Migration of the Professional, Semi-professional and Technical Occupations in South Africa: Past Patterns, Current Trends and Policy

David E. Kaplan

Message to Lyndon Johnson
from a Native American.
"Be careful with your immigration
laws. We were careless with ours. "

Introduction

The patterns and causes of scientific migration to and from South Africa are complex. Both the " attractions " and the " repulsions " for scientific and technical persons to work in South Africa have been determined by a variety of political and economic factors. Nor have these been constant over time - these determinants have been changing and are subject, at least to some degree, to policy choices.

By way of introduction, the first part of this paper briefly outlines South Africa's capacities in relation to science and technology. The contrast is drawn, most frequently, with the other African countries, since, as we shall see, scientific migrations as between South Africa and the rest of the African continent has assumed a special importance.

The second part of this paper attempts a " first-cut " examination of the empirical data on " scientific " migration to and from South Africa. A major qualification to make at the outset is that the data referred to here relate not to the migration of " scientists ", but rather to the category of " Professional, semi-professional and technical occupations. " Immigration and emigration figures exist for this category, but not for the more narrow grouping of " scientists [1] ". Unless designated otherwise, the discussion in this paper therefore relates to this broader occupational category, rather than to " scientists " more narrowly conceived. The paper examines the recent data on emigration and immigration - both the overall data, but also focusing on two important occupational sub-categories, namely doctors and engineers. The paper briefly attempts what historians term a " periodisation " ie. the identification of long time periods, broken up by major turning points, wherein the underlying factors and trends are reasonably constant. Particular consideration is paid to the continental (Africa-wide) dimensions of this migration and the regional dimensions (the SADCC countries) and the case of the key SADCC country, in this respect, Zimbabwe.

By way of conclusion, the paper briefly outlines current government policies as well as the analysis and proposals advanced by the very recent report of the Labour Market Commission in regard to this question.

Part 1 : South Africa's science and technology capacities

Post World War II developments in S&T

South Africa established a dedicated S & T system after World War 2, with the founding of the CSIR in 1945 South Africa's oldest and largest science council. The CSIR was conceived of as a national research organization and essentially similar to government laboratories established in the advanced countries. National laboratories were established for the basic sciences and these formed the core of the organization. There were other attached institutes that were more industry oriented, but the organization was primarily science driven. The freedom of individual researchers was respected and much emphasis was placed upon scientific publications. The CSIR was the leading research institution in South Africa and by 1985/6 was estimated to be responsible for performing 13 % of all the research undertaken on the continent of Africa [2].

Commencing in 1987, the CSIR was substantially restructured. Its 23 research institutes were replaced by eleven divisions or " strategic units ". Each strategic unit was focused on the needs of a particular market segment. A focus on applied research and a greater market orientation was also to characterise all the other government supported S & T performers.

Scientific research was also historically well-established in the university system, after World War 2. Apartheid ensured that the university system was heavily segregated. The " white " universities largely structured along Anglo-Saxon lines, disciplinary based with a research culture including tenure and reward for scientific publications, were significant sites of scientific research. This continues, but in the last few years government has been demanding an increasing emphasis on research that is relevant to national needs and supporting the development of research at the former black universities.

Inputs

In 1993/94, South Africa expenditures on R & D amounted to R2.6 billion (approximately $65 billion). This represents 0.75 % of GDP [3]. Over the last decade or so, total expenditure on R & D has shown a general tendency to decline - R & D has declined more rapidly than capital expenditure and R & D personnel as a percentage of the workforce has also declined.

Much of South Africa's technology thrust developed can be described as " mission-oriented " i.e. focused on radical innovations needed to achieve clearly set out goals of national importance. Most important have been technology development in respect of atomic energy and armaments [4]. It is not possible to calculate precisely the importance of R & D expenditure in these areas, but R & D in armaments directly exceeds R290million (or more than 10 % of total R & D spend) and 22 % of the Business sectors's spend on R & D [5]. The recent White Paper on S & T states the figure on Defense S & T to be R534million [6]. Over the past 26 years, over R14,600 million has been invested in atomic energy. While the R & D component of this expenditure is not known, it is certainly considerable. Atomic energy and armaments together therefore absorbed a considerable part of the resources historically invested in R & D. These areas - particularly atomic energy - are now attracting far less funding and further reductions are very likely.

Outputs

The number of South African publications in the Science Citations Index (SCI) was 3,700 in 1992. Publications increased steadily until 1987, but have declined since then. The decline has been most pronounced in respect of publications emanating from the universities whose publications declined by one-fifth between 1988 and 1991.

South Africa's share of total world SCI is currently a little under 0.5 %. South Africa's share rose to 0.6 % in 1986, and remained at this level until 1988, declining thereafter [7]. Citations are currently well below the international average in all fields except agricultural sciences. A recent assessment of the number of South African scientific publications and citations characterised South African science as " anaemic " and dramatically highlighted the extent of its decline in the period 1981-93 [8].

Nevertheless, South Africa's share of publications in the SCI is large by comparison with that of other African countries. In 1993, South African publications in the SCI were approximately equivalent to those of Egypt, Nigeria, Kenya and Zimbabwe combined.

South African origin patents registered in the US have exceeded 100 since 1987. South Africa is responsible for approximately 16 % of the patents granted to southern hemisphere countries in the US - second largest but well behind Australia. South Africa certainly dwarfs the international patenting of the rest of Africa [9].

Human resources

South Africa's human resources to support S & T are comparatively very poorly developed. This is evident at all levels. To take just one indication of this, in 1990, South Africa had a total of 121,000 scientists and engineers - approximately 3,000 per million population. In 1985, South Africa had some 8 % of the continent's scientific and engineering workforce [FRD, 1993 : 50]. Comparisons of graduating engineers per annum, reveals even more sharply, South Africa's poor performance by comparison with the NICs and indeed with a number of African countries.

Moreover, Blacks are severely under-represented in the ranks of scientists and engineers. To take but one indication of this. Of a total of 3,123 graduates employed by the science councils in South Africa in 1994, 2,975 or 95 % were White [10]. Overall, in 1990, only 18 % of all scientists and engineers in South Africa were black [11].

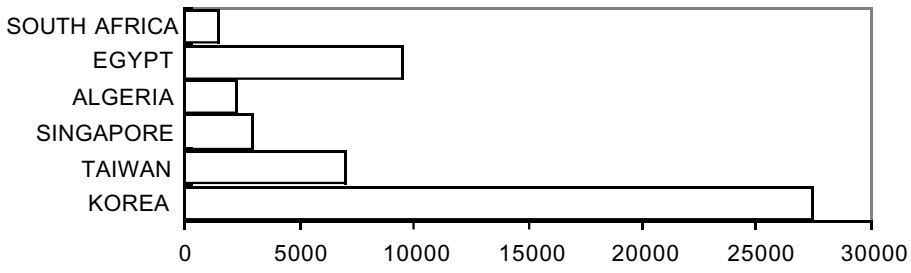

Figure 1. Graduating engineers per annum

Part 2 : Migration patterns - The data

The overall pattern

In the period 1947-1993, South Africa enjoyed a net gain in migrants in forty of those forty six years. The same picture holds for the professional and semi-professional category. In the last 10 years period, by contrast, there have been 4 years - 1986 and 1987 and 1994 and 1995 - when a net loss was experienced, both overall and of the professional and semi-professional category. It seems very likely that 1996 will also see a net loss [12].

Figure 2 and Figure 3 chart immigration and emigration (a) for all occupations and (b) for the professional and semi-professional category, over the last decade.

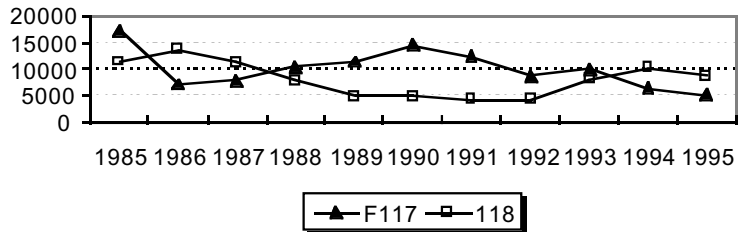

Figure 2. Total immigration and emigration, all occupations

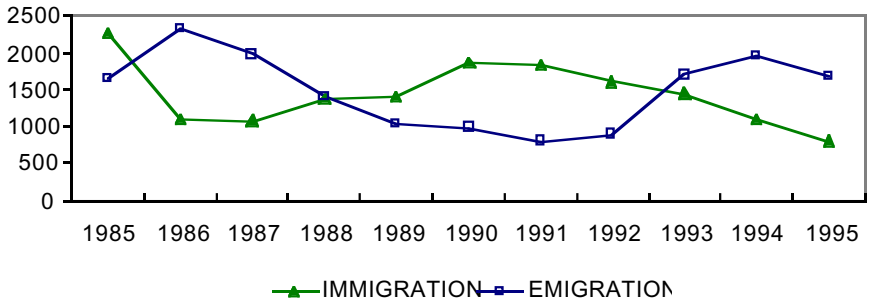

Figure 3. Immigration and emigration, professionnel, semi-professional and technical

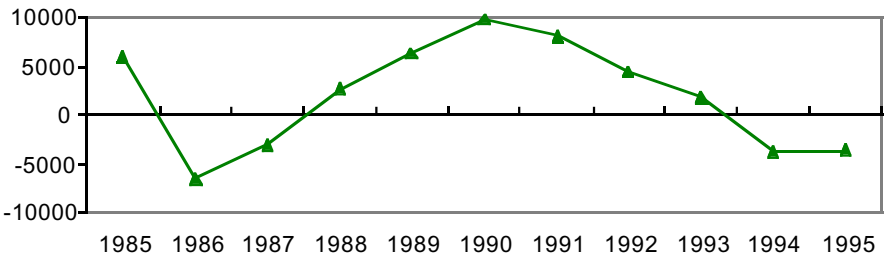

Figure 4. Net gain, all occupations

As is evident, from the two Figures showing net gain, the movement of all occupations and of the professional and semi-professional categories track each other very closely, suggesting that there are very similar explanatory underlying factors.

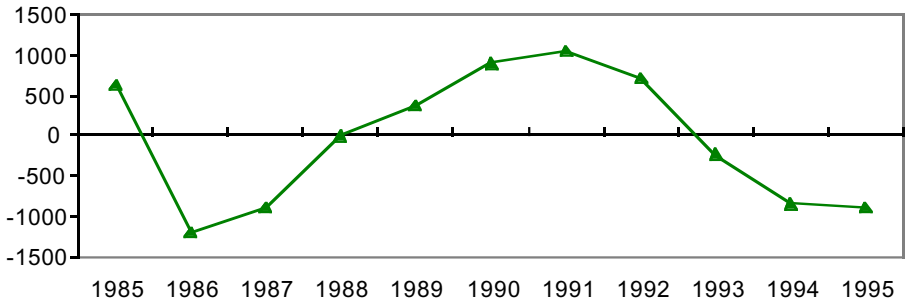

Figure 5. Net gain, professionnel, semi-professional and technical

The migration of the professional category A periodisation, 1960-1995"

Over the last three decades, South Africa has enjoyed long periods in which " scientific " migrations have been positive (inflows exceeding outflows). These periods have been punctuated by much shorter (hitherto never more than two years) periods of outflow, with the key turning points being marked by clear political episodes. Five periods can be distinguished.

Immediately following Sharpeville (1961), outflows increased dramatically. But with the high rates of economic growth thereafter outflows declined and inflows rose. In 1964 total immigration was nearly 41,000 with less than 8,100 emigrating for a net gain of nearly 33,000. In that year, for the professional category, there were almost 3,200 immigrants and a little over 900 emigrants - for a net gain of 2,256. The mid-1960s were the high point, but positive inflows continued.

This period saw the highest and most sustained level of inflow. What fuelled this inflow was a combination of the following factors - high rates of economic growth (much of that relating to capital and skill intensive industrial development) ; the development of so-called 'strategic projects' which were funded by government for political reasons and to lessen South Africa's external dependency, such as oil from coal, uranium enrichment [13] and armaments ; and a sustained attempt by government to attract white (particularly skilled) immigrants.

Following nation-wide unrest (1976), outflows increased substantially and inflows declined. Nevertheless, inflows still tended to exceed outflows - albeit by a much lower margin than in the 1960s. Similar factors underlay the flow of skilled labour in this period except that the growth rate slowed considerably and became more volatile - as a result inflows were at a lower level. Outflows were also at a higher level, principally because of mounting political uncertainties.

Overall though, these two periods saw major gain in the inflow of professional and skilled persons. It has been calculated that in the two decades after 1965, immigration accounted for about one-fifth of South Africa's increase in high-level personnel [14].

The next turning point coincided with deepening unrest combined with the government's refusal to countenance reform (epitomised in President PW Botha's 'Rubicon' speech) and the imposition of a state of emergency (1985-7). In 1986 and 1987, emigration substantially exceeded immigration. Immigration was at a historic low and emigration at a historic high. The major factors here were political turmoil, combined with a pronounced economic depression.

This initiated the fourth phase. Immigration increased somewhat, at least until 1990, while emigration declined dramatically - and there was a positive net inflow, until the end of 1993. However, there are some doubts as to the validity of the emigration figures. There is no data series for emigrants the first 9 months of 1993 due to a change in the departure form which did not elicit proper information. There were, at this time, very large discrepancies as between government

and other estimates for the number of emigrants [15]. There are various reasons, principally relating to exchange control, which lead many emigrants not to declare themselves as such. The likelihood is that the official emigration figures for the last few years are underestimated [16].

In the fifth and final phase, since the formation of the Government of National Unity, in 1994 and 1995, South Africa experienced two years of considerable net outflow of the professional category. Emigration is showing a declining trend on the statistics, but there is some evidence to suggest that it may be rising - particularly for skilled personnel [17]. Immigration is also showing a significant declining trend - see Figure 3. By comparison with January 1995, the data of January 1996 show a decline in immigration (68 to 53) and a particularly sharp rise in emigration (222 to 320) [18]. The gap is therefore increasing rapidly.

Three consecutive years in which there is a net migration of professional people is unprecedented. Moreover, there are indications of more long-lasting changes in respect of both immigrants and emigrants.

With regard to immigrants - between 1990 and 1993, there were " new " sources of immigrants - from Eastern Europe and Africa and, to a lesser extent, returning exiles. Nevertheless, the number of immigrants declined over this period. All these 'sources' of immigrants have largely dried up - the exiles have now returned ; immigration from Africa and particularly the SADCC countries has been on a long term decline (see below) and Eastern European immigration has also slowed considerably. But, much more significantly, government policy, or at least policy followed by the Department of Home Affairs, has, for the first time in South Africa's post-War history, sought to positively discourage immigration, including immigration of skilled and professional people (see below). The number of immigrants in the professional category has therefore declined markedly and consistently and is at a historic low.

With regard to emigrants, there was a major increase in the period just prior to and consequent on the formation of a new Government of National Unity. Emigration then slowed, but remains at a high level. As opposed to previous major periods of emigration that were precipitated by political events, there are indications that skilled emigrants in the period 1984-1994 have been more motivated by economic than political reasons (Argus 11/8/95). However, other socio-political factors, particularly the very high rates of crime, are increasingly stated as being the primary motivation for emigration on the part of skilled and professional people.

Economic performance is now improving and will be a major determinant of emigration, but the crime rate is growing. Moreover, declining government support for certain science-intensive activities - from uranium enrichment to higher-tech. curative medicine - are also promoting more emigration of the professional category. It therefore is very likely that emigration of professionals will continue to remain high [19].

The likelihood therefore is that South Africa will continue, at least in the short term and in the absence of any major policy changes, to experience a net outflow of professional and technical category - with important implications for further development.

The Migration of doctors and engineers, 1985-1995"

Within the professional, semi-professional and technical category, data is available for the subcategories of doctors and of engineers [20]. With regard to engineers, the data show net losses were experienced in 1986 and 1987 and then strong net gains until 1990. There after, the net gain declined steeply. Although, the 1993 figure was positive it is unreliable. 1994 and 1995 both registered a net loss and it is likely that 1996 will do so too, with the net loss increasing.

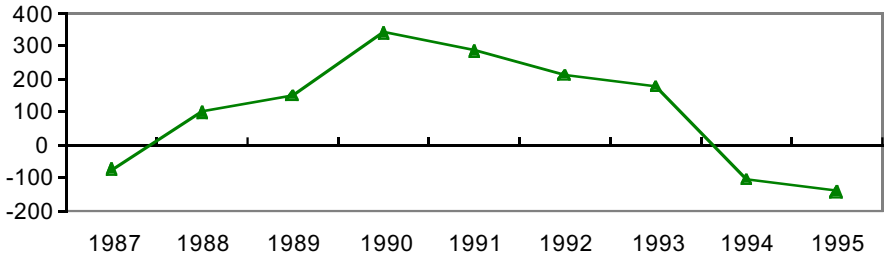

Figure 6. Net gain: engineers and related

Reliable data for the number (stock) of engineers in the country could only be obtained for the period after 1990. From a significant augmenting of the stock of engineers in 1990 (2 %), the 1994 figure is a negative 1 % and this negative trend continued in 1995 and in January 1996. A superficial look at the data suggests that migration of engineers is particularly sensitive to the economic climate - much more so than is the case for doctors, for example. With regard to doctors, there was a net outflow in 1986-87 and a marginal outflow in 1988. Net inflows then rose steadily until 1992. We know a little more about the composition of these immigrating doctors. Of the 1,897 foreign-trained doctors who came into the country from April 1990 to December [1991], 1,700 were immigrants. A small percentage of the remaining 200 were returning exiles; the rest were South Africans who, for various reasons, had studied abroad. " *Weekly Mail*, 21/2-28/2 1992. These sources 'dried up' after 1992 and inflow declined - it was negative in 1994 and in 1995 too. However, as a percentage of the stock of medics, net inflow or outflow has been quite limited over the last decade.

The South African Medical and Dental Council estimates that about 150 doctors emigrate each year (approximately 0.7 % of the stock) [21]. Given that the number of doctors graduating a year is growing at marginally more than 1 % per annum with population growing at 2.3 %, this is causing great concern in medical circles and in the restructuring of the health services. The South Africa Medical and Dental Council has asked for a review of doctors salaries and working conditions (*Sunday Times*, 5/5/95).

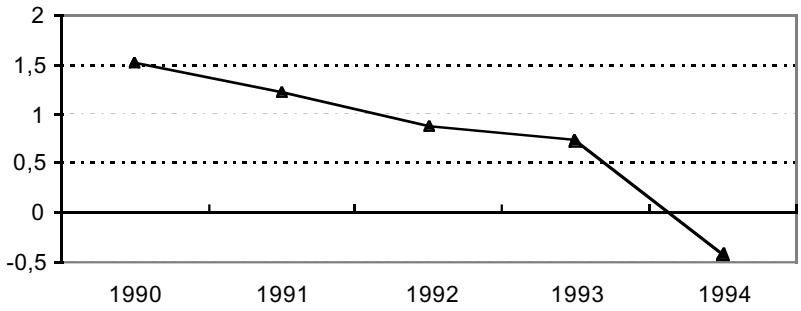

Figure 7. Net gain as % of stock of engineers

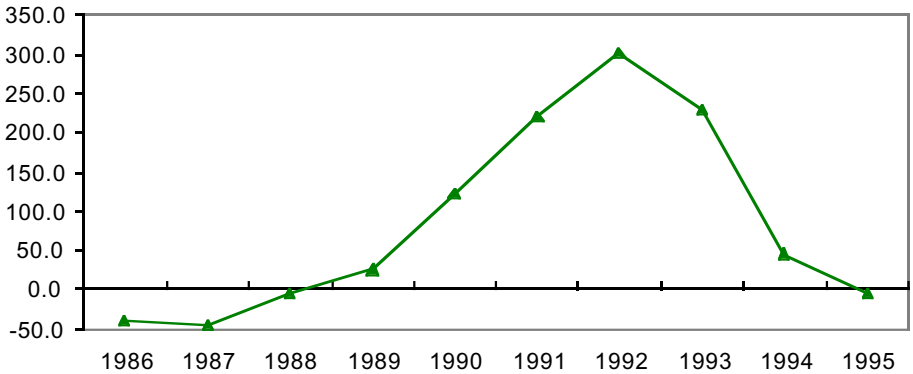

Figure 8. Net gain of medics

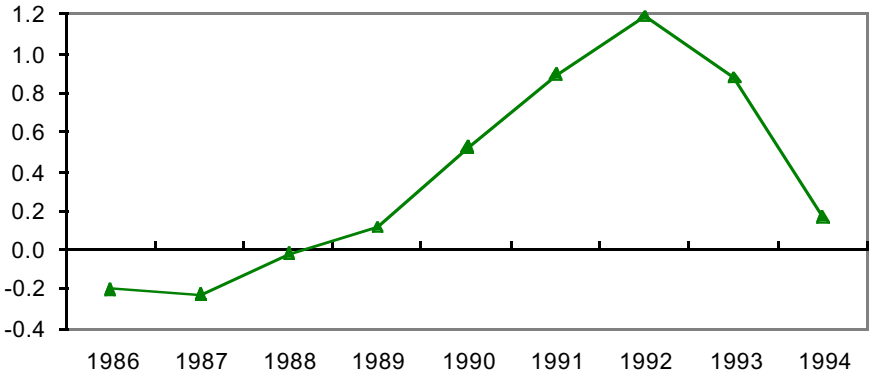

Figure 9. Net loss of medics as % of stocks

Migration to and from Africa and the SADCC countries, 1985-95"

Over the last decade, there has been a pronounced inflow of professional, semi-professional and technical persons to South Africa from elsewhere in Africa. Immigration has been on a declining trend however. Emigration from South Africa to elsewhere in Africa has been very limited - below 100. However, since 1993 this has increased and is now about 200 per annum. The " gap " has therefore closed considerably and the trends suggest that the outflow from South Africa to Africa will exceed the inflow.

A similar trend can be discerned in relation to the SADCC countries. While historically South Africa has been a major recipient of professional, semi-professional and technical persons from the region, the situation has now altered and in 1995 there was a net outflow from South Africa to the SADCC countries.

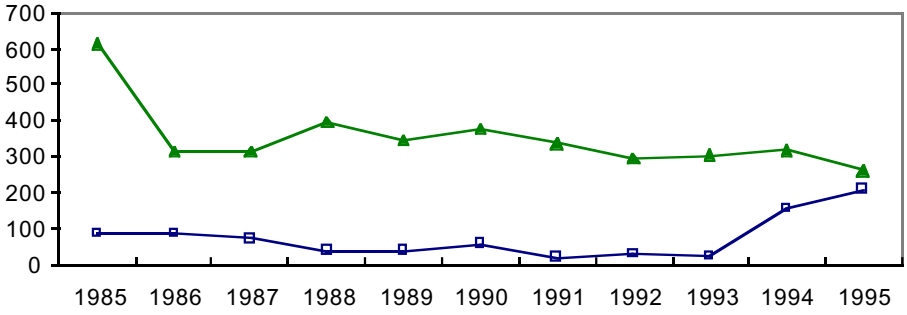

Figure 10. Immigration and emigration from Africa, professionnel, semi-professional and technical

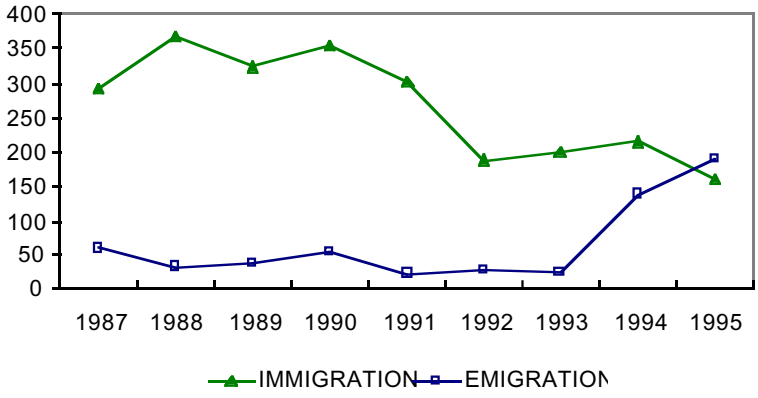

Figure 11. Immigration and emigration from SADCC, professionnel, semi-professional and technical

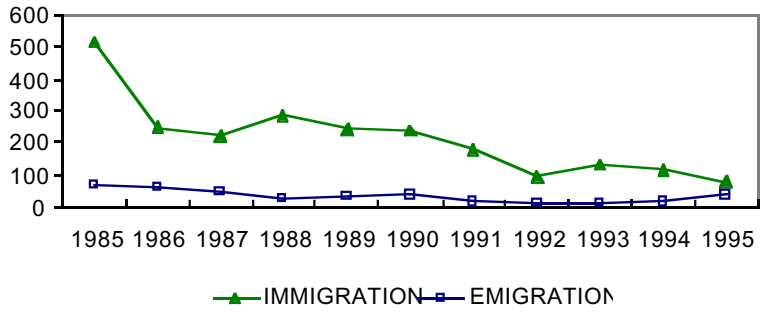

Figure 12. Immigration and emigration from Zimbabwe, professionnel, semi-professional and technical

On a disaggregated basis, these trends can also be seen at a country level. Thus, in relation to Zimbabwe, which has been the major SADCC country in relation to both outflows and inflows of labour [22], emigration is decreasing and immigration increasing and a " cross-over " is likely for 1996.

There have been strong calls from countries in the region, particularly from Zimbabwe, for South Africa to place restrictions on the entry of professional and skilled persons from the region. These restrictions are advocated in the interests of regional development. However, as we have seen, the trend is now reversing. Also, there is a notable migration of professional, semi-professional and technical persons from north to south, such that countries which have seen major outflows to South Africa have also seen major inflows from other African countries further north where levels of development are even lower. If South Africa imposed restrictions on inflows, this would not address the developmental problems of other African countries.

Overall, only a small part of South Africa's professional, semi-professional and technical personnel emigrate to other African countries (11 % in 1995). However, although the absolute numbers of immigrants from elsewhere in Africa have been falling, a much larger and growing share of South Africa's immigrants are from other African countries (16 % in 1991, but 37 % in 1995). In the event that South Africa were again to be a major net recipient of professional and skilled labour from Africa or the region, any proposed policy measures would need to assess the continental-wide impact of such flows.

Part 3: Conclusion - Some policy dimensions

For the first time in the post-War period, South Africa is experiencing a significant and a protracted period of brain drain of professional, semi-professional, and technical personnel. Emigration persists at high levels despite the fact that the economy is currently growing at a higher rate than it has at any time since the early 1980s. Emigration is clearly less sensitive to the economic climate than it has historically been. Other factors are coming into play - high crime rates and the reorganisation of the state services in the fields of health and education, in particular, are two evident factors. However, there is no firm evidence on the effect of these factors, or any others on emigration.

Similarly, immigration is historically at the lowest levels recorded. Moreover, levels of immigration are declining even further. This is true, even in relation to immigrants from Africa and the region. Once again, this is occurring in a period of reasonable economic growth. There are a number of factors which may account for the low levels of immigration, but firm evidence is

again lacking. However, what is clearly evident is that there has been a pronounced change in policy towards immigration.

Historically, immigration was encouraged, particularly in those occupations where there was an identified shortfall in suitable local applicants. In practice, this meant that there were no real barriers to immigration on the part of skilled and professional people. Under the Government of National Unity, the Department of Home Affairs has enforced the terms of the Aliens Control Act rigorously. Moreover a number of amendments to the Act have been passed which makes it far more difficult for skilled as well as unskilled workers to obtain work in South Africa. For example, all applicants for work permits and workseeker's permits and study permits will have to be made from outside the country. The Labour Market Commission report recorded.

Strong anecdotal evidence suggests that applications for work permits from skilled workers and potential investors are dealt with in an unsystematic and haphazard manner. It is argued that long term growth is hindered by skill shortages. This shortage is manifest in part, in unusually large occupational differentials. Under these circumstances, there are few grounds for a restrictive approach to applications for work permits from skilled foreign workers. Furthermore there is ample evidence to suggest that too little effort is being made to draw skilled foreign labour from developing countries, where the price of hiring this labour in South is far lower than the employment of an equally skilled foreign worker from an industrialised country. In this respect, the Commission is also particularly concerned at the role accorded to local professional associations who adopt a highly protectionist stance to the entry of foreigners into their ranks [23].

There are numerous reports of companies encountering enormous difficulties in obtaining permission from Home Affairs to allow skilled workers to obtain work and residence permits.

South Africa continues to have significant shortages of skilled workers [24]. Moreover, the wage gap as between professional and technically skilled occupations and unskilled workers is extremely high in South Africa [25]. Restrictions on the immigration of professional and skilled workers serves therefore to retard development and to exacerbate inequalities. This has prompted the Labour Market Commission to advocate a reversal of policy relating to immigration so as to actively encourage the immigration of professional and skilled people.

Countering emigration is far more difficult. The proposal that medical graduates, for example, would not be registered until they had done some service locally, is designed to limit the emigration of newly qualified doctors. But, such restrictions have strong disadvantages and may be difficult to enforce. Moreover, registration is not applicable to most other professional categories.

There is a need for much further research on the factors that underlie current trends in the immigration and emigration of professional, semi-professional and skilled persons from South Africa. As outlined above, the past does not serve as a good guide to the present - new determinants have entered the picture. Research particularly needs to unravel those determinants that may be influenced by policy. In the absence of a re-alignment of policy, the rapid and persistent haemorrhaging of professional, semi-professional and technical persons will significantly undermine the development prospects for post-apartheid South Africa.

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Mitton, S. (1995), “South African Science Anaemic : Serious Action Surely Advisable”, Science Watch, pp. 1-8. vol. 6, No. 3.

[1] The major sub-categories here are the following : Engineers and related technologists ; medical practitioners, specialists and dentists ; education and related occupations ; accountants and related occupations ; other. Engineers would generally be included in « scientific » migration studies - and hence the data relating to this specific sub-category is isolated and presented here. The other sub-categories would include but would also be wider than that of « scientists » conventionally understood. The data for the entire category Professional, semiprofessional and technical occupations are a measure of overall brain drain/gain.

[2] Garbers, C. (1989), quoted in Lutjeharms and Thomson, (1993).

[3] DACST, 1996 : 19.

[4] Oil from coal and, to a lesser extent, telecommunications equipment have also seen extensive technology development, driven by the state on the grounds of their strategic importance.

[5] In 1991/2, the Defense Department contributed R97million to R & D directly ; a further R51million was allocated by the different branches of the armed forces to « technology retention projects » and R & D to the amount of R100million was supported by capital projects. A further R30million was contributed directly by the Armaments Corporation (Armscor) itself and R13million by Denel. This excludes student bursaries and other forms of support on the part of Armscor and, most critically, defence related R & D in the private sector which is not directly supported by Armscor. The data in this paragraph were obtained from Garbers, C. F, 1993.

[6] DACST, 1996b : 48.

[7] FRD 1993 : 236.

[8] Mitton, 1995 : 1.

[9] Between, 1980 and 1990, South Africa had a total of 1,047 patents granted in the United States. Egypt had a total of 19 and Morocco 15 [FRD, 1993 : 246, Appendix 5-14

[10] LHA Management Consultants, 1994 p. 3.

[11] FRD, 1993 : 196.

12 Data are only available for January 1996. In that month the net loss in the professional, semi-professional and technical occupations was 267. This compares with a net loss in January 1995 of 154.

[13] CSS Statistical Release P0351. May, 1996.

[14] In 1994, the Atomic Energy Corporation (AEC) employed over 3,000 people, the largest single concentration of high-level skills in the country - most of whom are highly skilled. This may be compared with a total of 22,223 man (sic !) years devoted to total R & D in South Africa. and armaments - all of which were highly skill intensive.

[15] Between 1965 and 1985 net migration contributed about 20 % of the increase in high-level personnel. Barker, 1992 : 48.

[16] See for example, the data supplied by the South African Reserve Bank and the experience of the large removal companies in 'Brain drain 'a myth'. Official statistics at odd with exodus claims' The Star, 9/8/93.

[17] Of those who effectively emigrate without declaring that they have done so, many will eventually register as emigrants. As a result, there is something of a lag in the real figures for emigration.

[18] Skilled personnel emigration figures are said to have jumped by 800 % in the past two years and employee resignations due to emigration have been increasing steadily, according to one recent survey. 'Emigration jumps 800 %', Business Day 19/1/96.

[19] CSS, Statistical Release P0351, May 1996.

[20] As indicated by the data for January 1996. Emigration increased by 44 % over the same month in 1995.

[21] Doctors include medical practitioners, medical specialists and dental professions. Engineers and related technologists cover all categories of engineering.

[22] The chairman of the academic doctors group has stressed that reliable figures are difficult to obtain : « Some specialists go overseas but don't have their names removed from the medical register....Others leave for six months or a year, earning double or treble what they can earn here to work of their debt, then come back. But our impression is that we're loosing people permanently at a more rapid rate than in the past. » (Cape Argus, 29/9/95)

[23] Zimbabwe has generally accounted for more than 50 % of South Africa's immigrants of professional, semi-professional and technical personnel from the SADCC and for a similar share of emigrants - although the latter has been falling strongly and is now only 20 % of the SADCC total.

[24] Labour Market Commission, 1996 : 228.

[25] The last survey on nationwide vacancies was undertaken by the National Manpower Commission in 1992. Despite the fact that the economy was performing poorly, there were high vacancy rates in many of the professional and technical occupations. The occupation with the highest vacancy rate was the supplementary medical profession (38.5 %), followed by engineers in the agricultural sector (23.1 %) and the education professions (22.8 %).