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**SOUTH AFRICAN STUDY ON THE MOBILITY OF R&D WORKERS – IMPLICATIONS FOR THE
PROJECT ON CAREERS OF DOCTORATE HOLDERS**

**WORKSHOP ON USER NEEDS FOR INDICATORS ON CAREERS OF DOCTORATE HOLDERS
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SOUTH AFRICAN STUDY ON THE MOBILITY OF R&D WORKERS – IMPLICATIONS FOR THE PROJECT ON CAREERS OF DOCTORATE HOLDERS

Abstract

1. In a recent study on the mobility of R&D workers in South Africa it was found that while there were concerns that top researchers were being lost to developed countries with more attractive R&D environments, a more serious issue appeared to be the migration of researchers to non-R&D managerial and specialist positions within South Africa. The study relied on available sources of information and data, interviews with R&D worker employers, case studies of prominent researchers and questions on mobility that were included in the South African R&D Survey questionnaire for 2001/02. The best available South African and relevant international sources of migration data were examined but they all had their inherent weaknesses. In South Africa, most sources of official data collection, such as the forms used at international departure and arrival halls would be more useful if they had an occupational category for doctorate holders and/or researchers. There also needs to be greater awareness in the providers of information on skills, mobility and doctorate holders (such as higher education institutions) of the importance to planners of these sources of data. It is essential to establish and maintain institutional capacity to undertake the necessary baseline surveys in order that reliable time series may be constructed. In South Africa, as in many other developing countries, data on research and high-level skills are not a primary responsibility of the official statistical agency, such as Statistics South Africa. Consequently other government departments and research institutes find the need to establish their own institutional capacity to gather such information. In South Africa emigration to major destination OECD countries tends to be under-reported and the flow is up to four times as large as the official figures actually record. Surveys of doctorate holders in other countries would thus be particularly useful for providing policy makers with information on the factors affecting the careers of ex-South African doctoral holders abroad.

2. The approach of conducting interviews with employers and researchers is recommended for the richness of the information it provides for explanations of more quantitative data as well as the insights it provides on the factors affecting the careers of researchers. Some other pointers for improving South Africa data sources on mobility and the careers of doctorate holders were provided in the study, including the development and maintenance of standard, accurate and appropriate data series for mapping the migration of researchers both within the South African system and internationally. Although the mobility questions attached to the R&D survey proved to be a fairly onerous burden for respondents and are unlikely to be included in future surveys, they provided an excellent source of quantitative information, which will be published in the near future.

Introduction

3. There have been concerns in South Africa that many of its most capable and experienced researchers with doctorates have been lured to more lucrative and rewarding careers in other countries. In a recent study entitled *Flight of the Flamingos: A study on the mobility of R&D workers* (Kahn *et al* 2004) it was found that while the foreign exodus of these top skills is still of some concern, a more serious issue appeared to be the migration of researchers to non-R&D managerial and specialist positions within South

Africa.¹ On the positive side, as South Africa's economic and social climate improves there are signs that some of the highly skilled individuals, thought to be lost to the country, are returning to contribute to the economy with their new skills, qualifications and experience. Mobility also has some positive outcomes and contributes to innovation and change.

4. The study relied on available sources of information and data, interviews with R&D worker employers, case studies of prominent researchers and questions on mobility that were included in the South African R&D Survey questionnaire for 2001/02. Drawing on the insight and experience gained through the study this paper is aimed at providing discussion on items that are of importance to South Africa and several issues that are deemed to be important for consideration for the common survey instrument on careers of doctorate holders being developed by the OECD and stakeholders.

Issues for the careers of doctorate holders survey instrument

5. Attempting to map the careers of doctorate holders and gain clear understanding of the dynamics involved is a complex undertaking. As such it is unlikely that a single survey instrument will provide sufficient information for meaningful international comparisons. It will be important that other sources of information are consulted in order to provide the necessary background information. A variety of possible approaches are described here.

6. It is also important to understand the context of the education system from which doctoral holders graduate. For example, in South Africa the majority of Masters students in the natural sciences engage in full time research to complete a thesis. The quality standards of research Masters degrees at the leading academic universities in the country tend to be relatively high. In comparison with the 5768 masters graduates produced in the year 2000, there is a relatively low graduation rate of doctorates in South Africa (Higher Education Management Information System, Department of Education). In 2000 only 814 out of 22639 postgraduate degrees awarded at universities were doctorates and 6 out of 213 postgraduates received doctorates at technikons (polytechnic institutions). Given the relatively small number of doctorates produced in South Africa it should be a relatively straightforward task to track their careers through regular surveys but there are no formal mechanisms to do this in the country as yet.

R&D Surveys incorporating mobility questions

7. In 2002, because of concerns about an apparent growing brain drain in South Africa and the ageing profile of higher education researchers, the National Advisory Council on Innovation commissioned the newly formed Knowledge Management Group of the HSRC to undertake a study of mobility of R&D workers in South Africa. As the 2001/02 R&D survey was simultaneously being developed by the group on behalf of the Department of Science and Technology it was decided to incorporate key questions on mobility into the R&D Survey questionnaire. Although these questions were not specifically targeted at doctorate holders they did provide some information on the mobility within this sector of researchers. The content of the questions and the relative usefulness of the different items are highlighted here. The results obtained by the mobility study are currently being written up as a research paper but some of the key high level findings are presented here. It should be noted that respondents found the mobility questions quite difficult and frustrating to complete and in subsequently shortened questionnaires sent to reluctant business respondents and non-respondents the mobility and other detailed questions were omitted.

8. Following the questions on qualification and occupational levels of R&D staff (headcounts and FTE) respondents were requested to provide a breakdown of R&D staff by occupational level and age

1. The study was not directed at the more serious concerns around the exodus of medical and educational personnel to foreign destinations.

category. This question was a useful one and indicated that the average age of all researchers was 42 years, with the youngest researchers working in industry (average of 38 years) and the oldest in the higher education sector (average of 44 years). These results indicate that the majority of researchers have at least twenty more years to pursue their careers although other studies (Mouton *et al* 2002) have indicated that an analysis of publication outputs show that younger researchers are publishing far less than their counterparts ten to fifteen years ago did.

9. Respondents were asked to indicate the turnover (headcount) of South African and non-South Africa R&D personnel (separately) in terms of staff appointed and staff who departed by occupation level and qualification level. This question produced useful results and of the 1056 researchers who departed their organisations 23% had doctorates and 17% of researchers who joined during the survey year had doctorates.

10. Respondents were also asked to provide the reasons for R&D staff departure by demographic group (South Africans) and country of origin (non-South Africans). The following options were provided:

- Death / Medical Boarding
- Retirement from Labour-force
- Internal Movement to non-R&D Work
- Movement to other R&D positions in SA
- Movement to other R&D positions outside SA
- Movement to non-R&D positions in SA
- Movement to non-R&D positions outside SA
- Other / Unknown

11. The question was successful although, understandably, there was quite a high level of unknown departure destinations reported by institutional respondents (31%). Of the recorded departures, 33% left for other R&D positions in South Africa while 8% left for other R&D positions outside South Africa. A further 27% left for non-R&D positions in South Africa and nearly 5% left for non-R&D positions outside South Africa. Movement to internal non-R&D positions accounted for almost 4% of R&D staff departures. The results provide some support for the concern that researchers are tending to move to non-R&D managerial and specialist positions in private industry and government. Overall, a serious brain drain does not appear to be in operation amongst R&D staff and levels of departures were apparently much higher during the apartheid era.

12. A final question asked respondents whether shortages or deficiencies of skills within the organisation's R&D staff were a significant concern or issue during the R&D Survey year. If respondents replied in the positive they were asked to state which of the following measures were used to address skills shortages and deficiencies and to rate the measure on a scale of 1 (least important) to 5 (most important):

- In-house Training
- Internal Recruitment

- Out-Sourced Training
- Out-Sourced R&D
- South African Recruitment
- African Continent Recruitment
- International Recruitment
- Other (*please specify*):

13. This question was not as well planned as the others and the ranking scale did not work well. However, the results indicated that about 15% of employers reported that international recruitment was an important measure in addressing R&D skills shortages.

14. The mobility questions attached to the R&D survey proved to be a fairly onerous burden for respondents and will not be incorporated into future R&D surveys. Nevertheless, they provided an excellent source of baseline quantitative information, which will be published in the near future.

Sources of existing data and information

15. In South Africa, as in many other developing countries, data on research and high-level skills are not a primary responsibility of the official statistical agency, such as Statistics South Africa. Consequently other government departments and research institutes find the need to establish their own institutional capacity to gather such information. There are also a variety of other sources of data for understanding mobility but few in South Africa that can be used for gaining insights into the careers of doctoral holders. Most national information only records whether people have a university degree or not. The best available South African and relevant international sources of migration data were examined in the study on mobility but they all had their inherent weaknesses. Sources used were labour force surveys (do not distinguish doctoral holders), higher education graduation and enrolment rates from the Higher Education Management Information System (HEMIS) and more general data on qualification levels from census results and the annual October Household Survey of Statistics South Africa. In South Africa, most sources of official data collection, such as the forms used at international departure and arrival halls and in labour force surveys would be more useful if they had occupational and qualifications categories for doctorate holders and/or researchers.

16. All South Africans departing for a visit abroad are required to complete departure forms to hand in at passport control points at major international departure terminals. However there is no check on the information supplied and occupation levels are requested at a descriptive level and left to the individual to complete. It was found by Brown *et al* (2000) and Kahn *et al* (2004) that acquiring immigration data on South Africans directly from major destination OECD countries such as Australia, the UK, Canada and the USA shows that the inward flow is up to four times as large as the official South African figures actually record. It is also clear that the flows to South Africa are under-counted.

17. In developing countries it is important that appropriate bodies are used for collection of data on science and technology and human resources. For example the alumni associations of universities could collect valuable information on the movements and careers of doctoral holders. It is important for higher education institutions to keep track of their graduates but, of course, this depends on the willingness of the institutions and graduates concerned to supply information of this nature. There needs to be greater awareness in the providers of information on skills, mobility and doctorate holders (such as higher

education institutions) of the importance to planners of these sources of data. It is essential to establish and maintain institutional capacity to undertake the necessary baseline surveys in order that reliable time series may be constructed.

18. The Technology for Human Resources in Industry Programme (THRIP) in South Africa provides opportunities for postgraduates to work with industry on industry-based projects while finishing their higher degrees or PhDs. This provides the opportunity for the firm to get to know and work with particular research students well at a low level of risk for the firm and often leads directly to later employment of the graduate in the same firm or industrial sector. Such government supported programmes fostering higher education and industry links are also a useful source of information on the careers of doctoral students and the way in which state assistance can increase linkages.

19. The South African Network of Skills Abroad (SANSA) is housed at the National Research Foundation and is a network aimed at linking skilled South Africans or expatriates living abroad who wish to make a contribution to South Africa's economic and social development and connects them with local experts and projects. The database contains quite detailed information on some 3000 members living abroad and is a potentially useful instrument for longitudinal surveys of doctorate holders living abroad.

Interviews with employers of doctoral holders

20. Organisations can act to encourage, discourage, and direct the mobility of their research and development personnel. In the study on mobility in order to capture the influence that organisations have on the mobility of South African R&D workers, a series of interviews were undertaken with organisations conducting R&D in select fields of technology. While not targeted at doctoral holders such interviews could readily be adapted around key questions on the careers of doctorates such as the opportunities and possible barriers presented to them by the organisation. For example in South Africa there is very limited R&D in the automotive manufacturing and assembly sector and engineers and specialists in this area have to move abroad if they wish to pursue a research career in this sector.

21. In South Africa it emerged that the absorptive capacity of the local market in certain sectors is not sufficient to absorb even the relatively low numbers of doctorates produced. Many firms in these sectors would say that a doctoral degree over qualifies people for employment in South Africa and leads to them changing career path or moving abroad. In other sectors firms report that they need to recruit specialists from abroad because local institutions do not provide training in the specific fields of expertise they require.

22. International work experience and study makes doctorate holders more attractive to the local market and there is currently a positive trend of skilled South Africans returning to the country to look for new opportunities and a better quality of life.

Case studies of doctoral holders

23. The power of life history methodology is that it can show dimensions that are difficult to understand if only examined through a survey instrument. In the South Africa mobility study the life history approach was used to understand the dynamics of mobility from the perspective of highly skilled individuals, mostly with doctorates. Life stories are able to provide useful insights into the links between skills and intellectual and professional networks. They are also useful, in understanding why people make the career choices they do and offer insights into personal and social issues that lead to choices. Two excerpts from Kahn *et al* (2004) below illustrate the usefulness of case studies:

- B works for 9 months a year at a South African institution and has an appointment at a leading US institution for the other 3 months. The teaching and research at the US institution gives intellectual nourishment and allows an opportunity to keep up in the field. His teaching in the US means that the students get a perspective of African diseases from someone who has worked directly with it.
- Despite the perceived extent of emigration from South Africa, the case is sometimes overstated. It should be borne in mind that nationalism and political identification are important aspects of human life. People may like to move but they also enjoy and feel more comfortable to work in a well-known environment, in which they belong and have a sense of community. Nomadism is not the common rule.

Possible issues to be covered in doctoral holder surveys

24. Some possible issues that could be useful in the survey instrument could be:

- The importance or attractiveness of local postdoctoral opportunities and support measures
- The availability of funding opportunities for research and further study
- The attractiveness of the sector to doctoral holders in the country
- Remuneration rates and work availability in specialist fields
- The availability of other resources and infrastructure to support career development
- The importance of networks and possible barriers to participation in networks
- The value of international experience in improving career prospects in the home country
- The influence of perceptions of quality of life issues
- The importance of a familiar environment or whether the stimulation of working in a new country makes up for this
- Whether exposure of doctoral graduates to business and management courses leads to increased employment prospects? Does this exposure tend to lead doctoral holders to seek better paid opportunities in the business and government sectors rather than continuing with a research or academic career?

Concluding remarks

25. South Africa lacks good data on its citizens and expatriates with doctorates living abroad. In view of the underreporting of emigration data, surveys of doctorate holders in other countries would thus be particularly useful for providing policy makers with information on the factors affecting the careers of ex-South African doctoral holders abroad.

26. In the South African study of mobility through the R&D Survey all levels of occupation and qualifications of R&D workers were requested but if the focus had been only on researchers at doctoral level it would be likely that respondents could supply detailed information much more easily. The one major disadvantage of adding mobility or other questions to an R&D survey that is otherwise run along

Frascati Manual guidelines is that it puts a further burden on respondents. However in countries where high-level data on the careers of doctorate holders is not readily available from other sources this might be a useful exercise.

27. It will be important to supplement any survey data with interviews of employers and individuals to help uncover industry trends, institutional trends and other social and economic factors affecting the careers of doctorate holders.

References

Brown, Mercy, David Kaplan and Jean-Baptiste Meyer (2000) "An outline of skilled emigration from South Africa", *Africa Insight*, 30(2), pp. 41-47.

Kahn, M., Blankley, W., Maharajh, R., Pogue, T.E., Reddy, V., Cele, G. & Du Toit, M. (2004) Flight of the flamingos: a study on the mobility of R&D workers. (A project by the Human Sciences Research Council (HSRC) in partnership with the CSIR for the National Advisory Council on Innovation). Research Monograph, HSRC Publishers, Cape Town.

Mouton, Johann, Nelius Boshoff and Tracy Bailey (2002). "Promoting South African S&T Capacities for the 21st Century". Background Document for a Consultative Forum Organised by the Academy of Science of South Africa (ASSAf). Pretoria 13-14 September 2002.