the next decade is worth keeping under observation.

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I. Background and study design

The migration of scientists and engineers is a subject of continuing interest to all those concerned with the state of the UK science and engineering base and the overall economy. It is a complex phenomenon. The popular phrase the Brain Drain implies a one-sided movement, to the detriment of the home country, but it is important to attempt to look at the whole picture — who has migrated away, to where, for how long, why, have they returned; who has migrated into the UK, again from where, why and for how long; the relative quality of the incomers and outgoers; is migration a significant factor — for whom (the migrants, the institutions or the country), based on what criteria? It should also be remembered that the movement of scientists and engineers between countries is actively encouraged by many organizations (e.g. the Royal Society, the European Science Foundation, the European Community). At what stage, if ever, does migration change from a policy objective to a policy problem?

This study updates one published by SEPSU in 1987*. Coming at a time of vigorous but largely anecdotal discussion the earlier report provided hard data and proved to be an influential source of insight. Since migration remains a topical policy issue SEPSU, with support from the Nuffield Foundation, has now generated fresh data, covering the years 1984–92, to inform the current debate.

PREVIOUS STUDIES

The 1987 SEPSU report investigated migration in five broad fields of science and engineering — biochemistry, chemistry, earth sciences, electrical engineering and

* *Migration of scientists and engineers to and from the UK*. SEPSU Policy Study No. 1. (1987).

A similar questionnaire was sent to heads of departments in the five subjects asking for information about the movement of more senior university staff (primarily permanent academic staff members).

In both questionnaires respondents were asked to supply in confidence the names of migrants, to help eliminate duplication between the two questionnaires. This also served as a safeguard against exaggeration.

RESPONSES

The final response rate was a little below 70%, compared with the response rate of 83% in the previous survey. We received a number of letters and telephone calls wishing the study well but stating that the department simply could not now spare the time to complete the questionnaire. One replied that they received over 50 official/semi-official data-gathering forms per year and ours was simply a low priority. Response rates are given in table 1.1.

The distribution of questionnaire responses matches quite closely the distribution of departments as graded in the UFC research rating exercises. The sample is therefore representative of the broad mix of departments within the system.

Overall, the response rate is sufficient for purposes of policy analysis. SEPSU is indebted to all those who found the time to complete the questionnaires.

II. Questionnaire analysis

Part I — Movement of staff to and from the UK

NUMBER OF MIGRANTS NAMED BY RESPONDENTS

A total of 447 UK scientists and engineers who left the UK for overseas posts during the years 1984–92 were named in 371 questionnaires. Of these 228 were 'experienced' scientists and engineers and 219 had just gained their PhD.

Respondents also named 462 scientists and engineers who entered the UK from abroad during the same period. Of these 144 were British staff who returned from overseas, along with 318 foreign immigrants.

As in the previous study, we explicitly asked respondents to exclude foreign postgraduate students who stayed in this country for not more than 3/4 years to study for a higher degree. They do not represent long term migration to the UK as most leave the country on completion of their degrees, although some respondents commented that foreign postgraduates now formed a major part of their research groups.

Some respondents supplied only general statements about staff movements; these responses were not included in the analysis.

The following analysis deals only with professional scientists and engineers of PhD or equivalent status and only with emigrants of British nationality or immigrants of any nationality.

Tables 2.1A and 2.1B show the number of named scientists and engineers leaving or entering the UK by each of the categories of respondent and the proportion of respondents who reported no migration in either direction. 72% reported some migration to or from their group or department during 1984–92,

Table 2.1A
Occurrence of migration by category of respondent (all disciplines)

	<i>RGL</i>		<i>HoD</i>		<i>Total</i>	<i>1975-85</i> <i>Total %</i>	
No migration	43	21%	60	36%	103	28%	33%
Migration to UK only	33	16%	35	21%	68	18%	13%
Migration from UK only	47	23%	27	16%	74	20%	23%
Migration to and from the UK	83	40%	43	26%	126	34%	31%
Total respondents	206	100%	165	100%	371	100%	N=486

RGL = responses from Research Group Leaders, primarily about short-term staff.
HoD = responses from Heads of Departments, primarily about permanent academic staff.

Total 1975-85 = total responses from the university sector in our earlier study.

Source: SEPSU Policy Study No. 8.

Table 2.1 B
Numbers of migrants by category of respondent

	<i>RGL</i>	<i>HoD</i>	<i>Total</i>
<i>Individuals leaving the UK 1984-92</i>			
UK Staff	130	98	228
Recent PhDs	219	n/a	219
Total	349	98	447
<i>Individuals coming to the UK 1984-92</i>			
UK nationals returning	22	122	144
Non- UK immigrants	269	49	318
Total	291	171	462

Source: SEPSU Policy Study No. 8.

with research group leaders more likely to report migration than heads of departments. These figures are broadly comparable with our earlier study for 1975–85.

POPULATION REPRESENTED BY RESPONDENTS

The questionnaire replies necessarily represent only a sample of UK research effort. It is difficult to assess what proportion of the total relevant scientist and engineer population was covered: in the university sector the total number of researchers in any one discipline is difficult to measure from central sources as they tend to be structured around cost centres. We therefore asked respondents to give an indication of the size of their groups or departments, and of the average number of specific grades in the group or department over the survey period. Some respondents, particularly, but not only, in earth sciences, gave details of departmental mergers which had occurred during the late 1980s. In such cases we calculated average group sizes over the whole period 1984–92.

The estimated total population for each is included in table 2.2A.

RATES OF MIGRATION

(i) By category of respondent

To estimate the rate of migration the numbers of migrants in each category were compared with the corresponding estimated population. Table 2.2A shows that the total number of migrants who left or entered the UK is small in comparison with the total number of scientists and engineers. For postdoctoral research assistants and more senior members of university research groups the emigration rate was 2.1%. Heads of departments reported an emigration rate of 0.3%, slightly lower than the 0.5% reported previously. Overall these figures are broadly similar to those for 1975–85.

The rate of emigration from university research groups of UK postgraduates who had just completed a PhD is more difficult to measure, since the total postgraduate population (843) in the group survey includes foreign postgraduates and also those at different stages of their courses. However, an estimate can be made of the relevant population for the years and disciplines covered by the survey, by using other information on the typical nationality distribution of individual disciplines and by assuming that 30% complete PhDs in any given year.

Table 2.2 A
Rate of migration by category of respondent (all disciplines)

	<i>PhD students</i>	<i>RGL PDRA + senior</i>	<i>HoD</i>
Total number of staff in sample	843	799	3539

Estimated average number of UK staff in relevant disciplines in sample	592	679	3362
Total emigrants in sample	219	130	98
Average leaving UK per year 1984-1992	24	14.4	11
% of estimated population leaving UK per year	13.5%*	2.1%	0.3%

Total immigrants in sample	na	291	171
Average entering UK per year 1984-1992			
Total	n/a	32	19
Of which UK		2	13.6
Of which non UK		30	5.4
% of estimated population entering UK per year			
Total	n/a	4.0%	0.54%
Of which UK		0.25%	0.38%
Of which non UK		3.75%	0.15%

* Rate related to estimated number of pg gaining PhD each year (i.e of total population some 30% gaining degree each year, = 178)

NB period 1984-92 treated as 9 academic years for this analysis. UK populations estimated as in table 2.2B.

Source: SEPSU Policy Study No. 8.

From this the emigration rate for recently qualified UK PhDs was 13.5%, very similar to the 13.4% revised rate for PhDs reported in the previous study.

Immigration rates to research groups were 4.0%, an increase from 2.9% in the previous study. Heads of departments reported an annual immigration rate of 0.5%, a slight increase over the previous rate of 0.4%.

Table 2.2 B
Rate of migration by category of respondent and discipline

	Biochemistry	Chemistry	Earth Sciences	Electrical Engineering	Physics	All disciplines
University research groups						
Total responses	40	56	28	27	55	206
<i>(i) Research students</i>						
Total population	122	246	105	106	264	843
UK population (estimate*)	88	185	79	42	198	592
UK pg gaining PhDs each year (estimate*)	26.4*	55.5*	23.7*	12.6*	59.4*	177.6*
Emigrants per year	5	9	3	1	6	24
Annual rate of emigration%	18.9%	16.2%	12.7%	7.9%	10.1%	13.5%
<i>(ii) More senior staff</i>						
Total population	132	161	96	143	267	799
UK population (estimate **)	112.2	136.9	81.6	121.6	227.0	679.2
Emigrants per year	4.0	3.3	1.8	0.6	4.9	14.4
Annual rate of emigration %	3.6%	2.4%	2.2%	0.5%	2.2%	2.1%
Immigrants per year	6.3	11.7	2.8	2.3	9.2	32.3
Annual rate of immigration %	4.8%	7.3%	2.9%	1.6%	3.4%	4.0%
Heads of Departments						
Total responses	36	40	25	28	36	165
Total population	669	882	529	669	790	3539
UK population (estimate ***)	635.6	837.9	502.6	635.6	750.5	3362.1
Emigrants per year	1.8	2.6	1.0	3.0	2.6	11
Annual rate of emigration %	0.3%	0.3%	0.2%	0.5%	0.3%	0.3%
Immigrants per year	2.8	5.0	3.1	2.6	5.6	19.0
Annual rate of immigration %	0.4%	0.6%	0.6%	0.4%	0.7%	0.5%

* Population of PhD students estimated as follows:

Total population from survey divided by % of UK nationals, divided by a rate of 30% for annual completion rate for PhDs

Total populations were divided between UK and other nationals using rates from Atkinson *et al.* *An anatomy of research personnel in UK universities* (SERC, 1992) (i.e. Biological Sciences 72% UK nationals, Physical Sciences 75%, Engineering and Technology 39.5%)

** Population of research groups estimated using data from Atkinson *et al.* that 85% are UK nationals

**Table 2.3A
UK women emigrants**

	PhD		RGL		HoD		Total		
	All emigrants	Women	All emigrants	Women	All emigrants	Women	All emigrants	Women %	
Biochemistry	45	10	36	4	16	1	97	15	15%
Physics	55	4	44	3	23	0	122	7	6%
Electrical engineering	9	0	5	0	27	1	41	1	2%
Earth Sciences	25	1	15	0	9	0	49	1	2%
Chemistry	85	10	30	3	23	0	138	13	9%
Totals	219	25	130	10	98	2	447	37	8%

Source: SEPSU Policy Study No. 8.