

## **PART IV**

# **CONCLUSIONS, POLICY IMPLICATIONS AND AREAS FOR FURTHER RESEARCH**

# WOMEN IN SCIENCE, ENGINEERING AND TECHNOLOGY SCOREBOARDS (WinSETS)

The construction of a women in SET scoreboard (WinSETS) is an ambitious undertaking that has to contend with all the methodological and technical difficulties associated with science indicators and the comparative benchmarking of national systems of innovation. The methodological and technical difficulties associated with science indicators are at least threefold: first, the identification and selection of the appropriate constructs (e.g. participation in science; scientific productivity; scientific rewards) to be included in such a scoreboard; second, the lack of reliable data on key indicators; and third, gaps in the data for comparable years of data collection. In addition to these constraints, comparative benchmarking across national systems of innovation poses its own kinds of challenges. The meaning of a specific indicator is not context-neutral. Unless one understands the differences in the sociology, politics and history of different systems of innovation, key differences in the meaning of a specific indicator are lost.

Nevertheless, there are obvious gains in constructing such scoreboards or similar indices. At the methodological level, the construction of such indices is usually undertaken by cross-national teams, who pool their joint methodological expertise and experience. At the substantive level, a scoreboard of this kind is useful because it focuses the attention on critical points that require further research or policy interventions.

The researchers have attempted the construction of two scoreboards. The first contains all the available comparative information that makes international benchmarking in selected areas possible. The second scoreboard includes a selection of indicators that provides a more comprehensive profile of the status of women in South African science. The latter scoreboard contains a number of indicators for which the researchers have no international data but which can be used for benchmarking the national system of innovation over time. In summary then: the two scoreboards will be referred to as the comparative (CWinSETS) and the South African women in SET scoreboards (SAWinSETS).<sup>9</sup>

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<sup>9</sup> Note that the term science, engineering and technology (SET) is used here in its broadest sense to refer to all the scientific domains, from the Natural Sciences & Engineering, to the Social Sciences & Humanities and the Health Sciences.

## The comparative women in SET scoreboard (CWinSETS)

The available comparative data on women in SET is remarkably scanty. According to the recent European Commission report on S&T indicators (2003a: 257), although there were calls for disaggregated data on women in science as early as 1984, concerted efforts to gather international comparative data only started in the late 1990s. It is interesting, for example, that neither the current *Frascati Manual* (OECD 2002) nor the *Canberra Manual* (1995) require that sex-disaggregated data be collected. In both cases, however, there are now initiatives aimed at changing this situation. The most comprehensive set of comparative indicators that the researchers are aware of is the European Commission's *She Figures* (European Commission 2003b). This was taken as a point of departure and selected those indicators for which South African data to construct the comparative scoreboard<sup>10</sup> was available. The following four indicators were identified:

- Women's share of Doctoral graduations
- Women's share of Doctoral graduations in the Natural Sciences & Engineering
- The proportion of female academics in higher education, and
- The proportion of female academics in the senior ranks (professoriate) in higher education.<sup>11</sup>

Although this scoreboard is rather limited, given the small number of comparable indicators, it does show – at least on these four indicators – that the situation of women in South African SET compares very favourably

with the situation in European Union member states (Figure 38).

To get a more detailed understanding of the differences in gender representation across scientific fields, the researchers have included a table (over page) which presents the 1999<sup>12</sup> data for 12 member states (Table 2).

Among the 12 European Union member states listed in the table, there are clear imbalances in the share of female researchers across the different scientific domains. Although the representation of women varies across countries, the table reveals that the patterns of concentration are surprisingly similar. In other words, there are scientific fields where women are scarcely present (Engineering in particular), and others where they occasionally form the majority, as in the Medical Sciences. As a general rule – and this applies to South Africa as well – the data show that women are more concentrated in the Medical Sciences and the Social Sciences & Humanities, than in the Natural Sciences & Engineering.

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<sup>10</sup> The European Commission report contains information both on the 15 member states as well as the 15 associated states. The researchers have included information in CWinSETS on the member states only. In many cases, there are few differences between the member and associated states.

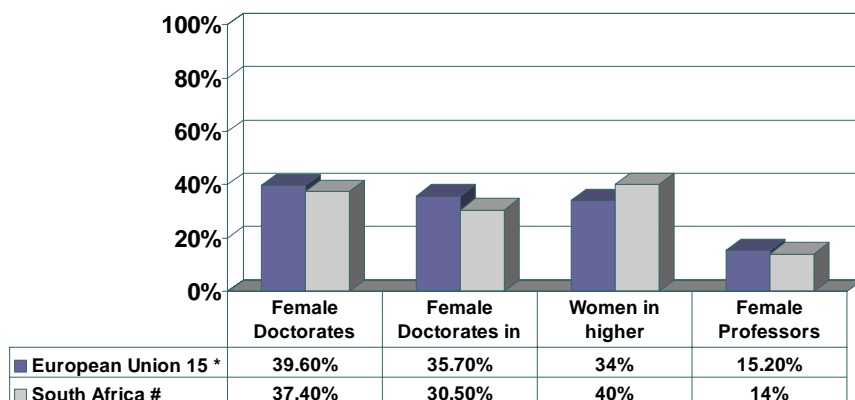
<sup>11</sup> The European Commission report currently includes indicators on the distribution of female Professors in different scientific fields (science, engineering etc). The South African data for these indicators that are available in the HEMIS (Higher Education Management Information System) of the National Department of Education could be added to the scoreboard.

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<sup>12</sup> Given the missing data in the HEMIS data for 1999, the study have included the 2000 and 2001 data for South Africa.

figure 38

### Comparative Women in SET Scoreboard (CWinSETS) (2001)



\* Source: European Commission (2003b): Fig 1.1.a (p23), Fig 2.1.a (p45), Fig 1.6.a (p29) (2000 figures), Fig 3.1.a (p62).

# All figures relate to the university sector, except for "Women in higher education" which refers to the university and technikon sectors combined.

^ European Union figures relate to Science, Mathematics and Computing; the South African figures relate to the Natural Sciences & Engineering.

table 2

### Proportion of female researchers in the higher education sector by scientific domain (1999 data)

Countries	Natural sciences	Engineering	Medical sciences	Agricultural sciences	Social sciences & humanities
Belgium	30%	22%	39%	35%	36%
Denmark	23%	13%	32%	43%	32%
Germany	17%	11%	33%	31%	30%
France	29%	17%	21%	(included in medical sciences)	38%
Ireland	45%	26%	68%	12%	55%
Italy	31%	14%	23%	24%	36%
Netherlands	20%	14%	37%	26%	30%
Austria	15%	6%	27%	26%	30%
Portugal	49%	29%	50%	44%	49%
Finland	34%	22%	52%	36%	48%
Sweden	31%	19%	51%	41%	44%
UK	25%	15%	52%	33%	39%
South Africa 2000	33%	11%	50%	22%	45%
South Africa 2001	35%	10%	51%	24%	46%

Source: European Commission (2003:261)

Other indicators currently included in the European Commission report for which it should be possible to get data from the R&D survey are:

- Share of women in the R&D labour force (EU average = 31%)
- Share of women in the R&D labour force in higher education (EU average = 34%; 2000 data/ USA = 23%)
- Share of women in the R&D labour force in government (EU average = 31%, 2000 data), and
- Share of women in the R&D labour force in business/industrial research (EU average = 15%; 2000 data).

The European Commission report also includes two other indicators for which it should be possible to compile South African data:

- Research funding success rates by sex, and
- Percentage of women on scientific boards (academies/ universities/ science councils).

Finally, there is currently an increasing number of studies that make it possible to compare scientific productivity by sex. The results of a Biosoft feasibility study (quoted in European Commission 2003a) show that the share of female authors in terms of total numbers was about 15% to 30% in the six countries covered. The study also revealed that the southern European countries (Italy, Spain and France) have a significantly higher share of female authors than the northern European countries of Germany, the UK and Sweden. The South African figures, as discussed in the main report, show that 29% of all authors who published peer-reviewed articles during the period 1990–2001 were women. From a different perspective, the study also show how the proportion of articles by female authors or co-authors increased from 16% in 1990 to 23% in 2001.

## South African women in SET scoreboard (SAWinSETS)

Whereas the value of CWinSETS would be in conducting regular international comparisons on the relative “performance” of the national system of innovation on the status of women in science, presented below is a framework for the compilation of a scoreboard (SAWinSETS) that can be used to compare the national system of innovation, over time, on a number of standardised indicators.

Following the structure of the European Commission study on women in science – which was also essentially followed in the main report of this study – it is proposed that the SAWinSETS includes indicators of the following five core constructs:

- Participation in the national system of innovation
- Representation across scientific fields
- Seniority in academia and R&D
- Gender equity and scientific agenda-setting, and
- Scientific productivity

The complete scoreboard would then include the following 15 indicators<sup>13</sup> (Figure 39):

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<sup>13</sup> The researchers have also included a column to indicate the data sources that need to be mined for the construction of the final scoreboard.

figure 39

## Framework for a South African Women in SET Scoreboard (SAWinSETS)

Construct	Operational definition	Indicators	Data sources
<b>Participation in the national system of innovation</b>	Share of female PhD graduates	% of female Doctoral graduate	HEMIS, DoE
	Share of women in the R&D labour force	% of female researchers	R&D Survey
	Share of women in the R&D labour force in higher education	% of female researchers in higher education	R&D Survey
	Share of women in the R&D labour force in government	% of female researchers in government	R&D Survey
	Share of women in the R&D labour force in business	% of female researchers in business	R&D Survey
<b>Representation across scientific fields</b>	Share of female PhDs in science	% of female Doctoral graduates in science	HEMIS, DoE
	Share of female PhDs in Engineering	% of female Doctoral graduates in Engineering	HEMIS, DoE
<b>Seniority in academia and R&amp;D</b>	Share of female Professors	% of female Professors	HEMIS, DoE
	Share of female Professors in science	% of female Professors in science	HEMIS, DoE
	Share of female Professors in Engineering	% of women professors in Engineering	HEMIS, DoE
<b>Gender equity and scientific agenda-setting</b>	Research funding grants	Research funding success rates (NRF and MRC grants)	NRF/ MRC
		% of women receiving NRF and MRC grants and monetary value	NRF/ MRC
	Female representation on scientific boards	% of women on scientific boards	Institutions
<b>Scientific productivity</b>	The share of female authors of peer-reviewed articles	% of female authors	SA Knowledgebase
	The share of peer-reviewed articles authored by women	% of peer-reviewed articles authored by women	SA Knowledgebase