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Gender and Excellence in the Making

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Foreword

The promotion of gender equality in science is a vital part of the European Union's research policy.

As Commissioner for Research, the full participation of women as graduates, researchers, academic staff, funding beneficiaries and scientific board members, is one of my particular concerns. Despite progress in terms of increasing the number of women scientists in European public research, it is still of utmost importance for the success of the European Research Area to take appropriate action to correct the remaining gender imbalance in science.

Women, who represent a valuable share of Europe's pool of trained scientists, need to see science as a rewarding career choice. It is therefore essential to ensure equal opportunities for women and men in access to promotion, research funding and decision-making positions in science.

In this context, I am delighted to present the report "Gender and Excellence in the Making", which presents the results of a workshop held at the European University Institute (EUI) in Florence in October 2003, jointly organised by the Women and Science Unit of the European Commission's Research DG, the Women and Science Network of the European Commission's Joint Research Centre and the Robert Schuman Centre for Advanced Studies of the European University Institute.

This report seeks to stimulate further discussion on the problems of defining and measuring scientific excellence, considering in particular whether the achievements of women and men scientists are assessed on the same basis. This is a rather complex issue and further research may contribute to a better understanding of the mechanisms involved. The report will help to launch the debate among research bodies and funding institutions and to encourage the scientific community to think, in a more general and systematic way, about promoting a research environment free of gender bias.

I welcome this report and am confident that it will make a significant contribution to the debate.

PHILIPPE BUSQUIN

Commissioner for Research

Workshop "Minimising Gender Bias in the Definition and Measurement of Scientific Excellence", Florence, 23-24 October 2003.

Co-organised by

Gender Studies and Governance, RSCAS-EUI

Women and Science Unit, European Commission

Joint Research Centre, European Commission

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Preface

This report is the result of a joint initiative between the three following entities: the Gender Studies and the Governance, Science and Technology Programmes of the Robert Schuman Centre for Advanced Studies, EUI, the Women and Science Unit, Research DG, European Commission, and the Women and Science Network, Joint Research Centre DG, European Commission. It seeks to stimulate debate on the construction of notions of 'excellence' in the shaping of scientific careers. In particular, it considers in what ways gendered assumptions underpin constructions of excellence, and what these imply for both women and men. Whilst the setting considered here is predominantly academia, the discussion and research findings are also relevant for other institutional settings – public and privately funded research institutes, and industry.

This report is based on a workshop held at the European University Institute (EUI) in Florence, 23-24 October 2003, entitled: 'Minimising gender bias in the definition and measurement of scientific excellence'', and sponsored mainly by the European Commission's Research DG, then by the European Commission's Joint Research Centre DG and the EUI. The Research DG sponsored the invited participants, the Joint Research Centre DG sponsored the two workshop rapporteurs, and the EUI funded the workshop facilities and the local organisation.

The rationale for this workshop was developed from two observed trends. First, the increased formalisation of systems of evaluation in some (but not all) countries of the European Union (and elsewhere), itself part of a broader emphasis on accountability. Secondly, direct attention to the general under-representation or under-promotion of women in science (albeit with variation by institutional sector, level, and scientific field). The processes which give rise to inequalities in scientific careers across different social groups are multi-faceted. There is evidence to suggest that systems of evaluation of scientific work are one element (and may interact with others) of processes which generate marked segregation between men and women in career trajectories.

The aim of the workshop was thus to explore the mechanisms and present modes of evaluation of scientific excellence, and the operation of gender within these.

The workshop presented the state of the art in measuring scientific excellence (including what conceptualisations underpin different techniques), and how these techniques may be gendered. It asked, amongst other questions, whether they measure what they claim to, and to what extent they are applied across countries, sectors, and fields in Europe and elsewhere. In the first session, mechanisms of evaluation were discussed in relation to careers. The interaction of gender in the definition of excellence and characteristics of evaluation systems was the scope of the second session which sought to address more specific practices of evaluation, for instance through peer review, in gate-keeping mechanisms, and in the decision-making processes of promotion committees. The final session explored strategies to combat gender bias.

The workshop participants were scholars from a range of disciplines – including sociology, gender studies, history, economics – either specialists in women and science and in the measurement and evaluation of scientific achievement, or in a related field that could offer insight into constructions of excellence. The exchanges between them made for an extremely lively interdisciplinary event! Very different points of view and paradigms were heard, and a wide range of data sources and modes of analysis and interpretations were brought into productive dialogue with one another. The fact that the workshop did not produce consensus on numerous points – including on appropriate methodologies and interpretations of research – is hardly surprising, and this multiplicity of perspectives remains a feature of this report and one which we consider to be amongst its positive contributions.

The report comprises a synthesis of the papers at the workshop and the discussions that took place around them. It offers the reader diverse resources for thinking about the problems of defining and measuring excellence and will, we believe, lead to some new research initiatives and improved practices which will have benefits for all.

We are very grateful to the workshop rapporteurs, Margo Brouns and Elisabetta Addis, who accepted the challenging task of preparing the synthesis and reviewing the papers that follow.

Delilah Al-Khudhairy, Nicole Dewandre, Helen Wallace

Acknowledgements

We would like to thank all those who contributed to this initiative: Rikard Stankiewicz, Professor of Governance, Science and Technology, EUI; Dawn Lyon, Research Fellow and Coordinator, Gender Studies Programme, Robert Schuman Centre for Advanced Studies, EUI; Elisabetta Spagnoli, Conference Unit, RSCAS-EUI; Constantina Filiou, Scientific Officer, JRC DG, European Commission; Tanya Leigh and Véronique Degraef, Scientific Officers, Valérie Gobbe, Communication Officer, Women and Science Unit, Research DG, European Commission. Many of the speakers commented very generously on the synthetic report that precedes their own papers as well as on one another's contributions, for which we are also very grateful.

Part I - Synthesis report on the workshop

Margo Brouns and Elisabetta Addis

Synthesis report on the workshop*

Introduction

The issue of gender and excellence represents a relatively young research field in which questions, methods and answers are developing rapidly. Scholars from very different fields and using very different methodologies gathered together for the workshop. Some participants were experts in measuring scientific output on a large scale, while others were primarily oriented towards the multifaceted issue of gender and science. Qualitative case studies on micro-politics, text analysis on placement reports, experiments with men and women judging each other, and extensive surveys on success scores of men and women regarding research applications were examined together in an effort to unravel the different aspects of the complicated issue of gender and scientific excellence. In this context, exchange of ideas and research results were expected to be very fruitful: sometimes dissension is a major source of inspiration for scientific developments.

In this synthesis report, we have tried to summarise the most important factual elements and discussions from the workshop, and streamline the conclusions and recommendations arrived at in the final session. This synthesis report opens with a description of the problem, the dilemmas regarding existing measurements of scientific excellence, followed by a chapter on masculinity and male bonus, and the social dynamics regarding development and measurement of scientific excellence. The next chapter investigates mechanisms causing indirect gender bias and, finally, the report will draw some general conclusions and make some recommendations.

Framing the problem

The last 15 years have witnessed unprecedented interest in the presence of women in the sciences. The career paths of men and women in almost all branches of scientific endeavour have been investigated (e.g. Sonnert and Holton 1996a), the aim being to unravel the complex interactions between institutional arrangements and personal preferences that might explain the under-representation of women, especially at the highest levels. This research has produced new knowledge and understanding of the 'gender of careers', as well as divergence in interpretations of the current situation and the appropriate strategies to deal with any problems. One issue that remains central to current research is whether achievements of men and women are assessed on the same basis, and it is this question that underpins the contributions to this report.

> *"The low female presence at the highest levels of the scientific hierarchy is an indicator of the inability of research institutions to follow changes in society, such as the increase in women in higher education, which in turn highlights the dysfunction of a system for the evaluation of scientific excellence that has not abolished or weakened the old boy network of co-optation."* (Palomba, this volume, p. 5)

In 1997, Wennerås and Wold published their ground-breaking *Nature* article on sexism and nepotism in the peer review of research grant applications to Sweden's Medical Research Council (MRC). The article showed that the peer review system is not as 'neutral' as it claims to be. Male applicants and researchers with an affiliation with one of the evaluators were more successful in their applications to the MRC for postdoctoral research grants. The article concluded that whilst the quality of the proposal was an important factor in assessing the scientific competence of research grant applicants, so was the gender of the applicant, as well as his or her affiliation to one of the members of the evaluation committee. These applicant characteristics proved significant in subsequent assessments of research grant applications in Sweden[1].

This evidence of gender bias was particularly disturbing because it contrasts with one of the scientific community's core beliefs about its own internal governance. Decision-making should be based on meritocracy, hierarchy on

(*) This synthesis report reflects primarily the view of its authors. Participants have had the opportunity to review the first draft. Many of them have sent their comments, for which we are very grateful. The authors are, nevertheless, responsible for the final synthesis report.

individual performance in furthering scientific inquiry. This belief is rooted in the heart of the scientific ethos, connected with the struggle of science to liberate itself from theology and other societal powers (Merton, 1942). Originally, it was a plea for autonomy of the scientific community and democratic self-government within the scientific community. Only the accomplishments of the individual scientist should count, and only the scientific community is capable of evaluating accomplishments. A scientific enterprise cannot afford to base the acceptance or rejection of scientific claims on the personal or social attributes of their protagonists (Gupta, Kemelgor, Fuchs & Etzkowitz, this volume). Wennerås and Wold's (1997) results questioned this core belief and the validity of scientific selection procedures. A science that is oriented by non-scientific judgments on the performance of some scientists lacks the fundamental quality of objectivity. In this context, the supposition of attributing 'excellence' mainly and mostly to male scientists becomes problematic for all scientists.

Methodology and evidence of gender bias

The Wennerås and Wold publication prompted other investigations into research funding. However, the results from studies in Great Britain (Wellcome Trust, 1997) and Germany (Boehringer Ingelheim Stiftung, 1999) found the success rates of men and women to be rather similar. The authors conclude, therefore, that there was no gender bias in the systems investigated. However, they did not research the files of the applicants in order to validate the conclusions. A Dutch study showed that even if, on a general level, success rates of men and women are similar, gender bias can still be active. Due to processes of selection and self–selection, it can be expected that on average women applicants are better qualified than men.

Those who question the existence of gender bias often point to other circumstances in which gender bias does not occur as confirmation of meritocracy as one of the central values of the scientific system. This caused a lively debate on the evidence of gender bias during the workshop, and it did not end in consensus. As John Stuart Mill already stated in the 19th century: "*In every respect the burthen is hard on those who attack an almost universal opinion*".

General issues

However, there are more reasons to question current definitions and measurements of scientific excellence. The peer review system has long been the subject of debate within the scientific community. For decades, most scientists published their views without formal peer review and peers published their criticisms openly. However, at the turn of the 20th century, the breadth of scientific endeavour widened to the extent that editors of journals and fellows of societies began relying increasingly on the advice of specialists. The editorial system used by leading journals such as *Nature* runs on similar lines to those used more prevalently until about 20 years ago, when many journals relied on editors to make decisions without the formal refereeing of papers. Henneberg (1997) argues that peer review, as now practised by most scientific journals, might stifle scientific communication and slow down the advancement of knowledge.

According to Cozzens' input into the discussion, the long-lasting debate on 'objectivity' and 'fairness' of assessment systems ended more or less in the statement that although the system is not perfect, it is the best available (Cole and Cole, 1985). However, with the growing interest in gender issues in the field of research policy, the picture seems to be changing: the system is not only imperfect, it may even be hindering women in establishing scientific careers. Merit and talent are not sufficient conditions to become a successful scientist. Resources, time, social networks, encouragement – unevenly distributed between the sexes – are necessary prerequisites.

Gender issues

Although the workshop focused on 'excellence' – i.e. the very high levels of scientific performance – the mechanisms that appear to prevent women scientists from achieving excellence partially overlap with those that prevent women from rising from any step of the academic ladder.

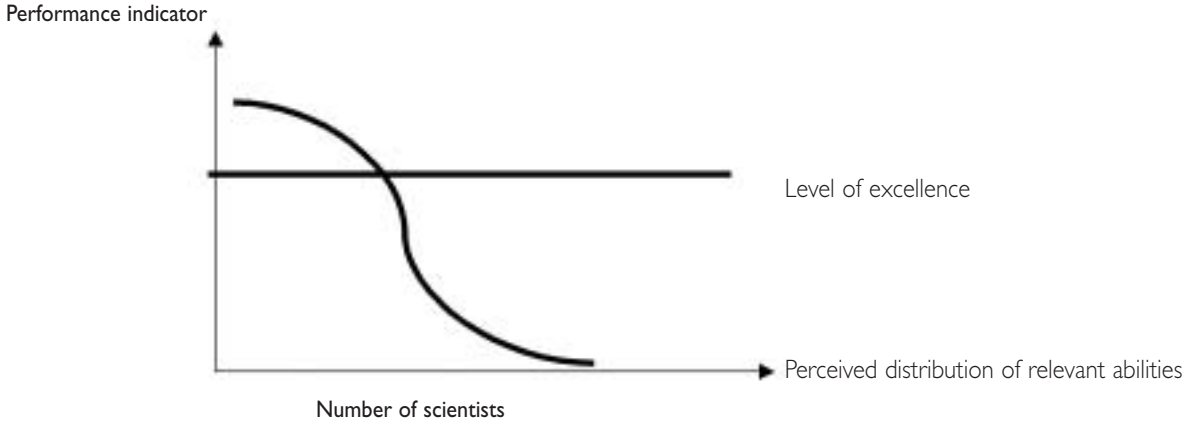
In some national systems, direct gender discrimination has been prohibited for many years, but this does not mean that it is not practised. Research has found gender to be a strong and meaningful category in all aspects of social life, and thus also in the sciences.

Gender bias

Gender bias is the often unintentional and implicit differentiation between men and women situating one gender in a hierarchical position to the other, as a result of stereotypical images of masculinity and femininity steering the assessment and selection process or the gendered structure of the scientific system. Explicit gender bias is prohibited, but still exists – discriminatory practices considering recourses seemed partly to explain the under-representation of female scholars at the highest positions (MIT 1999).

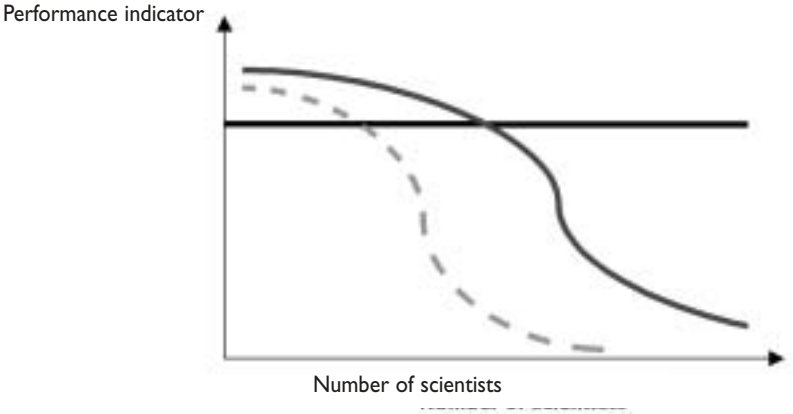
Participants in the workshop presented evidence from their research both of direct and indirect gender bias. Direct gender bias refers to the ways scientific competences are attributed to men and women, see for instance the report by Foschi (this volume) which clearly points to the existence of a double standard in the assessment of task performance by men and women. Indirect gender bias refers to the unintended negative effects the organisation of sciences and scientific assessment has on the opportunities and challenges for women scientists. An important issue is that of the hegemonic position of the 'hard sciences' vis-à-vis the humanities and social sciences, in combination with the relative absence of women in the hard sciences.

Before a more extensive discussion of the multifaceted gender bias, we should first turn to more general problems related to measuring scientific excellence. Simplism is surely one of them. The dangers that derive from using an over-simplistic model of excellence are illustrated by the following set of graphs. (*)

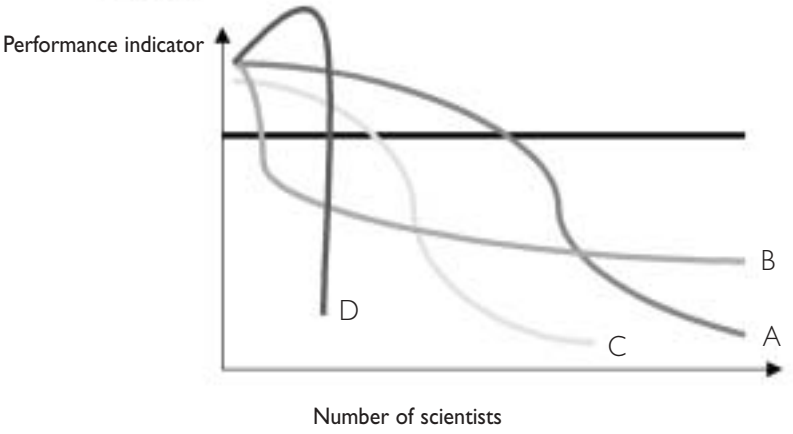


Some may think of excellence as if it was an easily and objectively measurable variable. There is a performance indicator, related to publications and other accomplishment, and there are scientists. Those who reach a certain level of the indicator, as established by the scientific community, are "excellent". More male than female scientists appear to attain that level.
Notice however that….

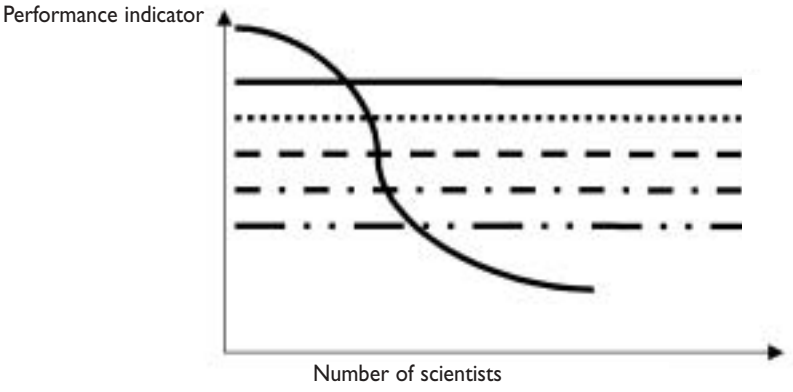
(*) Graphs are Elisabetta Addis's closing contribution to the workshop. Names in parenthesis are not direct quotations. They are the contributors to this volume whose presentation inspired the graphs. They are not responsible for the interpretation. Only Elisabetta Addis is, and she thanks them all.



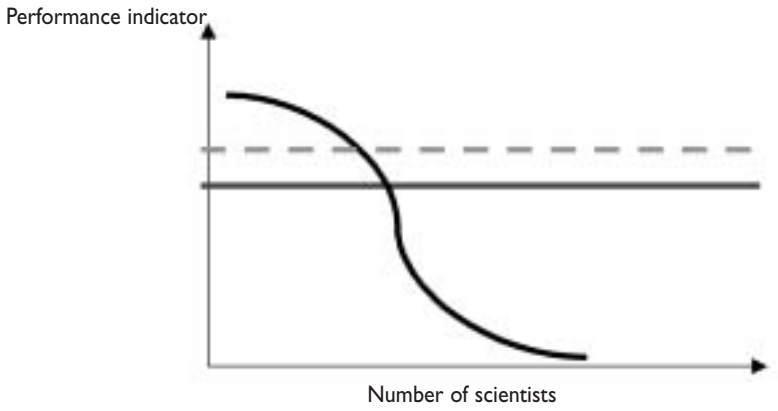
…for purely statistical reasons, even if abilities relevant to excellence have the same distribution among M and F in the population at large, **a low F/M ratio in the population of scientists** – related to the triple burden, (Kemelgor, Gupta, Fuchs, Etkowitz) – **produces a low F/M ratio among the "excellent"**. This may lead to the wrong conclusion that women are less apt than men to be "excellent".



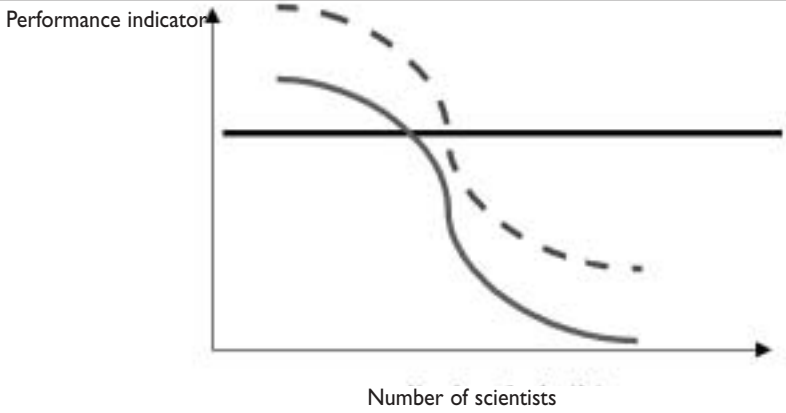
… Notice also that the distribution of abilities is not a natural fact. It is a social construction (Griffin). Its shape varies depending a) on which abilities are counted as relevant b) on what is the indicator of performance chosen c) on who is counted as a member of the scientific community. Therefore, the distribution of excellence to some appears as the line A, to some as the B line, and to some as the C or D line, depending on what abilities they factor in…



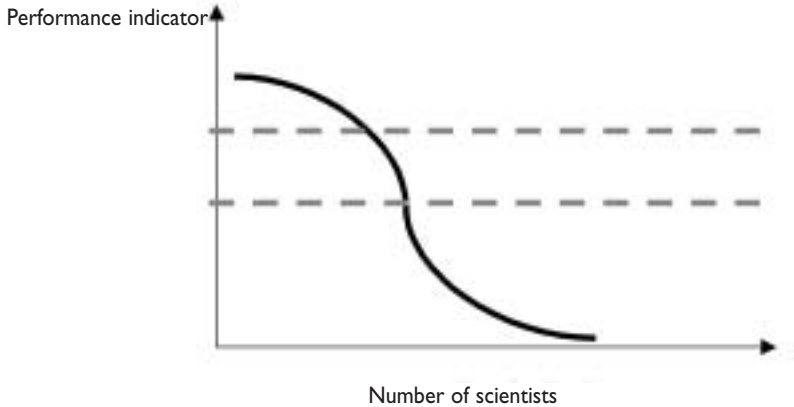
Moreover, the top level of excellence is attained after passing through a number of screenings. If after any level the F/M ratio is lower than unity, this will produce a cumulative effect that will make women scarcer and scarcer on the way to the top. (Palomba). For each of those screenings, there are "gate-keepers"(Husu), and their qualifications may be questionable. They may look for some characteristics that are unrelated to the pursue of knowledge (e.g. unconditional availability of time, assertiveness…) or, even unawarely, marginalize and devalue women's contribution (Thorvaldsdóttir).



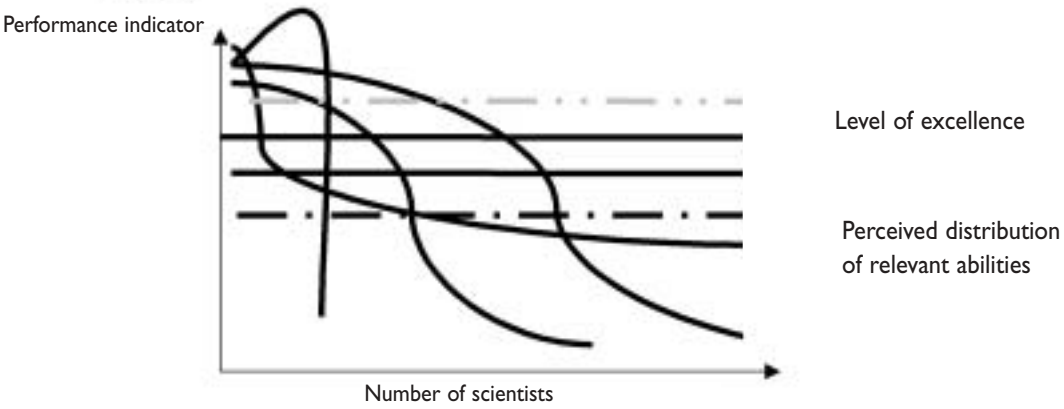
Gate-keepers may assess excellence using double standards (Foschi); Standards may be set higher for women, for scientists who come from disadvantaged backgrounds (Cozzens), or from relatively non-hegemonic nations (Blagojevic).



…and sometimes gate-keepers are just looking for a ranking according to a set of qualities we can better define as "masculinity" (Hearns). Some men, many women and often younger people are less endowed with it….



If the standards to be achieved in order to be judged excellent are fuzzy, rather than been clearly stated, it may favour the application of double standards. For some people it is enough to pass the lower dashed line, but some others need to overcome the higher dashed line. The same may happen when gate-keepers are not accountable and procedures are not transparent.



If we consider all that, the model of the first box deconstructs in a rather more complex scheme. Excellence as we see it today is just one of many possible consensuses about what excellence is. This consensus is shaped by gender relations in the scientific community and in society at large. But the standards used may be different, and the distributions may be perceived differently. Excellence can change. Thus excellence becomes a contested terrain. The effort to measure excellence is also a battleground. Existing measures, like bibliometrics, are not gender-biased, but this is not the same as saying that there is not structural gender-bias in the larger environment (Feller). The effort to establish criteria and build indicators that take into account the difference in men's and women's lives and abilities is an effort to redefine excellence so that excellent people of both genders may contribute to science.

Definition and measurement of excellence: the mainstream

Scientific excellence is essentially difficult to grasp. In his seminal work on the ethos of science, Robert K. Merton (1942) stated that for science to be fertile and productive, scientists must be judged only by their work, and win status and membership within the scientific community on that criterion alone. From this perspective, the scientific forum is the best institution capable of evaluating the results of research. Peers should, therefore, assess the quality of research proposals and products. Because it is based on these principles, the peer review system professionally produces 'certified knowledge'. Disinterestedness and the ability to be objective are cornerstones of the scientific ethos.

Bibliometrics

The most important device used by peers when reviewing research results, which most academics are willing to recognise as 'unbiased', is the number of published articles and books and their influence. However, there is a tension between reliability and validity. Indicators that are measured easily and unequivocally – and provide a reliable way of counting – are not necessarily the most valid. In other words, bibliometrics are not necessarily the best indicator of scientific quality, as argued by Feller in this volume. What can be measured is not the full potential of quality but only representations of quality. Bibliometrics are used as a proxy for excellence, quality, and ability. The quantitative is a reduction of the qualitative, which is not easily measured in an objective manner. Moreover, the connection between short-term publication and long-term scientific impact is rather weak. Early measures may not be an accurate predictor of the long-term impact of a scientific discovery: Wittgenstein would not have survived such a system (Dummet 1991 cited in Feller in this volume).

The validity of the Science Citation Index regarding scientific excellence is limited as it rarely includes sources in languages other than English, and covers only a minority of the scientific journals in humanities and the social sciences (see chapter below). The system of judgment employed in bibliometrics privileges well-established fields with long-standing publication traditions and clear boundaries. In these research fields, scholars have ample

opportunity to expand their scientific activities along existing research lines, to participate and exchange within an established scientific community, to get funding for their research and to publish in several journals, ranked in prestige from high to low. For new research fields, these facilities – resources, publication sites – still need to be developed, and measuring scientific quality causes some difficulty – especially if quality is measured using bibliometrics as these fields are not yet visible enough. The same holds true for scholars active in relatively narrow fields – for example, certain languages – who are easily underestimated when it comes to measuring quality by citations and publications, which certainly applies to scholars engaged in gender issues (Griffin, Rees and Mottier, this volume). Bibliometrics privileges clear and intelligible sets of rules that successfully translate scientific publishing into economic rewards, which is not the case in issues and countries at the periphery, as Blagojevic argued.

Another major and still increasing problem caused by mainstream measurement of scientific quality is the way individual scientists react by producing more and more publications. An unintentional performative effect of bibliometrics as the standard measure for scientific excellence may be that there are now even too many publications in certain areas. The way scientific excellence is measured creates a specific atmosphere in which competition leads to high numbers of publications but not necessarily to good science. "*Publication numbers themselves can be an outcome of a certain form of masculinity*", as Hearn stated during the workshop. The competitive atmosphere tends to stimulate the individual performances of scientists competing with one another. The result is a stream of publications.

An additional problem with bibliometrics is the result of the same computer technology that made bibliometrics possible. Writing an article in 2003 was different from writing it in 1993. The availability of computers with more capability, better word-processing programs, improved printing facilities, and access to multiple bibliographic sources through the web has led to the possibility of writing more articles using the same amount of effort. As a result, scientific production has increased massively. There has been a veritable inflation of literature, while the information-processing capabilities of humans has stayed the same.

Since the 1970s, a lot of research has been done on the issue of gender and publications. On average, women tend to publish fewer articles than men (see the text box). This so-called *productivity puzzle* is a fascinating issue. Recent publications clearly show that productivity appears to be related to academic rank. The lower productivity of women can be explained by the fact that they are working at lower professional ranks than men. Within the same category, it seems that there is no significant difference by gender (Bordons et al., 2003). In addition, there are important differences between the scientific fields in terms of women's participation and of publication rates and citations. Discipline-specific publication traditions can explain the existing gender differences in productivity.

Women and publishing

According to Schiebinger and Valian, there is some evidence that women tend to publish fewer papers, with each paper being more substantive. On average, papers published by female scholars are cited more frequently than papers by more 'productive' male scientists (Schiebinger 1999, Sonnert & Holton 1996b, Long 1992, Zuckerman 1987, Nilsson 1997; Feller this volume). Palomba (this volume) reflects on this issue: differences are not so much caused by numbers of articles but by other aspects, such as type of publication, language or type of specialisation (p.3). However, Palomba found no difference in impact factor: her data show that publications by women are as influential as those by men.

An alternative explanation for gender differences in publication rates emphasises family responsibilities. During the workshop, Palomba presented research which showed that there is a family effect on productivity: the publication peak for men is earlier in their careers than for women. A lack of reliable data comparing men and women working under similar conditions (age, experience, etc.) makes it difficult to draw conclusions on gender differences in publication rates across disciplines and age. Nevertheless, these results were not confirmed by research carried out by Sax et al. (2002) which shows that factors affecting faculty research productivity are nearly identical for men and

women, and family-related variables, such as having dependent children, exhibit little or no effect on research productivity.

During the meeting, Sandström suggested that the use of bibliometrics benefits women scientists. According to his data, women are the most productive (number) and influential (citation index) researchers. From this point of view, women could profit from the more 'objective' measurements of scientific excellence by counting publications and citations. Bibliometrics are reliable in the sense that counting numbers of publications is not influenced by who is counting, thus avoiding implicit subjective judgments at this level.

However, bibliometrics may still be gender biased if the measurement and the underlying criteria reflect the scientific activities of men and women differently – for instance, a citation index that is primarily focused on the natural sciences and covers only 20% of the journals in social sciences and humanities has limited validity in measuring the achievements of female scientists. In these cases, although the counting may in itself be exact, the underlying processes that lead to citation may reflect practices so different as to render the counting meaningless or biased.

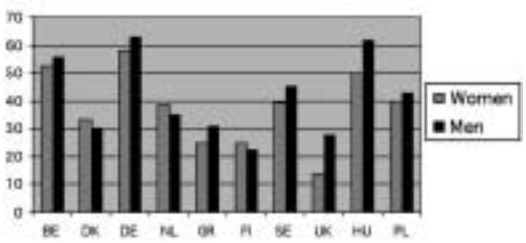
Peer review

There was general consensus among the participants in the workshop that excellence is not an 'universal fact' or a 'natural given', or a 'supra-disciplinary' fact. It is a social construction and, as such, it is open to many kinds of bias. As suggested by Addis in her contribution, it would be wrong and misleading to treat excellence as if it was a simple, easy-to-measure quality, like height or speed. Instead, it is a composite of many skills – carefulness, originality, clarity, complexity, etc. – and is achieved through a process of training, networking, accumulation, and resources. The judgment of excellence depends on the importance attributed to each of these characteristics. Therefore, it is dependent on the people judging and the standards they set for excellence.

The most obvious difficulty is the evaluation of original, innovative research. Innovation is not always recognised immediately, and may sometimes even be rejected as 'bad science'. Other problems arise because of the idiosyncratic character of the judgments. According to Feller (this volume), there seems to be a lack of attention to or endeavour in the construction of alternative measures. The challenge for future work assessing scientific performance and excellence is to develop metrics that better capture the dynamics of scientific discovery, as well as encompass the array of societal objectives that led to the initial public policy decision to fund the research.

Research funding success rates in EU Member States 2001

In some countries, women are more likely to submit successful research funding applications (Denmark, Finland, the Netherlands), but in others they are less successful than men (UK, Germany, Sweden). The diversity of grant application procedures between countries is strong, even stronger than the diversity between the sexes.



(Source: She Figures 2003: 75)

However, similar success scores of men and women do not provide a final answer to the gender bias issue. Due to the self-selection processes, we might expect female applicants to be on average better qualified than men. Unless they are really qualified, women do not bother to apply for a subsidy (Brouns, this volume).

In addition, the presupposed disinterestedness of the peers and the objectivity of the system are the subject of debate. A standard called 'objective' can be interpreted differently: one, because similar results are achieved when applied to similar situations, and two, because there is consensus that it really is capable of doing just that. However, as Griffin noted in her paper, there is no golden standard – all those participating in the decision-making process must agree on a standard and/or rules to decide whose standard will prevail in order for a decision to be made. Thus, choosing the standards, proper indicators, and devices capable

of measuring the standards is a point of contest between different viewpoints. The 'objectivity' of the final decision is the result of negotiation.

'Similarity' seems to be a major aspect steering the evaluation process. Although existing research is ambiguous, there is some evidence that peer reviewers prefer proposals that are similar to their own work (Guetzkow, Lamont & Mallard [in press] cited, with permission, in Griffin in this volume). Knorr-Cetina (1999) has called practices based on similarity 'epistemic cultures', a primary orientation and research styles characterising research groups and research fields. These preferences function as the frame of reference for judging 'excellence'. This implicit cloning mechanism[2] limits the chances of research proposals and publications that do not fit in with the traditions. Moreover, evaluators tend to overestimate the accomplishments of scientists with an established reputation, whereas unknown researchers meet more reserve. This so-called Matthew Effect (Merton, 1968) – achievements are attributed to the more famous researcher – has been documented extensively. The gendered variant, called the Matilda Effect, has also been documented: achievements of female researchers are frequently attributed to their male colleagues or otherwise minimised and underestimated (Rossiter, 1993; Stamhuis, 1995).

Some participants in the workshop argued that the criticism refers to a conservative approach towards the sciences. The scientific profession has changed dramatically and has become internally segmented. Career tracks are fragmented because scientists and scholars are active partly inside universities and partly inside national labs. Scientific careers are characterised by a variety of activities but only a few become visible; many of them stay unnoticed by the assessment systems. It is impossible to address all the dimensions of an individual's professionalism. In this case, research is about 'good' and not about 'best' (Laredo, this volume).

Masculinity, male bonus and cultural interpretations of gender

Some papers indicate that the academic career system is based on the traditional male model of labour market participation. A scientific career presupposes long working hours, creating a rather one-sided work-life balance for many researchers – especially those with family responsibilities – that both men and women find hard to live up to. The ideal type is essentially a male model of practice, full-time devotion, emphasis on early achievements, and exclusive identification with science, without any other social obligations. In this context, equalising resources is not enough to create a situation of equity, as the transmission of resources into a career is not the same for all people (Cozzens, Rees in this volume). This situation has been described by the catchphrase 'male bonus' (Thorvaldsdóttir): the problem is not so much that women encounter discrimination as such, but that people – men and women – who resemble those who are in powerful positions and behave according to masculine traditions of full-time devotion and competition enjoy a bonus that allows them to be assessed as better scientists. The winner seems to take all.

Many institutional evaluation guidelines acknowledge the impact of a part-time job on productivity, for instance, the recently implemented British Research Assessment Exercise (RAE), but at the symbolic level the idea of 'the scientist' described above is still active. Despite the guidelines, part-timers and 'women returners' (those returning to academic work after a career break) are vulnerable to a negative judgment due to limited publication records. Although, in the UK, 50% of the part-time workers are male scientists, it is generally the female part-time workers who experience a negative impact on their positions; they are 'time poor' (Rees, this volume). The male part-timers are generally approaching retirement and thus do not fear for their careers. In fact, they are 'time rich'.

Men are over-represented in the senior positions of academia, especially in Europe. This male dominance tends to lead to women having increased visibility as women. As Hearn stated during the workshop, only women are seen as having a gender. "*Most analysis and policy development in research and academia, and often even that which is concerned with gender, continues not to gender men explicitly and not to make explicit men's part in the problem of gender inequalities.*"

(Hearn, this volume, p.1) Mechanisms of discrimination against women are discussed frequently, but what about the way men are treated? There is still much research to be done on this issue, both in academia and more generally. There is a complex interconnection between men's practices, academic practices, and managerial practices. This creates a highly gendered atmosphere. As a result, most applicants and evaluators are men, and they also serve as gate-keepers for new positions. Following Essed & Golberg (2002), Hearn argues that the recruitment of new managers is closely related to processes of cultural cloning, pointing at an often unintended preference by men for men or, as Kanter stated some decades ago, homosocial reproduction (Kanter, 1977). The similar-to-me effects implicitly influence assessment and selection procedures. According to some of the participants in the workshop, this privileges the contribution of men and diminishes that of women. This might also produce competition between men and make them rivals as well as supporters.

Women scientists seem to encounter trouble in becoming part of loose networks, subtly excluded even by colleagues who are not explicitly sexist in any way. One possible explanation of this fact is that men competing against each other can expect large honour gains when they win and only small ones if they lose. In competition with a woman, the picture changes: men do not want to compete with women because the gains from winning the competition are relatively small, and the risk related to losing the competition is high, because this implies large honour losses (Addis, this volume). As a result, men treat women differently from the way they treat men, and women remain 'the others'. Under these circumstances, it is far easier for men to gain scientific credibility from an overwhelmingly male scientific forum than it is for women.

Based on an analysis and close reading of texts considering university placement committees, Thorvaldsdóttir's paper describes several mechanisms of gender bias in selection procedures. Gender-biased language may be used, as well as gender-biased characteristics, such as deprecation and silencing, and negative criticism, fault-finding and correction, to raise or lower the social weight of the individual under discussion, irrespective of his or her biological sex. Gendered language was defined as language that rests on or refers to pre-fixed notions of gender roles, and stereotypes and standard images of masculinity and femininity and the relationship between the two. The investigation concentrated on metaphors that refer to activities or spheres that have traditionally been associated with one sex rather than the other as methods for analysing the way gender is used in the evaluation of scientific standards and excellence. It showed that feminine characteristics were used to feminise 'undesirable' male or female applicants and cast doubt upon their credibility as scientists. Positive qualifications were often expressed in more masculine language, the language of science, for instance, the expression 'to wrestle with a difficult task' is considered more positive than to 'have something knitting', which trivialises a reflection. From these results it appears that gender matters in the recruitment for professorships. However, this result was not confirmed by Lindberg et al. (2003) who found no systematic differences in non-neutral adjectives used by referees.

Gender between 'sameness' and 'difference'

Cultural interpretations of gender vary strongly – even within Europe. Are men and women essentially the same and is equality realised by equal treatment of men and women? Or are men and women essentially different from each other (whether by biological sex, or by historical traditions) and is equity realised by different treatment? Both positions can be interpreted as the extremes of a continuum; many scholars and policy-makers use a mixture of arguments depending on the context. Research on gender and science is clearly inspired by both visions, sometimes focusing on sameness (e.g. competences), sometimes on differences (e.g. gender differences in research issues).

Thorvaldsdóttir's paper provoked a discussion on what exactly is meant by 'masculine' and 'feminine' language, and the methodology that had been used, especially the independent criteria by which words were classified as masculine and feminine. This issue highlights one of the major methodological dilemmas within gender studies: analysing gender mechanisms without an implicit and unwanted reproduction of gender stereotypes. Moreover, gender-neutral concepts are very often used in a gendered way.

Social dynamics of scientific excellence: gender problems in practice

This chapter provides a short description of the social dynamics of research production and evaluation and the operation of gender in these processes. We can distinguish four stages:

1. setting the agenda for research
2. publications and citations
3. evaluation and assessment processes
4. transparency and accountability

Definition of research agenda

Science as a social institution has been dominated by men (white and socially privileged) and their views of what is important and relevant. We can expect this to have a strong influence on dominant discourses and established research agendas and paradigms. "*The scarcity of women in senior positions in science inevitably means that their individual and collective opinions are less likely to be voiced in policy- and decision-making processes.*" (She Figures 2003: 73). This also means that women are contributing less than men to shaping the big research questions of the moment. As long as women do not have a position in the power structure their influence in setting the research agenda is limited. If we want more women in the sciences, it is necessary to reflect on epistemologies and on research topics. This immediately leads to the question whether or not women have specific research interests. Addis (this volume) cites some evidence suggesting that men's and women's interests do not completely overlap. As regards economic sciences in Italy, on average women seem more interested in more 'socialised' fields, such as development economics, or in specific methodologies, such as narrative analysis. But this statement provoked a lively debate on the essentialist presuppositions. Sometimes, women do have different interests, as a result of differences in positions, historical traditions and roles, but not based on essentialist grounds arising from their sex.

More women in science, does it make a difference?

In many research fields there is no difference between the numbers of men and women if these are counted by research topic; in other fields, however, there is a difference. For instance, the Women's Health Initative in the USA: " … *higher numbers of women in power are thought to be a force for change in the research agenda"* (Cozzens, this volume). Women scientists identified that women were being left out of clinical studies, although the results were being used to diagnose and treat them. Addis found that women had more interest in the 'soft' issues of economics (developing countries) whereas men were also engaged in the hard finances and economic theories and models.

Women still constitute the marked category. Work which focuses explicitly on women, and do not mention men, immediately draws attention to itself (Griffin). As a rather new field, not well established at the institutional level, sometimes critical towards mainstream research and often interdisciplinary, gender studies is vulnerable to a negative judgment of its scientific quality. Gender-based research faces some difficulties in being acknowledged (Mottier and Griffin, this volume). This leads to a circular situation: rather limited publication opportunities, a lack of established positions and, as a result, low prestige. Moreover, the lack of established positions results in intense competition between gender scientists (Blagojevic, this volume). According to Rees (this volume), gender studies is vulnerable in the UK's RAE system as there is no separate panel for this interdisciplinary area, despite the fact that there is a sizeable body of work across a range of disciplines that could be described as falling into this area. "… *the RAE in effect (…) undermines an interdisciplinary field that is the focus for a considerable concentration of research by women*" (Rees, this volume).

In the evaluation of the scientific quality of research programmes, the incorporation of gender issues does not seem to be an important consideration. A review of existing research assessments of several scientific fields, carried out by Mottier (this volume), showed that many evaluators do not integrate gender into this work as an

important category, even though some fields clearly have a gender dimension, such as pedagogics and management. In the Netherlands, research assessments within these fields were published in 2002 without – or with very little – reference to gender issues. The committees usually comprise male scholars and, even in the field of pedagogics, it seems as if excellence primarily refers to fundamental research: scholars engaged in social consultancy and policy advice performed badly in the assessment. Only one research assessment committee engaged women with gender expertise – socio-cultural sciences – and this influences the scope of the assessment. Gender issues are part of the evaluation: "*it is good that a gender dimension is fully integrated into most aspects of the programme rather than being a separate field of study*" (Assessment Report Socio-Cultural Sciences, in Mottier).

Social dynamics of publications, citations and success

It is not solely the search for excellence that is steering the selection process of publications and applications; other targets, such as the profile of the journal or the aim of the grant, also play a role. Some fields and issues are marginalised and therefore work in them is difficult to publish and/or get subsidised. In every organisation – an editorial board, an advisory committee, a research council – many stakeholders are represented. Visibility and scientific recognition are cornerstones for a successful selection process. It is not only talent and merit that decide whose papers will be published or whose application will be approved; this is also affected by social capital, especially in the current situation of overproduction of publications. In order to distinguish oneself as a scientist, publication alone is not enough; publications must be read, discussed and cited. "*Publications need personal representation within the scientific community*". Therefore, participation in academic networks is important and having the right (formal and informal) connections seems to be crucial in a successful career trajectory (Gupta et al.). Participation in specific networks is not only relevant in itself – the overall range and density of networks in which one is involved may also be significant for career opportunities. Having a wide range of 'weak ties' (Granovetter, 1974) or fewer 'structural holes' (Burt, 1992) is fruitful for finding out about opportunities, especially in contexts in which labour markets are less formalised.

Due to a lack of social capital – by which we mean access to resources and positions of power – women scientists run the risk of under-citation, the Matilda Effect mentioned above. Expanding on the statements of Gupta et al. (this volume), Feller suggests that, compared to men, women may experience disadvantages when having their work published, read, and thus cited, due to their lack of visibility and social capital. Scientists pay most attention to well-known or already established researchers. Citations may be by-products of participation in larger networks as well as measures of intrinsic scientific quality. Reputational status creates conditions for future success. In this respect, we can suppose that affiliation with the decision-makers for publication and research funding affects the opportunities of scientists. From this point of view, citations do not mirror 'quality' in an unambiguous way, but rather represent a mixture of 'quality' and 'social embeddedness'. A low citation score is not synonymous with a 'low quality of scientific work'. From this aspect, involvement in professional networks is an important strategy for improving the position of female academics.

However, as Blagojevic stated in her presentation, in countries in transition (such as some in Eastern Europe) networking does not mean the same as it does in Western European countries. "*In countries facing serious difficulties with transformation, nepotism not meritocracy prevails*". In that case, networking could be counter-productive for meritocracy. The ambivalence became very clear in the debate that followed the presentation of this paper. On the one hand, networking provides access to information and sometimes positions and, on the other, it is time-consuming and exclusionary.

According to Valian (1998), the accumulation of advantage is an important explanation for the gender differences in scientific careers: success leads to more visibility and new successes, and enhanced reputation leads to more

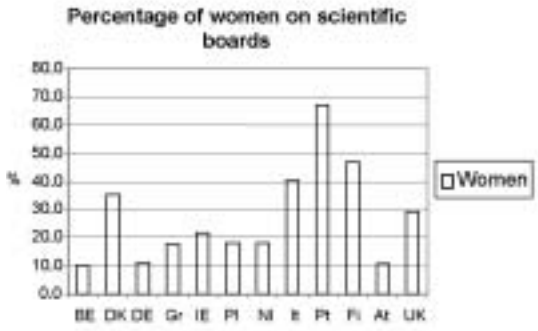
citations and more success in grant awarding and subsidies. This becomes an obstacle for newcomers in the field as they have to become visible and to compete with those who are already 'known' (Sandström and Hällsten, this volume). An instance of this is seen in a study by the Swedish Research Councils (MFR and NFR): most proposals were submitted by those seeking a renewal (circa 45%) and by people who were already known to the council as a result of former successful applications (circa 45%). Only a minority of the applicants were new to the research councils (10%). The first group was the most successful (85% received a subsidy) while newcomers were less successful (only 8%). This poses some questions about the often unintended effects of these systems regarding researchers who cannot rely on an established position.

Definition and selection of peer reviewers and composition of selection committees

Gate-keeping is one of the scientist's important functions. Gate-keepers are undoubtedly in a key position to influence the definition, evaluation and development of scientific excellence (Husu, this volume). Members of research councils, members of selection committees, peer reviewers, referees, editorial boards, are all in a position to define what is excellent, to distinguish between what is good and what is not. Gate-keeping can function as a process of control and exclusion, but it can also function as a facilitator providing resources, information, and opportunities. According to the ETAN report (Osborn et al., 2000), gate-keepers are generally middle-aged male academics. Women are clearly under-represented as gate-keepers. Their limited presence in the highest levels of academia is mirrored by their under-representation as peer reviewers, on editorial boards, research councils and in other decision-making positions. Many institutional rules block women's opportunities to take part in gate-keeping processes, as women are more often represented in low status positions. Even in countries like Finland, which has a rather high proportion of female professors (21% in 2002) and a 40% gender quota for all public bodies, the gate-keepers in the private research foundations are predominantly male (86% of the board members of the largest research funding foundations (Husu, this volume). The National Research Councils are approaching gender balance because they are government appointed in Finland and their composition has had to follow the quota paragraph of the Gender Equality Act since 1995. However, the proportion of women was clearly lower among referees who evaluate the funding proposals for the Research Councils. In 1999, only 16% of these were women and in 1999-2002 the proportion of women varied from 11-12% (in natural sciences and technology) to 33-43% (health sciences) (Husu, this volume).

Women in decision-making

The She Figures 2003 showed that the composition of scientific boards in most European countries is rather unbalanced. Only in Portugal do more women then men participate on the boards, while the Finnish boards approach 50%.



(Source: She Figures 2003: 76)

One of the important declared strategies to minimise gender bias in academic decision-making is a gender balanced composition of scientific boards.

Strong male dominance is also evident in other institutions in the power structure of the sciences: editorial boards, peer panels, and selection committees for professorships. The ways in which these organisations and groups are recruited are rather informal and lack transparency, the composition is often unbalanced and the male élite is over-represented. In many cases, new members are invited on the basis of their expertise or their networks, not on their ability to make reliable, unprejudiced judgments. Many criteria are marked by a kind of elasticity, and can be mobilised in order to make a positive or negative judgment. Moreover, issues like 'how to conduct assessments', 'how to use criteria' and 'how to avoid gender bias' are not recognised as important aspects influencing the professionalism and accuracy of selection and evaluation procedures (Mottier, this volume).

Processes: transparency and accountability

It has been suggested that, generally speaking, three main mechanisms are used to decide promotion: co-optation (discretionary promotion by those at the top, who are not accountable and do not state the criteria they use), selection (promotion by accountable people at the top, according to certain explicit criteria), and election (promotion by choice of the peers). Of these, selection appears to be the most transparent, while many appointments for professorships seem highly influenced by co-optation (Addis). Although more research is needed on this issue, many participants in the workshop support processes based on explicit standards, transparent procedures, and more public accountability as a means to aid screening for excellence, with positive spillover neither restricted to nor specific to gender issues. Evidence, however, shows that the opportunity loss resulting from the lack of transparency is highly gender specific: too much female talent is wasted.

Several experiments on gender-based double standards carried out by Foschi and her team were reported during the workshop. They clearly indicated a double standard in assessment processes. Different requirements were applied to men and women in assessing each other's competence. Moreover – and more importantly from a strategic point of view – this work showed that the effects of double standards decreased when the assessors were held accountable for the results by making the assessment public and known to the assessed. These experiments also showed that providing explicit standards rather than allowing assessors to generate and use their own criteria reduces the gender bias. Double standards flourish if assessments, assessors and criteria are not made public, leaving much room for subjective and uncontrolled judgments.

Indirect gender bias: crossing borders

The rather monolithic standard model of scientific excellence – with bibliometrics and peer review as the dominant measurement of scientific quality – does not fully coincide with the heterogeneity of what actually happens in the sciences. As Griffin stated in her paper, "*There is, as yet, in the literature concerned little recognition of the fact that assessment of scientific excellence, far from being an exercise in disinvested and disinterested judgments, is one of situated knowledge-making, reproducing the cultures from which it emanates*." (Griffin, this volume: p. 10) Four dimensions of 'situated decision-making' were discussed during the workshop: disciplinary differences, mono- and interdisciplinarity, different modes of science, and geographical location at the centre and periphery. Sometimes the relationship with gender is quite clear – e.g. the disciplinary differences – but in some cases the gendered character remains indefinite. There is – for instance – some evidence that women scientists have a stronger tendency towards interdisciplinary research and towards research aiming at social issues, but the results are not unequivocal.

Diversity among disciplines and research fields

Measuring scientific quality using bibliometrics is clearly anchored in publication traditions of the natural and related sciences that are generally well organised at an international level, with publication occurring in scientific journals (e.g. psychology). These standards reflect the normative ideal of the natural sciences and have come to represent a model for all scientific research. This seems to cause some problems for measuring scientific quality in the humanities and in many social sciences (Mottier, this volume). The coverage of journals by the 'citation index' is much lower in the latter than in the natural sciences and, moreover, in many disciplines scholars prefer to publish books instead of articles in journals. In general, the normative ideal of 'real science' is more or less identical with natural science, and recourses and infrastructures for research are unevenly distributed among the disciplines. Since women are proportionately more actively engaged in the social sciences and humanities, this results in an unintended but nonetheless active gender bias that affects the opportunities for the scientific careers of female scholars and their relative success rates.

Monodisciplinary versus interdisciplinary fields

Participants in the workshop agreed that in the last few years there has been growing recognition of the need for interdisciplinary research – but this recognition is only apparent at the level of discourse. However, many assessment systems are rooted in monodisciplinary activities and, in fact, assessment regimes produce or reproduce disciplinary boundaries and elicit disciplinary behaviour. Interdisciplinary fields do not belong to the core issues or the core community of established fields; they are not well organised within research councils, and remain largely invisible. Similar processes take place at the individual level: interdisciplinary or multidisciplinary activities are often invisible. Publications in high quality journals from other disciplines have almost no impact on the personal network or the scientific reputation, as Feller stated during the workshop. In most cases, such publications are simply not recognised or acknowledged. Although interdisciplinarity is definitely part of the discourse, the system seems to operate at the disciplinary level.

This need for interdisciplinary research is closely related to the next issue: the missions and tasks of universities and scientists in a knowledge-based society.

Different modes of science

One of the central lines of debate during the workshop referred to the changing position of the sciences as a social institution in the emerging knowledge-based society. Different concepts have been developed to cover these transformations. Gibbons et al. (1994) describe them as Mode 1 versus Mode 2 models of knowledge production and transmission; Laredo (this volume) addressed it as a 'third mission' of the universities – a responsibility to ensure more direct links with societal and economic needs. Brouns (this volume) refers to it using the metaphor of Mount Olympus versus the Agora. The classic but still powerful metaphor for science is the Olympus model which situates scientists, in their unselfish and disinterested quest for truth, at the top of the pyramid, far removed from the concerns of everyday life. In the Agora model, science is analysed as a societal practice, tightly bound to other such practices. In the context of the knowledge-based society, the sciences are moving into the Agora, but this is hardly recognised in the evaluation systems. Scientific knowledge refers to creators, transmitters and users (Blagojevic, this volume), but only the first ones are acknowledged in the dominant system of measuring scientific quality.

The *Centre de Sociologie de l'Innovation* has designed a 'research compass card model' to map the complex world in which researchers have to operate (Laredo, this volume). It would be counter-productive for research institutions to consider only academic excellence when, at the same time, policies demand other missions to be developed. What is needed is for indicators to be developed for performance in other research activities. Laredo argues for a transition from scientific excellence to scientific performance, which clearly engages in scientific activities in a broader scope. A wide range of achievements is needed to be successful as a scientific group, varying from designing research, addressing several audiences, acquiring research money and negotiating with governments and enterprises to gaining new resources and facilities for research. This wide range of tasks is not within the reach of

Enwise expert group on women scientists

In February 2004, the Enwise expert group on women scientists presented a report to the European Commission. This report investigates the situation of women scientists in the Enwise countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The report highlights the influence of specific gender policy implemented in these countries during the communist regime. The proportion of women among researchers in Enwise countries is higher than in the current 15 EU Member States. Analysis reveals that even in countries where the presence of men and women is fairly balanced, there are gender differences in the concentrations across the fields of sciences, whereby women are absorbed in low-expenditure systems. It shows that although formal legislation is an absolutely necessary condition, it is not sufficient to guarantee equality. The consequences of the transition have left women scientists in a more vulnerable position.

individual scientists, but presupposes a collective effort from research teams. But how do we manage assets when taking the collective dimension of research into account?

Universalism versus national/regional research traditions

According to Blagojevic, some research valued as excellent in the context of production does not fit in the Anglo-American traditions and journals and is thus rejected. This is clearly a case of situated decision-making: what 'good science' is depends on the context of evaluation and the inherent evaluation systems. The dominance of Anglo-Saxon traditions might cause problems for researchers in countries at the semi-periphery. First of all, they face some complex problems related to the epistemic culture in their own countries, which may be more problem-oriented than knowledge-oriented, and secondly, they are confronted with an asymmetry in the roles of Eastern and Western scientists. As Schiebinger stated some years ago: "*the Science Citation Index rarely includes sources in languages other than English, so the hair-splitting measures of productivity and influence do little to consider science in a global context*" (Schiebinger, 1999: 50).

Many concepts used in research are not universal, they are context-specific, as Blagojevic argued. This means that in semi-periphery countries there are circles of translation that make the scientific discourses accessible to researchers in these regions. Adaptation to international conceptual frameworks is necessary in order to get published. However, this might cause some tension since these conceptual frameworks are not always adequate or relevant: "*some theories are irrelevant to our experiences*" (Blagojevic).

In conclusion, many of these elements in the actual functioning of the system cause an unintentional tendency towards conservatism. The system of evaluating scientific quality has become much more than an accounting device and is being taken much more seriously. In fact, in many situations it is decisive for new appointments, distribution of resources, and publication opportunities. Scientists react accordingly, trying to establish good prospects. It is necessary to take into account the performative effects of these kinds of evaluation systems – i.e. the fact that the scientific product will often tend to change as a result of the evaluation system as scientists try to be evaluated positively. According to Feller (this volume), the emphasis on bibliometrics is too great because even an unbiased measure, when applied in a biased system, will produce biased results. Therefore, too rigid a use of bibliometrics may obstruct a refined measurement of achievements and contributions of women scientists.

Instead of adapting traditions and behaviour to the standards, it is argued that it is necessary to broaden the spectrum of activities and achievements to be included in the definition of scientific excellence. It is important to include other dimensions of scholarly practice, such as education, participation in committees, administrative tasks, external consultancy, and contribution to public debates. In other words, it is important to emphasise not only production, but also relevance and the different users of scientific knowledge. Measures are meaningful if they are based on the context of their production and in the uses of the knowledge. But the question of how exactly this science-in-context is measured and what kind of criteria should be applied remains subject to debate.

Conclusions

During the workshop, the pursuit of excellence was described by many participants as *a set of practices framed within a 'discourse*' used by the scientific community to organise its self-governance. The workshop addressed the problematic aspects of some contemporary systems in general, as well as in relation to gender. The workshop frequently discussed the issue of the validity of existing definitions and methods for measuring scientific excellence, in connection with the variety of scientific practices, interdisciplinary research, and mainstream versus periphery in terms of issues, methods and location.

The specific gender dimension appears as the continuation, in the top tiers of science making, of the same mechanisms that prevent more women from participating in larger numbers, even at the rank-and-file level of scientific enterprise. Achieving the best results in terms of scientific productivity requires that the discourse on 'excellence' be reframed in such a way as to include all scientists, independent of their biological sex. The presentations in the workshop showed that the environment in which scientific inquiry takes place is not yet free of bias against women, and that this is linked to the subtle persistence of gender stereotypes. Persistence of these stereotypes generates many 'double standards': women are repeatedly requested to prove themselves worthy, as stricter criteria to assess competence are used in judging them. This may prevent some of the best scientific minds from growing to their full potential, and some innovative and very productive scientists from participating fully in scientific governance. It also creates persistent stress for those female scientists who keep working, often achieving excellent results.

That the scientific environment should be free of gender stereotypes is a statement that would most likely be agreed upon by the vast majority of men and women involved in science. Nonetheless, translating this statement into a strategy that really leads to a 'gender-equal' or 'gender-sensitive' scientific environment, one that is not gender discriminatory and that is capable of containing all genders and valuing all genders' abilities equally, has proved more problematic. The first step in this direction is cultural; it is the understanding, by the entire community, that the problem is there and must be addressed.

Several aspects of possible gender bias in the production and evaluation of scientific excellence were discussed in the workshop. Gender bias can occur (1) in the characterisation of scientific excellence, (2) in the criteria used to assess it, (3) in the choice of the explicit and implicit indicators for scientific excellence, (4) in the way the criteria are applied to men and women, (5) in the failure to integrate women in scientific networks, and (6) in the procedures through which criteria are applied to people.

(1) Characterisation of scientific excellence

The discourse about what characterises excellence is generally not subject to scientific evaluation, and the actual practices in each branch of science are often quite idiosyncratic. It is assumed that the scientist in each field somehow acquires, from his or her environment, a notion of what excellence is, and that there is no need for a critical evaluation of the concept and of its correspondence with actual practices. There is a dominant characterisation, the one adopted in the natural sciences, which produced standards that have been easy to adopt more generally but have been criticised as rather limited and prone to reductionism. Social sciences have adopted similar standards, introducing them as grounded in the practice of the natural sciences, but they do not acknowledge the diversity in missions and achievements, such as the so-called third mission of universities (link with society). Other scientific practices, in particular those from disciplines most popular among women, such as humanities and social sciences, are not adequately included in the characterisation, and the standards do not cover what excellence there might be in these disciplines sufficiently.

(2) Criteria

Criteria used to assess excellence are often described at a very abstract level (researchers need to be innovative, productive, coherent, etc.). These abstract nouns become frameworks for interpretations in a specific context or in epistemic cultures. Teaching and professional activities are usually undervalued, and if women have a systematic overload of these activities as a result of their temporal contracts and positions, this may introduce a source of gender bias. As underlined by Griffin, the boundaries within which criteria are applied, i.e. the definition of what falls within and what falls outside a given discipline, may be a very important source of bias.

(3) Indicators

Scientific excellence is not easy to grasp. The dominant image of the excellent scientist is more or less grounded in a male career pattern with an absolute dedication to science. Many people – especially those with family responsibilities – find it hard to live up to this image. Good indicators of excellence should take into account the fact that time-poor people can still be excellent scientists, and should measure scientific output not only in cumulative terms, but also in relation to the amount of time devoted to research. Many indicators explicitly or implicitly used to assess one's qualities do not accurately measure one's scientific products. Some of these indicators can be an obstacle for women, such as affiliation to established scientists who have access to many resources, position within a social network, and competitive style. Indicators that are unbiased per se (counting of publications and citations) may still produce biased results when applied to a biased system (e.g. if men cite men more often than they cite women).

(4) Assessment of competence based on application of these criteria

Many investigations presented during the workshop produced evidence of the fact that standards adopted for the attribution of scientific competence to women differ from the standards used when assessing men. In experimental settings, similar achievements led to different assessments of the task competence of men and women (Foschi). Gender-biased judgments appear to be pervasive: people of both sexes may apply double standards when working as evaluators of themselves as well as of others. Accountability seems a major strategy to reduce double standards. Evaluators who have to explain their judgment are more sensitive to the equal assessment of men and women. This means that transparent procedures may contribute to a gender-equal atmosphere.

(5) Networks

The workshop stressed the power of networks, emphasising their role in information exchange, agenda setting, control, and implicit decision-making. Therefore, it is important to increase women's participation in networks, which is also a *sine qua non* to be known as a scientist. Because networks are often quite informal and generated by pure co-optation, it is difficult to devise a clear strategy to increase women's participation. Moreover, we have to register some ambivalence towards suggesting that women invest more in networking because it is very time consuming. Although networks as exchange media are somewhat unavoidable and therefore are probably here to stay, a 'gender-equal' or 'gender-sensitive' scientific environment requires networks that are inclusive of women, and a shift of decision-making power away from male exclusivity and informal networks and into more formal and professional mechanisms.

(6) Procedures

Excellent scientists are those who have proved themselves through a set of different screening procedures. 'Hiring' procedures are different from 'funding' procedures which, in turn, are different from 'review for publication' procedures. The workshop underlined the need to think, in a more general, systematic and scientific way, about various procedures that are free from gender bias. Sources of problems were indicated in a) choosing the 'gate-keepers' in charge of a procedure, b) gender balance of panels in charge of procedures, c) transparency of the procedures, which includes advertising positions and criteria being made explicit, and d) accountability of the 'gate-keepers'.

Recommendations

Although individual participants may favour one solution over another, some consensus over lines of action did emerge:

Evidence

More research is needed for a better understanding of where the bias comes from. Gender is a deep cultural construct that operates at symbolic and institutional levels, and gender bias may assume different forms in different cultures, which may go unnoticed unless systematically explored. There are fields where women have fared better than in others; this needs systematic investigation.

General recommendation: Funding of research in some neglected areas, such as differences between disciplines, epistemic cultures, and national and regional contexts. These differences should be compared and investigated in order to improve our understanding of the gender dimension of science and scientific organisations.

i) *Assessment of scientific excellence: micro level*
   - Research on the attribution of scientific competence to men and women with highly comparable academic records, focusing on systematic research on key factors that affect the intensity and relative weight of a biasing practice (e.g. transparency of procedures, degree of accountability, disciplinary sex-category association, sex-category composition of assessors and assessed, national contexts).
   - Investigation of personal gender bias of assessors, especially the extent to which sex-category is viewed as an implicit indicator of scientific competence.
   - Systematic research on perceptions of excellent scientist in different disciplinary, organisational (universities, research institutes) and national contexts, compared to perceptions of women scientists and men scientists in the same context. Also investigate possible differences between men and women as regards these perceptions.
   - Analysis of performative effects of the standards of scientific excellence and the way male and female scientists adopt and identify with these notions in their own scientific practice.

ii) *Assessment of scientific excellence: institutional level*
   - Comparative investigation of procedures and protocols at universities and other research institutions and their effect on the gender dimension. Comparison should be focused on gender blindness, gender sensitivity and gender relevance.
   - Research on decision-making procedures of funding agencies and the genderedness of 'epistemic cultures' in comparative perspectives in different disciplines, including areas where women are relatively well represented.
   - Examination of constructions of masculinities within evaluations of scientific excellence and academic merit.
   - Investigation of gate-keeping in relation to research funding, recruitment and promotion in universities at the individual and institutional levels, their practices and policies.
   - Comparative analysis and gender impact assessment of initiatives taken in various institutional settings for measuring scientific excellence in a gender sensitive way or for defining transparent and fair methods for assessing merit, quality and productivity.
   - Comparative analysis of how women's studies and gender studies, as highly feminised interdisciplinary areas of research, are treated in the research assessment exercise and on the impact of these assessments on the field developments.
   - Elicit constructs of 'excellence' from a substantial sample of men and women in order to design a standardised list of criteria for excellence at a more operational level.
   - Elicit constructs of effective leaders in sciences from a sample of females and males, and content analysis.

iii) *Social dynamics of scientific excellence*
- Research on the impact of networking in science, both as an existing practice and as a strategy for gender equality. Examining gender and the inclusion or exclusion of women from Networks of Excellence would be a very relevant case study.
- Investigations of the relationship between gendered culture, practices considering scientific excellence, and career tracks of men and women scientists.
- Research on gender differences as regards the support – logistic, technological and financial – provided by the institutions to men and women scientists.
- Research on the relationship between mobility and the construction of scientific excellence.
- Investigation of family-related aspects, such as part-time work, and its effects on scientific excellence and the attribution of scientific competence.

iv) *Science and society*
- Investigation of the relationship between knowledge and policy-making; comparison of different European regions.

Awareness

An important first step is to make all scientists, male and female, aware of the extent and the consequences of the problem of gender bias in measuring excellence. In particular, those in charge of screening procedures should be trained to understand gender bias and its consequences, so as to minimise it.

General recommendation: Special training programmes on gender awareness, designed by gender specialists. Development of reading material on gender bias in evaluating research.

Field boundaries

Particular attention should be paid to the fact that the definition of the boundaries of a field of inquiry and the specific activity profiles of scientific institutions matter when deciding who is excellent.

General recommendation: Much greater recognition of the positive contribution of interdisciplinarity, new research fields and gender studies to scientific excellence. Discuss also the relevance of productivity measures as a primary way of assessing researchers' performances.

i) *Interdisciplinarity*. How to evaluate contributions that 'fall through the cracks' between two fields of inquiry? Working at the borders of a discipline creates some risk and this, in particular, is true of gender studies. An evaluation of interdisciplinarity, in contrast to the lip-service it usually gets, may be helpful.

ii) *Novelty of fields*. Creating a new field is often a matter of redefining the boundaries of an old field, so as to carve out the study of a specific terrain, with its own methodology, network, and shared knowledge.

iii) *Activity profiles*. Discuss the relevance of productivity measures, especially if other activities (teaching, management) are crucial to the actual functioning of researchers.

iii) *Gender studies*. In recent years, women scientists trained in many different fields have chosen to focus on studying gender from the perspective of their discipline. Gender issues have been explored along a spectrum ranging from the visual arts to literature, philosophy, psychology, history of thought, law, sociology, economics, and biology. There is definitely a field of gender studies, but it is difficult a) to define excellence within gender studies given that people come from so many different perspectives, and b) to make the contributions on gender count towards assessing performance in the original field of the gender scientist. From a purely career-oriented viewpoint, contributions to gender studies are devalued with respect to advancement in the original field – which has not prevented gender studies from growing.

Networks

The issue of networks is strongly linked to the issue of awareness and power. Scientists should be more aware of gendered difficulties in engaging in dialogue and networking with scientists of the other sex. More formal processes and criteria need to be set up to allow more women to pass the 'fuzzy screening' of networks.

General recommendation: gender balance in officially funded networks to be achieved by the imposition of recommended quorums formulated with reference to women's and men's respective presence in the field.

Procedures

Procedures for assessing excellence are not obvious or natural; there needs to be a critical examination of their interaction with gender.

General recommendation: in order to minimise gender bias, it is of particular importance that screening procedures be made more transparent and evaluations more public.

i) *Public advertising of positions*, thus helping to reduce the influence of informal networks that often exclude women.

ii) *Explicit standards of promotion or appointment.* The existence of explicit standards that apply to a large set of applicants tends to favour objectivity. On the other hand, a caveat is needed against the practice of tailoring the standards for a call or a position to favour one particular applicant.

iii) *Standards based on traits that are relevant* to the pursuit of scientific knowledge.

iv) *Use of appropriate indicators of performance*, rather than intransparent judgements.

v) *Indicators chosen to fit the life-cycle productivity* of scientists, both women and men.

vi) *Indicators chosen to fit the different scientific interests* of scientists, both women and men.

vii) *Public availability of the records* of a procedure – even making proceedings public to a certain extent.

viii) *Accountability* of the members of panels in charge of procedures.

ix) *Composition of panels balanced in terms of gender ratios*, at least with respect to the promotion of women among applicants or senior experts in the field. Particular attention should be paid to the selection criteria for editorial board members and referees of scientific journals.

x) *Gender audits* on women's participation as well as on the gender dimension of research programmes should have effective consequences for a mark in evaluations.

xi) *'Professionalisation'* of selection procedures by training panel members, chairs and members of editorial boards to look for and to correct gender bias.

xii) *Recognition of that change – to reduce gender bias – involves all participants in the process, both men and women, not only women.* There should be excellence in practices of definition and measurement of scientific excellence, and not only in excellence in science itself.

General recommendation: as procedures are different in different countries, the above requirements regarding transparency need to be adjusted to fit each national situation, in a coordinated effort at the European Union level. In addition, research-funding procedures employed by the EU should be revised to ensure transparency.

Notes

(1) Investigations presented during the workshop show that the Wennerås and Wold article has had a notable influence on the success rates of female applicants in Sweden, which have increased considerably due to what Sandström calls 'The Wold Effect'. Since the publication of the Wennerås and Wold article, Swedish research councils – and many others, supposedly – have become more aware of the possibility of gender bias in the peer review of research grant applications.

(2) Henneberg (1997) argues that evaluators sitting on grant committees tend to be selected because they are working in a problem area similar to that a grant application proposes to solve. However, since scientists working in similar areas tend to know each other and either dislike each other and compete amongst themselves or like each other and collaborate, the result of a review of grant applications depends on political and financial elements external to the application.

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Part 2 - Experts' papers

Measurement of scientific performance and gender bias

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Introduction

This paper addresses the question of whether metrics of scientific excellence are gender-biased. The paper is purposively methodological in tone because it seeks to clarify conceptual and measurement issues that at times are conflated in contemporary scholarship and policy documents. This clarification is seen as necessary for future empirical research.

Gender bias in science and gender bias in the measurement of scientific excellence

Two separate themes appear to be conflated in the research and policy literature on gender bias in science: (1) bias in the system of evaluating research performance and excellence; and (2) bias, or more properly, the validity and reliability of the metrics used to assess performance or excellence. Gender bias under (1) is generally treated as synonymous with equity, or what Harding (1986) has termed "fair practice", that is whether two or more individuals whose performance is deemed comparable by some agreed-upon measures are treated in a like manner (in terms of whatever happens to be the relevant emoluments, such as appointment, promotion, salary, advancement, reputation, awards, etc.). (Relatedly, gender neutrality would imply that differential performance is treated differentially.)

Gender bias under (2) groups several different meanings. These include such themes as failure to recognize or give adequate recognition to the performance of women scientists (e.g. the oft-cited example of the undervaluation of Rosalind Franklin's contribution to Crick/Watson's discovery of DNA), and the "feminization" of selected fields of science, such that once female scientists reach a critical percentage of all active scientists, male scientists exit the field, making it a 'ghetto' of research. The consequence of this "territorial segregation" is that the "reputational" weight attached to outstanding performance in ghettoized fields is diminished in competitions for international or national awards. Gender bias here also may refer directly to differential treatment of the research proposals and manuscript submissions of female and male scientists, assuming equal scores on established criteria for scientific or programmatic merit.

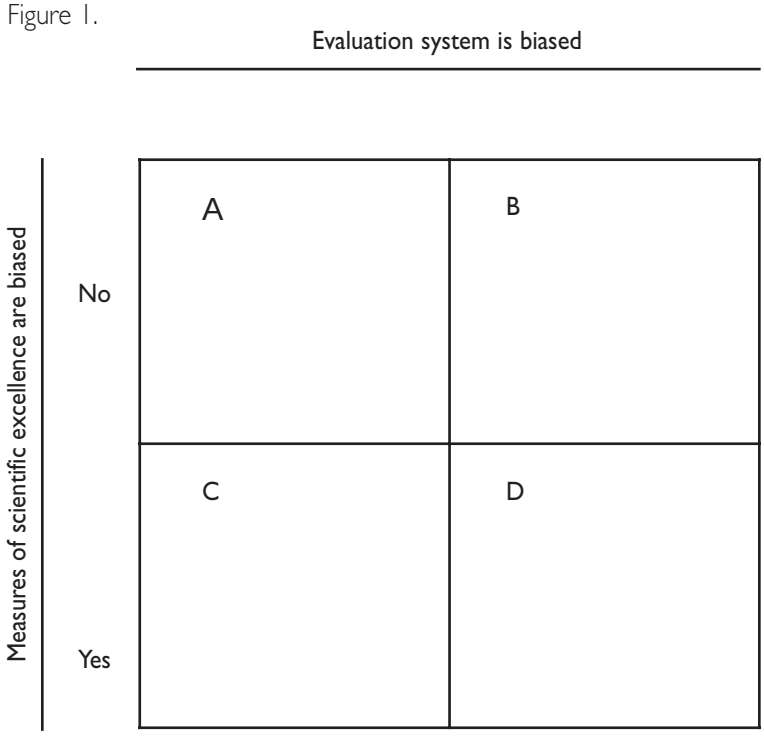
Operationally, this distinction between bias in a system of evaluation and a metric may be blurred by the institutional arrangements of the national research system within which scientists work. Thus, in a stylized sense, publication measures associated with a US-style (basic) science system, which is characterized by a single investigator-initiated, competitive and merit review system of research funding, may be deemed a more valid measure of individual scientific performance than those generated through a national research system in which block grants are made on a formula basis to designated universities, centers, and chairs, and in which a hierarchical or "industrial" model of research organization dominates. These latter characteristics tend to concentrate economic and reputational benefits to leaders of research units and to dilute the recognition received by other, possibly more creative and productive scientists. To the extent that existing funding and organizational arrangements are characterized by gender bias, seemingly neutral measures, such as publication counts, will simply transmit the underlying bias to a new screen.

The differences between these two conceptualizations of bias and their possible combinations are laid out in Figure 1. The simple 2x2 classification generates four possible combinations: (a) unbiased system, unbiased metrics; (b) unbiased metrics, biased system, (c) biased metrics, unbiased system; and (d) biased metrics, biased system.

I take as given the desiderata of (a) an unbiased evaluation system employing valid metrics, and so say little more about it. Likewise, I am unaware of any study that explicitly contends that (c) describes the contemporary or past world of science, namely, that there are gender biases in the metrics used to compute scientific performance but that the evaluation system is otherwise gender-neutral. Given the preponderance of evidence about the presence of various forms of gender bias in the structure of science, I omit further discussion of this cell.

My modest reading of the literature on feminism in science suggests that much of the attention paid to issues of gender bias in the measurement of scientific excellence has focused on variants of (b) and (d). For example, in terms of this typology, the well-known Wennerås-Wold study documenting nepotism and sexism in the practices of the Swedish Medical Research Council would be an example of (b). Their study employs six measures of scientific productivity, but each is a variant of publication and citation counts. Valian's (1999) account of research performance in universities likewise centers about quantity and quality, with the former operationalized by publications counts, the latter by citation rates. Similarly, several of the studies surveyed by the ETAN Expert Working Group that sought to determine whether gender bias existed in the behavior of a set of European funding agencies, and whether differences existed in the performance of female and male recipients of agency grants, employed bibliometric analysis. In general, the thrust of this work has been to demonstrate discrimination by highlighting that female scientists receive less in the way of economic or social returns even when their performance, as measured by bibliometrics, is equal to or above that of male scientists.

Figure 1.



Without rejecting or excluding the existence of (b), other studies of gender bias seem to be referring to (d). This line of analysis starts by documenting the biased nature of the evaluation system, but then proceeds to argue in one form or another that publications are not the only measure of scientific excellence. To quote Schiebinger (1999), "*Despite their precision, publication and citation counts do not tell us much about discrimination in the sciences*" (p. 50). Left open to question in this approach is whether or not publication and citation counts are gender-biased.

Reliance on bibliometrics as the hallmark of scientific performance also spills over into what Schiebinger has termed the "*hotly contested*" hypothesis of whether "*women do science differently*" (Schiebinger, 1999, p. 11). Several themes found in the literature on feminism in science have implications for and, in turn, are affected by measurement issues. Are female scientists more cautious in stating claims, thus losing out in priority

races, and in having their manuscripts rejected on the grounds of lack of originality? Do female scientists eschew high-risk, high-stake speculative lines of inquiry, settling instead for "well-crafted" but safe science – characteristics that can be expected to lead to lower publication counts and lower citation rates? In a contrary manner, as suggested by Schiebinger's review of publication statistics, are they likely to publish fewer papers, with each paper being, on average, more substantive and thus cited more frequently, on average, than papers by putatively more productive male counterparts?

Without venturing to answer these questions, what is striking, to me at least, is how much of the debate about gender bias in the measurement of scientific excellence is dominated by the use and interpretation of publication counts and citation rates; in a contrary manner, there seems to be a lack of attention or endeavor to the construction of alternative measures. This emphasis on bibliometrics is overdone, both because of the limitations of these measures and because it blocks more detailed measurement of contributions of women scientists.

A brief overview of the current role of bibliometric measures is that they are, in fact, the primary metric for gauging the importance of scientific research. Indeed, reliance on bibliometrics is increasing in frequency and saliency as both research sponsors and performers adapt to worlds of increased accountability. This increase is occurring even as historians of science and policy analysts point to frequent disconnects between short-term publication measures and long-term scientific impacts.

Two brief examples of this criticism, taken from the experiences of male scientists, are relevant here. Dummet (1991), criticizing the ascendancy of publication counts as a measure of scientific importance, wrote, "*Their output is monitored by the use of performance indicators measuring the number of words published per year. Wittgenstein, who died in 1951 having published only one short article after the Tractatus in 1922, would plainly not have survived such a system.*" (Dummet, 1991, p. 9) The early waffling reception to Nash's work on game theory, now a staple in the repertory of social scientists and natural scientists, likewise indicates that early measures may not be an accurate predictor of the longer-term impact of a scientific discovery. As observed by Luce and Raiffa in 1957, "*We have the historical fact that many social scientists have become disillusioned with game theory. Initially, there was a naïve bandwagon feeling that game theory solved innumerable problems of sociology and economics, or that at least it made their solution a practical matter of a few years' work. This has not turned out to be the case.*" (as quoted in Nasar, 1998, p. 122) Moreover, other recent studies have pointed to the "game-like, opportunistic" behavior of scientists and their home institutions to maximize rewards by manipulating output measures, trading off, for example, publication counts for citations (Butler, 2003), and to the dysfunctional aspects of these measures on interdisciplinary research (Feller, 2003).

For all these and other faults as valid or reliable measures of scientific impact, bibliometric measures do not appear to be gender-biased. This is a statement about the characteristics of a metric; it is not an explanation of observed differences in publication and citation quantities for female and male scientists, or the consequences that flow from differences in computed measures. But to say that existing measures are not gender-biased is not the same as saying that there may not be structural gender-based biases in the larger environment in which scientists send and receive messages about research findings which, in turn, affects interpretation of the meaning of these measures.

The emphasis that Etzkowitz, Kemelgor and Uzzi (2000) place on the importance of social capital and density of network relationships as an explanation for the observed differential performance of female and male scientists offers an important insight here. Extending their line of analysis, citations may be by-products of participation in larger networks as well as measures of intrinsic scientific quality. Given the expansion in the number of journals and articles, not to mention other forms of knowledge dissemination, productive scientists have to determine what they read. To the extent that the "literature" portion of any manuscript is delegated to other members of a larger research team, lead scientists have to decide which of the multiple references put before them to cite. Familiarity with the work of other scientists, and perhaps more importantly assessment of the significance of any single article, may occur prior to the publication of the article and be based on professional interactions with the authors in any

number of a set of formal and informal scientific settings. The opportunity to hear research presented in an open setting, where both assigned discussants and question-and-answer sessions permit probing of the research, may provide a better filter of the quality of an article than its publication, even if in a "top-ranked" journal. Indeed, the reaction of one's peers at the public forum in which the research is initially presented may be a better community gauge of the merits of a research paper than its ability to course the journal review process, and thus a better guide to authors about the value-added of citing the article in one's own work. Basing a manuscript on "publications" that are not viewed favorably by one's peers does not necessarily add to the luster of one's own work. All these considerations lead to the conclusion that to the extent to which female scientists experience disadvantages in accumulating professional opportunities and visibility, as described by Etzkowitz et al. (2000), so too will they experience a disadvantage in having their published work read, and thus cited.

To return to the limitations of bibliometrics, the above caveats point to the need to develop an expanded set of metrics, and to a conceptually clearer distinction between performance and excellence, or between quantity and quality. Greater attention needs to be paid to the long-term impact of a discovery as defined and measured in terms of its generalizability across fields of science, its stimulus to the creation of new fields of knowledge, and its applications (Feller, Gamota, and Valdez, 2003). Not all of these impacts are adequately measured by bibliometrics; conversely, bibliometric measures can be misleading measures of the importance of a line of research or of a highly cited paper.

Development of these alternative measures is a demanding task. Delayed recognition of discoveries ("*hidden stories of science*"), protracted periods of rejection of paradigm-changing propositions, disputes about priority claims, premature discoveries, and debates about adequate recognition of the contribution of specific contributors are each standard parts of the history of science. Examples of each of these occurrences may be found in the literature on the contributions of female scientists to scientific discovery, such as Barbara McClintock's discovery of movable gene elements, but so too may they be found for males (Hook, 2002). Thus the task is twofold: to develop a broader set of measures of scientific excellence, and to determine whether or not gender bias exists in these measures.

What must be emphasized is that this search for broader and possibly alternative measures must be gender-neutral. The goal is not to seek metrics that make the performance of female scientists look better than that of male scientists. Rather, it is to find better measures of scientific performance. The challenge for future work on assessing scientific performance and excellence (note here again the distinction made between the two output measures) is to develop metrics that better capture the dynamics of scientific discovery, as well as encompass the array of societal objectives that led to the initial public policy decision to fund the research.

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The 'Triple Burden': A cross-cultural analysis of the consequences of discrimination for women in science

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Introduction

With limited exceptions for breakthrough individuals (see Hargittai, Istvan interview with Jacqueline Barton), science is characterized by a "sexual separation of labor" in which male and female scientists often pursue different career paths. The paradox of women in science is that when they are excluded from traditional career paths, they may reappear in non-traditional career paths at the margins of the traditional scientific enterprise but at the crossroads of new links between science and society, such as in intellectual property management and science journalism. We call these non-traditional paths the 'Rachael Carson' track after the female scientist whose path to the Ph.D. and academia was thwarted but who found a career in government service where her official duties explicating ecological research for government publications led her to synthesize a broad range of data into a new environmental paradigm (Linda Lear, 1999, Rachael Carson).

This paper draws upon data from studies, utilizing both qualitative and quantitative methods, conducted by the authors of the experience of women in science in universities and research institutes in India, Germany and the US. Although participation of women in science shows a steady increase, it is marred by two trends: (1) the tendency of fields to reduce in status as women achieve equality of representation and (2) continued resistance to women reaching higher positions of authority (Judith Glover). Thus, even apparent inclusion is subverted by exclusionary factors that most men, and some women, deny exist. Women in science carry a triple burden:

- Universalism subverted by gender stereotypes hidden by official openness;
- Women academic scientists have to work harder to prove themselves;
- Stress induced by coping with lack of social capital and over-reliance on human capital.

Women in scientific professions face barriers above and beyond those found in other professions (see Mary Frank Fox, and Women and Work, Cynthia Mayfield Epstein). Moreover, although these barriers take various forms, 'stressors' in the work environment are found in widely different cultures. The paradox of women in science is that the expected lack of social distinction in determining 'good science' has been inverted into the creation of invisible 'caste' barriers between men and women in science. The existence of hidden barriers is exemplified in the emergence of distinctive male and female scientific roles and cultural styles that place women at a disadvantage[1]. We hypothesize that these 'gendered' roles and styles emanate from the social structure of science rather than from gender or national culture. The existence of common barriers, as well as a modest cross-national trend towards reform that could be accelerated, is supported by our comparative analysis.

Method, data and thesis

In this paper we analyze structural obstacles encountered by women scientists in developed and developing countries on the three continents of North America (US), Europe (Germany) and Asia (India). These structural constraints impose a triple burden on women in science that is a product of the manner in which science is practiced, which is resistant to any variance in its success model. Nevertheless, the experience of women scientists differs somewhat from country to country according to: 1) differences in the socio-cultural matrix, and 2) differences in the organizational structure of science. The two overlap each other to a great extent since cultural norms infiltrate organizations and influence the formal and informal work environment. The expectations of men and women in their gendered roles influences their performance as scientists.

Table 1: Nature of data sources

	US	Germany	India
No. of institutes		9	4
Type of institutes	Public and private research universities (Carnegie I level)	Max Planck Institutes	2 central and 2 state government-funded institutes
Sample frame	Men and women faculty and graduate students	All men and women scientists	All women faculty in science and engineering
Sample size	84 men and 13 women faculty members of Midwestern University and 400 women faculty and graduate students of other universities	252 scientists including 95 female scientists	82 women academic scientists
Tools of data collection	Electronic questionnaire survey at Midwestern University and 400 in-depth interviews of women faculty members at other universities	Questionnaire for a mail survey of scientists	Questionnaire and interview
Type of respondents	Tenured and untenured faculty members and graduate students	All had at least started their Ph.D. work at MPS (Max Planck Society)	All (but 3) respondents had Ph.D. degrees
Year of survey	1992	1996-97	Dec. 1999 - Sept. 2000

The US study included interviews with female faculty members in 21 departments in five disciplines (chemistry, biology, physics, computer science and electrical engineering), and the electronic survey at Midwestern University (MWU) included six departments (biology, biochemistry, chemistry, computer science, engineering and physics). The German survey was also directed at those scientists who had already left these institutes by the end of 1997, which allowed a study of careers of those scientists who made it into the Max Planck Society (MPS) as well as their career developments after voluntary or forced departures. The Indian survey excluded biological and social sciences. In this

survey both questionnaires and interview data were collected from 72 respondents, and from the rest either interview data or questionnaire information was collected. All the respondents were engaged in teaching and research.

Why few women in science?

US, Germany and India are at different spectrums of economic, political and social development. However, there are certain similarities with regard to the position of women in society. Higher education in Germany has traditionally been a male domain. Women were denied access to universities until 1908 and the situation changed only in the 1960s and 1970s with the beginning of mass education. But the proportion of women in academic posts continues to be less than the proportion of academically qualified women. Given the lack of structured graduate programmes and curricula in Germany, the senior advisors have a huge impact on the formation of networks, the distribution of opportunities, and the provision of tacit knowledge necessary to advance successfully in science. Since men occupy the highest and most influential positions, the structure of academic careers have a host of underlying gender-biased career prerequisites and mechanisms. Further, careers in academia and science in Germany are very long, thus discouraging women from following careers in academic science. Candidates for Habilitation (postdoctoral qualification that makes one eligible for position of professor) are usually 40 years old, signalling that career requirements in science – for example, flexibility and full availability – are incompatible with having children and family.

In the US, while the proportion of women with science and engineering Bachelor degrees has almost doubled from 25% in 1966 to 47% in 1995, the percentage of women with a PhD in science and engineering was only 31% in 1995. In engineering, their share of PhDs is much lower at 11% (NSF, Survey of Earned Doctorates). During their childhood, boys and girls develop different gendered images of scientists and their activities. Conformity to stereotypes, such as incompatibility of girls and maths, is frequently, although subtly encouraged by educators and other authority figures, although this is changing with the spread of programmes to encourage young women to take up S&T careers. Nevertheless, the women who enter engineering programmes in large universities often feel an unwelcome minority, negatively viewed by a majority. Discrimination in the graduate school is often informal, such as not being taken seriously in a research group meeting, or a devaluation of their contributions[2].

In India, social structure and ideology, referred to as 'patrifocality'[3] by Mukhopadhyay and Seymour (1994), directly affects women's education. Science is considered as a male enterprise. Educational decisions are family decisions. Although science and engineering degrees bring in greater prestige and job opportunities, most families are less inclined to invest family resources in academic achievements of daughters than they are in sons. It is assumed that, after marriage, benefits of their education would accrue to their husband and his family. Many parents perceive a danger of sexual 'pollution' in sending girls to a predominantly male college. Fear of travelling alone across towns, odd hours, long periods of study, and the danger of not finding a suitable match (of higher education and age) constitute barriers to women's education in science. Women constitute 33.8% of the total enrolment in science and 14.8% of the total enrolment in engineering (Research and Development Statistics 1996-97). Women who cross the social barriers to attain the highest degree in science constitute a minuscule proportion of women in science. Women formed only about 9% of the personnel engaged in research and development in the fields of natural science and engineering and technology in 1996; 15% of such personnel had doctorate degrees, and only about 12% of such doctorate personnel were women (Research and Development Statistics 1996-97, Ministry of Science and Technology, Govt. of India).

The 'Triple Burden' in US, India and Germany

The problems of working in an unfavorable work environment result in a career-related stress which we refer to as the 'first burden'. The second burden is the usual predicament of domestic responsibilities which fall disproportionately on women. However, women in science carry a third burden which is the burden of grappling with a deficit of social capital and with the feeling of being aliens in science. The interaction among these burdens induces a triple burden, the cumulative "surplus of anxiety" that arises from coping with multiple stressors that are felt to be out of control. Efforts to balance the three burdens lead to exhaustion and a scaling down of ambition. There are mainly four responses to a triple burden: (1) women adapting to the existing structure of science; (2) changing the structure to accommodate women; (3) women seeking alternative occupations related to science; and (4) women leaving science. Numbers 1,3, and 4 have been the predominant responses to a common condition.

Female scientists in Germany report having been told that they "*must understand that [male] Ph.D. students are not willing to take orders from a female superior*", that they suffer from discriminatory comments by peers and superiors, and that they had often been in the role of the visible minority or the 'token woman'. In these situations they "*felt like being known all over the place*" and to have been treated accordingly by their male peers and supervisors. A male superior who neither invited nor hired female scientists explained: "*I do not employ women with my group. First, if I invite a female and do not hire her, I will have to discuss that matter with the Institute's personnel board (Betriebsrat) and justify my decision. Second, since my research is funded by grants, there will by no money for a replacement if the female scientist is getting pregnant during the project period.*" (Almendinger, Fuchs et al.)

Gender stereotypes in science and the contradictions of norms and practice lead to stress. As an Indian woman professor in the Department of Electrical Engineering said, "*It is generally taken for granted by the men scientists that a woman cannot be as good as or better than them. So women have to work harder than men to prove themselves.*" In such an environment where science is not only male dominated but also considered unfit for women, a woman scientist typically faces the contradiction in roles of a 'woman' and a 'scientist'. In the German survey, male scientists maintained that successful female scientists "*turned into dragons*" and were, in their opinion, "*women not anymore*". Many Indian respondents remarked that colleagues expected them to be submissive (a common expectation from women as a part of patrifocal ideology)[4]. Women who speak their minds or who are assertive are considered 'unwomanly'. As one Indian woman professor said, "*Some men colleagues initially wanted to force their views on me; they thought that being a woman, I should simply agree to their viewpoint.*"

The surplus of anxiety for women in science

Apprentice male scientists are typically welcomed to full membership in the 'club'. They need not 'watch their backs' beyond what is common for all of us in competitive work situations. They are able to attend conferences or begin their first academic appointment without undue concern at any level of awareness that they may be disregarded because of their sex. The experience for many women is one in which there is frequently an underlying anxiety as a response to the threat of not being taken seriously. In hostile environments, along with intellectual demands and the every day stressors of a scientific career, there is an additional expenditure of emotional resources in response to the additional anxiety produced by discrimination.

Table 2: The Triple Burden

Causes			Effects
US	Germany	India	
Work environment • Male dominance in numbers and vertical segregation: In the 6 departments of MWU, women were 20% of the faculty, and often assume official responsibilities of minority status in academia. • Horizontal segregation: Large percentage of women (57%) in biochemistry and biology (21.4%), while none in computer science at MUW. • General male dominance in the work environment: Women's personal obligations taken into account and they are ignored while men are hired; Academic career gap due to childbirth and rearing is officially expected to be ignored but is taken into account; Denial of tenure due to flimsy reasons, such as being proactive on behalf of women students; Invisibility and denial of professional identity (e.g. young woman faculty member mistaken for secretary, student or technician by hostile older members); Neglect by colleagues.	**Work environment** • Male dominance in numbers and vertical segregation: Numerical majority of males, especially in higher positions; 16.4% women in the scientific staff of the MPS, and only 2% of the MPS directors are women. • Horizontal segregation: Only 9% of female researchers in engineering, while 27% in humanities and social sciences. • General male dominance in the work environment: Women seen as risky employees who may, at least, temporarily drop out; Ignoring a woman's contributions in discussions; Being treated as 'the boss' secretary or assistant'; Lesser recognition of their performance; Preference given to male scientists when better or tenured positions are distributed; Women sent less to professional meetings.	**Work environment** • Male dominance in numbers and vertical segregation: Women scientists form only 7% of faculty in science; low proportion of women scientists at 'professor' level. Exclusion from administrative positions in the organization: never any women deans or directors. • Horizontal segregation: No woman scientist in Mechanical Engineering Departments of the institutes surveyed. Also discouraged in Mining, but large numbers in social sciences. • General male dominance in the work environment: Appointment and promotion committees bring up family issues and question women's commitment to the job; Exclusion from certain tasks, such as field work, not being put in charge of a certain engineering section because of gender role stereotypes; Underestimation of performance (only 34% of respondents reported that their performance is correctly evaluated); Condescending attitude of colleagues; male students prefer male advisors.	**The first burden** • High degree of 'noticeability' or 'heightened visibility' due to minority status, leading to an exaggeration of mistakes; stigmatizing women in general for small faults or mistakes. • Exclusion from administration deprives women of a chance to build up contacts, to prove themselves, and to make the administration more gender sensitive. • Have to work doubly hard to prove their capabilities due to an intrusion of gender stereotypes in work environment. • Conflict between men's perceptions of women in science and women's perceptions of themselves. **Second burden** • Exhaustion in managing home and career. • Lack of time for informal communication and activities that lead to building up of contacts. • Break in career due to pregnancy. • Foregoing opportunities to travel for assignments, conferences, etc. • Scaling down one's ambitions to accommodate family.

Family and career • Conflict between biological clock and tenure clock. MWU survey showed that a significantly larger number of women than men participate in tenure race without having children. • Lack of geographical mobility (affecting shift in worksite from Ph.D. to postdoc and postdoc to another site). • Graduate students often take up jobs in small teaching colleges to avoid disturbing family by moving out. • Giving priority to family considered a virtue in a woman.	**Family and career** • Women scientists with children reported double burden of career and family responsibilities being forced on them. • Women scientists without children anticipated low chances of combining career with family. • Women scientists reported greater involvement with childcare responsibilities than their partners. • Women scientists regard partner's career as more important than their own. • Institutes see combining family and career as a 'private affair' for women.	**Family and career** • Added social obligations due to marriage and a lack of spouse's co-operation in domestic responsibilities. • Lack of geographical mobility. • Strong internalization of traditional norms. • Absent or minimal childcare facilities in institutes.	**Third burden** • Exclusion from interaction lead to a lack of collaborations, contacts and recognition. • Isolation
Third burden • A lack of support, informal communications and networking: Consistent with the field data, in MWS survey women reported lower levels of colleagueship and reciprocation in the department relationships than their male peers. Women experience the need to work harder to prove their worth more than men do. Problem is more acute in departments with token status. Women in such departments lack strong tie networks essential for academic success in the department. Women's network of interdepartmental ties was much smaller and less diverse than men's.	**Third burden** • A lack of support, informal communications and networking: MPS has no internal labour market and its members have to leave MPS for professional development. Analysis shows that women are less likely to stay in science than men, but full support increases the chances of staying. External support is more important than internal support but women scientists are unable to capitalize on external support for career development due to traditional assumptions about women. In the scientific labor market, taking on women is considered 'risky' with stereotyped assumptions about their aptitudes and expected skills.	**Third burden** • A lack of support, informal communications and networking: Exclusion from informal networks: about 65% of respondents felt that contacts with successful professionals outside the institutes are not easily available to women. Some respondents report use of embarrassing language in tea clubs, exclusion from old boys' networks, and a 'male culture' in departments with a single woman faculty. Traditional role expectations influence interaction.	

Stress denotes a state of being in which there is intense strain from the pressure of circumstances requiring strained exertion in response. Women PhD candidates report that they are cognizant that graduate school is an equally difficult experience for their male peers, but wrestle with why the men seem less 'stressed' than themselves. The exclusionary experience for women heightens stress, requiring greater resources to manage the tension that many female scientists experience within a context that impedes interpersonal connections and obstructs fulfilment of the potential of many gifted women. Multiple experiences of marginalisation, rejection and diminishment, no matter how subtle, produce an anticipatory state of vigilance.

Invited to the tea party and then not served, multiple stressors create a burden for women scientists which is not experienced by men. Marginalization, isolation and a demand for autonomous, independent functioning in graduate school, within a highly social and socializing activity available to men, places women in a double bind. Discrimination is exacerbated when adaptive attempts at affiliation through women's groups are labelled as indicating women have 'special needs'. This is further compounded when similarly isolated women faculty are offered up as a solution to institutional problems as they too grapple with issues of isolation. Underneath all of these confused and confusing experiences is frequently a covert understanding that to survive one must get through in silence.

The women who have reached high levels within the scientific community are clearly individuals who have, heretofore, been able to exercise and develop their capacity to fulfill their potential and to experience a sense of their own self-agency without suffering defeat. Made to feel weak and vulnerable by an unexpected discriminatory assault, women must then grapple with their own hostile feelings while continuing to rely and depend on those who may diminish and rebuff them. It is this 'un-level' playing field that inhibits self-agency and diminishes the capacity to transform potentialities into realities that distinguish the condition of women from men scientists.

Multiple roles lead to efforts in time management and rigorous self-discipline, which sometimes bring about a feeling among women that life has become mechanical. Most respondents are exhausted physically, emotionally, and mentally at the end of the day. This is evident from the Indian survey's responses to the scale of tiredness. Respondents were asked: "*How often do you feel that pressures of being a scientist and a homemaker make you tired?*" They were asked to answer on a five-point scale ranging from 1 (never) to 5 (always). In the table, a higher value of mean shows more stress.

Table 3: Degree of stress due to Triple Burden

Statement	Average	S.D.
Degree of tiredness due to pressures of being a scientist and a homemaker:		
a. physically	3.32	0.88
b. emotionally	2.72	1.07
c. mentally	2.67	1.07
Feeling that life has become mechanical	2.65	1.08
Overall	2.90	0.11

Table 3 shows that, on average, respondents feel physically tired more often than emotionally or mentally. It may be noted that there is a greater diversity regarding feelings of emotional and mental tiredness rather than physical tiredness. This is due to the diverse organizational and departmental settings in which the respondents work. The average score for the statement that "*life has become mechanical*" is 2.65, which shows that a majority of the respondents feel so at least sometimes.

Exhaustion is experienced as a conundrum, a situation in which, for no other reason than their physical characteristics, women in science experience themselves as unacceptable. There occurs a disruption in one's familiar, effective self-functioning, or the customary way of 'being me'. It is a challenge to one's sense of identity, based on rejection and diminishment, with a concomitant feeling of anxiety based on anticipated interpersonal censure. Such 'surplus anxiety' is expressed as a feeling of loneliness and helplessness in a hostile environment.

Strategies for response and change

This paper also discusses the strategies that women have adopted to cope with a triple burden that appears in different guises in various cultures. Some women, seemingly lost to science, have turned their scientific interests away from bench research in academia to positions such as marketing director for a biotechnology firm, venture capital firm partner, or independent inventor. Some are responding to their exclusion from traditional academic careers. Others are taking into account individual and/or cultural commitments to family life. In pursuing academic careers, invidious differences appear even at the highest levels, such as the differences in salaries, office space, etc., identified in the study of senior professors at MIT.

Further down the academic ladder 'caste' barriers are more explicit. An informal group of female research associates, raising their own funds, nominally under the supervision of scientists with academic status, was identified at a second-rank research university in the US. Carrying out their research at a relaxed pace, in conjunction with family life, these female oceanographers were pursuing "off the book" scientific careers. These relatively invisible female researchers had creatively transformed the traditional subordinate female associate position into a relatively independent status, albeit one with no career mobility. More research is needed to identify the anomalous career paths of female scientists, that have both negative and positive consequences.

Reform strategies

Above all, the traditional attitudes and prejudices need to be overcome. To cope with a triple burden, women scientists adopt various strategies at the individual level that fail to challenge the perpetuation of science as a male domain. There is little systemic change involved in such adjustments. The importance for a nation of the full utilization of the potential and talent within the population cannot be understated. It is therefore vital that governments and the institutes should consider organizational and structural changes.

In India, the Constitution guarantees equality of pay and prohibits any discrimination. Yet, as pointed out, there is subtle discrimination within the institutes. There is very little recognition of the problems of women scientists. As an economically developing country, India faces several problems, such as unemployment, problems of occupation and health among rural women, and raising the standard of living of the lowest sections of population. As a result, most science and technology programmes are geared towards rural women, economically and socially weaker sections of the population, or towards encouraging young scientists in the country. There is only a single point on the agenda of 'Science and Technology for Women' in 'Science and Society Programmes' at the Department of Science and Technology (DST) that may concern us. It states, "*selective studies on issues concerning women scientists*" (p. 4). Often the schemes announced by the government are sporadic and ad hoc, as in the Union Budget 2002 which announced 100 scholarships per year to be provided by the DST to women scientists and engineers. There is a general assumption that women scientists, as an educated élite, are a lesser priority.

In Western countries, periods of shortfall in the supply of scientific personnel prompt governments to enhance women's participation in science. Although efforts have been made to increase participation, larger structural and organizational issues persist. In the US, affirmative action programmes, requiring full consideration of female and minority candidates, has become a routine affair with little effect on recruitment or retention. Women often lose

out since they follow careers that are slightly off the beaten track. In Germany, the MPS has implemented programmes to raise the number of female scientists among directors and group leaders (C4- and C3-Sonderprogramm of the MPG). However, without a financial and institutional commitment and support from below, programmes from above may be considered as 'quota programmes', thereby devaluing those positions and stigmatizing its occupants.

"Critical mass" was expected to be achieved in the US through affirmative action programmes. However, due to subtle biases and exclusionary practices built into the university system, a mere 'supply side' approach is insufficient. There is a need for wider organizational and departmental policies. For example, women should be recruited into pivotal positions and placed on important committees so that they develop a network of contacts, access 'inside' information on organizational politics and display their administrative competence. Organized mentoring programmes will be helpful in changing the academic culture and raising the social capital. Department review (with outside referees) for diversity issues should evaluate departments' recruitment, hiring and retention of women. Such reviews could also be used for ranking departments.

One of the keys to mitigating the triple burden on women academics lies in university-wide policies on childcare, parental leave, and the slowing of the tenure clock, including flexible work schedules and financial help with childcare. The offbeat career track due to an attempt to combine family and career commitments should not be held against women in recruitment and retention. Many women scientists across the countries are unaware of the fact that other women scientists individually share the same experiences. Also, often they do not realize that their problems are produced by the organizational culture of science. Workshops and organized mentoring could help in increasing the awareness of women scientists of these issues, help counter feelings of anxiety and self-blame, and encourage strategies to cope with the situation.

Cultural prescriptions and proscriptions are not immutable. We may postulate an alternate model of conducting science which incorporates co-operation and communal qualities and reduces over reliance on task orientation and instrumentality. A young group of female faculty and some young men faculty members in science emphasize collaboration and community in their working environment. Some male advisors are excellent mentors of all their students, regardless of sex. This emergent group is more sympathetic to and understanding of the problems of the women graduate students and their 'relational' approach is in contrast to the singularly focused, aggressive and 'instrumental' approach of most of their colleagues.

Conclusion: multiple paradoxes, multiple strains

Unlike other professions, only women scientists live under a theoretical framework which refutes that discrimination exists and proclaims a democratic and inclusionary ethos. In his seminal work on the ethos of science, Robert K. Merton held that for science to be fertile and productive, scientists must be judged only by their work and win status and membership within the scientific community on these criteria alone. The scientific enterprise could not afford to base the "*acceptance or rejection of [scientific] claims... on the personal or social attributes of their protagonists: his [sic] race, nationality, religion, class and personal qualities are as such irrelevant*"[5]. Notably, however, Merton referred to his normative scientists as "he" and "him". At that time, sexism was not specified as an area of discrimination.

The expectation, built into science, that the cognitive content of science is rational has often been carried over into the assumption that the social institutions of science are, as a matter of course, constructed upon similar premises. However, as rationality does not always carry the day in resolving research issues, it fails to explain fully the operation of the scientific workplace. 'Good science' is essentially a 'male model' of practice of science. The traditional male path is one of full-time devotion to research, emphasis on early achievement, and the exclusive

identification of oneself with science. Women find such a model difficult to follow due to their need for diverse identities, and the marriage-family concerns. In other professions, such as medicine and law, it is easier for women to drop out and then re-enter the career path later. In science, women find this difficult and careers off the beaten track are looked upon unfavorably.

Paradoxes abound, potentially double-binding women at every juncture within the pipeline. The experiences of women scientists begin and end with the consequences of social exclusion in an activity which necessitates, perhaps demands, community. All too frequently the consequences of social isolation and aloneness have been attributed to inherent deficits within the women themselves. The argument has been made that they lack the right human capital for physically demanding and mathematically intensive scientific work, whether by nature's wisdom which has divided the gene pool or by self-selection into 'softer' fields that permit greater attention to family. However, the experience of separateness and stigma makes more understandable the tendencies for self-blame, lack of self-confidence, fear of risk-taking and role confusion at the highest faculty level.

The triple burden is not only about the stressors that women experience uniquely, but that their experiences often cannot be talked about openly for fear of further blame and, in some cases, humiliation. Shame and humiliation are forms of social control in which the subordinate group is influenced to believe that, "*they are responsible for the damage they have brought upon themselves, to blame themselves for some deficiency or supposed inferiority*". It is this idea of self-blame that seems to permeate the experience for many women in science and is exacerbated and propagated by a cocoon of silence due to the fear of stigma and further blame. Such silencing, however, deepens the burden and makes the possibility of change for women that much more problematic and complex.

Notes

(1) Etzkowitz, H., Kemelgor, C. and Uzzi, B. (2000) Athena Unbound: The Advancement of Women in Science and Technology. Cambridge: Cambridge University Press.

(2) Kemelgor and Uzzi, op.cit.

(3) 'Patrifocality' refers to a set of social institutions and associated beliefs that give precedence to men over women. 'Patriarchy' is commonly used to denote male dominance. However, the term patrifocality is preferred to patriarchy because, while patriarchy implies a system where males always dominate in all conditions, patrifocality refers to a family system in an agrarian, hierarchical society in which rank depends on ritual purity that requires, among other things, control of women's sexuality. Some of the important features of patrifocality are: subordination of individual interests to welfare of the family; family control of marriage system; gender-differentiated family roles; a complex of structural features, such as patrilocal residence, patrilineal descent, patrilineal inheritance and succession; domination by the males of the same generation over socially equivalent females (husband over wife, brothers over sister); and ideology of 'appropriate' female behaviour that emphasizes chastity, social conformity and domesticity.

(4) Namrata, G. Ph.D. Dissertation Indian Institute of Technology, Kanpur

(5) Merton, R. K. ([1942] 1973) 'The normative structure of science', in The Sociology of Science: Theoretical and Empirical Investigations, Chicago: University of Chicago Press, 553

Blocking the use of gender-based double standards for competence*

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Gender bias

This paper concerns the occurrence of gender bias in settings where individuals are engaged in the completion of a valued task, either by themselves or as members of a team – for example, carrying out scientific research, designing an architectural project, or organizing a fund-raising event. Many practices contribute to gender bias in those settings; the bias, in turn, serves to maintain other gender inequalities (e.g. the uneven representation of men and women in many occupations and professions and, in most cases, the gap in their salaries).

Those practices often vary in the form they take and in the intensity with which they are applied – but they all have in common that they place women at a disadvantage relative to men. Here are some examples:

- Gender differences in performance evaluation when the quality of the outcome leaves room for interpretation.
- Gender differences in the number of opportunities granted to complete a task.
- The inclusion of factors unrelated to competence [(1)] when assessing women but not when assessing men (such as considerations regarding marriage and parenthood).
- Different levels of encouragement for men and women after members of both groups have completed the same task with the same level of proficiency.
- The use of different competence standards for men and women when assessing the same (or highly similar) successful performance by both sexes.

It is useful to distinguish two processes at the core of these practices: (1) In some cases, the bias modifies *how a given performance is evaluated* – that is, the bias affects whether the outcome is judged to be either a success or failure, depending on the performer's sex category. (2) In other cases, the bias has an effect on *how much competence is inferred* from performances, by men and women who have already been evaluated as either successful or unsuccessful. The first process concerns units of performances, the second affects an assessment that is more global in nature. In this paper, I discuss the role of double standards (i.e. different requirements for different categories of performers) in the latter process, and examine two ways of preventing their use. My previous and current work on this topic provides the basis for the ideas I present here.

Gender and double standards for competence

In Foschi (1989, 2000), I identify gender-based double standards, stricter for women than for men, as the mechanism through which women are assigned less ability than men, even though performers from both sexes have achieved the same level of success. The theory I have proposed on this practice is an extension and elaboration of status characteristics and expectation states theory, the comprehensive programme on status effects in group interaction

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(Berger, Fisek, Norman and Zelditch 1977).[2] Ideas from attribution theory have also influenced my thinking, as I discuss in Foschi (1989).

The key elements of the type of situation I am interested in are: (1) the performers of a valued task, (2) their performances, (3) the evaluators whose task is to judge the performances, and (4) the assessors whose task is to infer competence from those performances. (In particular cases, the same person may occupy more than one of these roles.) I have proposed that the following set of scope conditions identifies the circumstances that result in the activation and use of double standards:

(a) assessors make direct comparisons of the task performances of at least one man and one woman;
(b) the performances have already been judged by one or more evaluators; the assessors consider these evaluations to be accurate (i.e. unbiased) and to show either equal or highly similar levels of success by both sexes;
(c) assessors treat performers' sex category as a status characteristic, i.e. as an attribute that implicitly conveys information about men's overall superiority to women, including superior competence at most tasks;
(d) assessors view the performances as pertaining to a masculine field/ domain;
(e) no explicit competence standards have either been set for or accepted by the assessors;
(f) besides sex category and level of performance, assessors have no other grounds on which to infer competence; and
(g) assessors are motivated to do their task well but are granted low accountability for their conclusions about competence – that is, assessors are free to process the available information in any way they wish.[3]

The use of double standards, I also propose, is not necessarily deliberate or conscious. Moreover, the practice involves neither overvaluing nor devaluing performances directly, but simply defining them as either "meeting" or "not meeting a standard". As a result, double standards are a subtle yet effective instrument for the maintenance of the status quo.

Experimental evidence

I have carried out several experiments to test hypotheses on the activation and use of double standards under the above conditions. Results show clear support for those hypotheses. A review of this work is presented in Foschi 2000.[4] This evidence originates from two types of experimental designs. In one case, participants work in pairs to solve a perception task as a team (Foschi 1996: Exps. 1 and 2; 2003). In the other, participants review files of applicants for junior positions in various engineering jobs, and make hiring recommendations concerning these candidates (Foschi, Lai and Sigerson 1995; Foschi, Sigerson and Lembesis 1995). In the first type of experimental design, participants assess the relative competence of themselves and their partner as they perform a task together. In the second design, participants are assessors of other performers but are not themselves performers of the task in question. In both cases, the settings provide limited information. This is done not only for experimental control and increased clarity in the interpretation of results – it is also the case that many everyday organizational settings indeed have that minimal-interaction quality. Thus, people must often work in teams where they have no more than a few items of information about each other (e.g. a supervisor charges a newly formed group with the completion of a task, and team members can only communicate electronically). Moreover, assessors must often choose applicants for positions (e.g. jobs, promotions, admission to graduate school, fellowships), at least at the initial screening process, from only paper records or brief interviews.

In this paper, I propose two strategies, derived from two of those experiments, for blocking double standards. Both consist of making changes to the scope conditions. One strategy involves increasing the assessors' accountability; the other, providing explicit standards rather than allowing assessors to generate and use their own. The next section presents summaries of those studies; further details of their designs, results and analyses appear in the original reports.

Two strategies

1. Increasing accountability

In Foschi (1996: Exp. 2), two people at a time, a man and a woman, worked together on the solution of a visual perception task involving abstract patterns of two colours. Participants were either first- or second-year undergraduates at the University of British Columbia[5]. Participation was strictly voluntary. The task, which consists of a series of trials, was presented on a computer screen. This task is actually ambiguous, but participants were told that each trial required a choice between two answers (one right and the other wrong) regarding which colour was predominant, and that all trials had the same level of difficulty. The ability required to do the task well was described as "recently discovered and of high potential value to a variety of tasks". It was also mentioned that "although no significant relationship has so far been established between the ability and attributes, such as mathematical or artistic skill, men have been found to be generally far more accurate than women at this task". The two people worked at individual stations and did not meet or see each other at any time during the session. They were informed that the two of them were of the same year and school at the university but of opposite sex category. Instructions also created *either low or medium accountability* for the participants. Thus, in the first case, they were asked not to write their name on the various forms. They were also assured that only the research team would see the data they provided, and that they would neither be asked to justify any of their responses nor would they be meeting the partner during the course of the study. In the second case, they were told that "at the conclusion of the study you will be meeting your partner to compare and discuss your answers", and were also reminded to write down their name on the forms.

In the first phase of the session, the two people performed the task individually and received what they were led to assume were accurate evaluations of their performances. There were two conditions for each accountability level: in one condition, the scores (out of 20) were 11 for the male participant and 13 for his female partner; in the other, these were 11 for the female participant and 13 for her male partner[6]. Next, both participants were asked to write down their own standards *for the partner* to have ability. This standard was to be expressed as the proportion of correct answers required by the respondent to conclude ability. In the second phase, each pair was instructed to work as a team, and to communicate through the computers to arrive at a joint solution to the task. This communication, however, had been pre-arranged by the experimenter so that each person received information indicating that the partner disagreed with him/her on 80% of the trials. Next, on each trial, participants had to give a final answer. Given that each trial presented only two choices, the answer constituted either acceptance or rejection of the partner's disagreeing opinion. In turn, the percentage of trials on which the partner's answer is rejected constitutes a measure of how much task competence a person assigns to himself/herself relative to the partner. At the end of the session, the two people were individually debriefed on the real nature of the study and paid for their participation.

Manipulation checks carried out through questionnaires and the post-experimental interview indicate that the participants were engaged by their task, viewed it as valuable, were trying to do it well, and believed the scores to be unbiased. Results also show that two accountability levels were created as intended. In addition, control groups from a comparable experiment (Foschi 1996: Exp. 1) support the prediction that, when the task is defined as masculine but no performance scores are given, the men would reject more influence from their female partner than the women would from their male partner. In other words, the control groups provide baseline data on the combined effects, on perceived competence, of beliefs about two factors: gender and the sex linkage of the task.

Results from the *low-accountability* conditions show that the standard for ability applied by the men to the women (72.14%) was higher than the standard applied by the women to the men (65.86%). The men also rejected more influence from their female partner (55.2%) than the women did from their male partner (42.9%). For both measures, the sex difference is as predicted and statistically significant with p at least $< .03$ (results based on 21 men and 21 women). On the other hand, results from the *medium-accountability* conditions show that although the sex difference

in both standards for ability and rejection of influence is still present, it is, as predicted, no longer statistically significant for either case (basis for results: 22 men and 21 women).

2. Providing explicit standards

The experiment reported in Foschi (2003) is similar in most respects (such as design and type of subjects) to the one presented in Foschi (1996: Exp. 2). Thus, as expected, results from manipulation checks are similar in both studies, as are control-group findings in Foschi (2003) relative to Experiment 1 in Foschi (1996). In the most recent study, however, accountability was low in all conditions. Furthermore, in the four experimental conditions of interest here, *either the participant or the experimenter set the standards*, and the scores were either 14 for the male participant and 6 for his female partner, or 14 for the female participant and 6 for her male partner. In the two conditions where no standards were provided, participants were asked to state the standard for ability that they were setting by (and for) themselves. Results indicate that the women's ability standard (78.98%) was higher than the men's (72.36%), and that the men rejected influence from the women (70.90%) more frequently than the women did from the men (63.40%). For both measures, the sex difference is as predicted and statistically significant with p at least < .04 (results based on 22 men and 22 women).

In the other two conditions, the scores were presented with explicit, universal (i.e., the same for all performers) standards: a score of 12 or higher was said by the experimenter to be a definite indication of ability; a score of 8 or lower, a definite indication of lack of ability. Thus, the higher-scoring participants were clearly in the first group; the lower-scoring partner, in the second. Manipulation checks indicate that these standards were accepted by the participants as valid. As predicted, the sex difference in rejection of influence is still present but it is no longer statistically significant (basis for results: 20 men and 22 women).

Summary and conclusions

In this paper, I have reported results from two experiments on gender-based double standards for competence. The results point to two strategies to block this practice, namely, to make assessors more accountable and to provide explicit standards that universally define competence in the task at hand. The results are informative about the use and extent of double standards, and promising in the strategies that they imply. In two pairs of experimental conditions designed to investigate the emergence and use of this practice, accountability was low and no explicit standards were provided. In the first pair, a double standard, stricter for the women than for the men, emerged when assessing oneself; in the second, when assessing a partner. In both cases, the person to whom the standard was applied had performed at a satisfactory (although not outstanding) level. In one case the participant was minimally worse than the partner; in the other, the participant was considerably better. In both cases, the application of a double standard affected how much competence was inferred.

In two other pairs of conditions, interventions to block the use of double standards were enacted. It is worth noting that the proposed strategies were effective even though they involved minimal changes: accountability was raised only to a medium level, and the validity of the explicitly presented standards was implied but not emphasized. It is clear from these results that there is ample room to elaborate these strategies further in order to make them even more effective. It would also be worthwhile: (a) to investigate whether the strategies continue to be effective if assessors hold stronger beliefs about men's overall superiority, than did the participants in these studies, and (b) to replicate this research using a different design (such as the one that I described earlier involving application files), for operational cross-checking of the results.

Finally, it is also important to underline that the scope conditions of the formulation provide a blueprint for other interventions. Some of these could involve affecting the information the assessors receive, such as: equating the

performers on several successful performances (rather than a single one); increasing the number of the evaluators and their status relative to the assessors; and presenting strong empirical evidence that clearly dissociates gender from the task at hand. I am pursuing some of these directions in my current work.

Notes

(1) I use "competence," "ability", and "skill" as synonyms. I use either "sex category" or simply "sex" when my objective is merely to refer to individuals as either men or women. I use "gender" when I wish to emphasize cultural aspects of this categorization.

(2) In this paper, I discuss only gender-based double standards for competence. However, the formulation on which I base the research reported here (Foschi 1989) also includes standards for the inference of incompetence from unsuccessful performances. Moreover, this formulation is not only about gender but concerns any characteristic that is viewed by an assessor as carrying status or worth, including overall competence (such as social class, nationality, or skin colour). The assessor is seen as reflecting the majority views held in his/her social system regarding the attribute. It is important to note, however, that gender is not a status characteristic for *all* individuals. Some social systems (societies, cultures) are more sexist than others; moreover, even in the most sexist of societies, there are often individuals for whom gender is not such an attribute. Individuals also vary in terms of the social system that they consider the source and support of their views – for some, that social system may be the majority of their country's population; for others, a network of feminist friends. There is also individual variation in the circumstances under which those views are deemed to be applicable (for example, assessors may vary in the importance they attach to the competence decision and therefore in the relevance that sex-category information has to that decision). It is for these reasons that I formulate my hypotheses to refer only to individuals for whom gender carries status in the setting in question.

(3) Some of these conditions are specified at a narrow range of values. I do so as a research strategy, as I consider those ranges to be the circumstances that make the use of double standards more likely. It will be one of the tasks of further research to investigate whether the practice still occurs (and if so, to what extent) if those conditions are expanded. For example, in Foschi (1989), I propose that the double standard will emerge if the field/domain is either masculine or gender-neutral, but that the intensity of the practice will be lower in the latter case. It would be interesting to examine whether or not changes to the practice occur if the task is viewed as feminine. For other scope conditions, it would be worth investigating if double standards do indeed emerge at all the specified levels. For example, it may be possible to block double standards if the level of success is outstanding (Foschi et al. 1995 explores some aspects of this issue).

(4) Foschi (2000) also includes a review of work by other authors on gender and competence double standards, as well as related work. The latter includes competence double standards that are based on other factors (such as ethnic group or affect) as well as double standards for the inference of other attributes (such as morality or beauty).

(5) The choice of participants rests on the assumption that, although they are probably less sexist than other types of individuals, as a group they would nevertheless not be immune to gender bias. This assumption is supported by numerous empirical studies. It should be noted, however, that beliefs about gender are becoming more egalitarian in many societies, including Canada. For a discussion on how to assess the status value of gender and the conditions under which this value is activated, see Foschi and Lapointe 2002.

(6) Two people, a man and a woman, indeed participated in each session. At the same time, however, the physical lay-out of the setting allows the experimenter to communicate separately to each person that his/her score is 11 and that the partner's score is 13.

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Gendering men and masculinities in research and scientific evaluations

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Abstract

Most analysis and policy development in research and academia, and often even that which is concerned with gender, continues not to gender men explicitly and not to make explicit men's part in the problem of gender inequalities. To develop gendered analyses of academia, research and science, and gender-sensitive policies in academia, research and science, involves explicitly gendering men. In this paper, I consider the implications of gendering men for research and scientific evaluations. I therefore focus on: the position of men and various forms of masculinities in academic and research institutions; and men's constructions and constructions of men and masculinities in evaluations of scientific excellence and academic merit. This is contextualised within the growth of critical studies on men and masculinities over the last 20 years or more.

Introduction

The move from 'sex' to 'gender' in the 1960s and 1970s often implicitly, sometimes explicitly, continued the primary association of gender (or sex) with women. In some ways this is not surprising. Most of this change was brought about by women; the impulse to develop women's studies and gender research has come mainly from contemporary feminism; it is generally women who have made gender visible in scholarship. Meanwhile, there has been a more insidious preference by many men to continue 'malestream' (O'Brien, 1981) associations of sex/gender with women, thus allowing men not to appear gendered and not to be subject to critique. There is a reversal of the widespread ideology of women as nature and men as culture, so women's gender is culturised, and men's is naturalised.

Revealing the dynamics of gender does, however, make men and masculinities open to problematisation. Where men and men's culturally defined characteristics were formerly the unexamined norm, in science and elsewhere, the specificity of men and masculinities within gendered power relations can now be recognised. This process has been active for more than 20 years, with critical research explicitly focusing on men (Connell et al., 2004).

The focused study of men has taken various forms. It has sometimes misleadingly been labelled 'men's studies' (just as 'white studies' would be a similarly confusing label). The approach outlined here is conceived as Critical Studies on Men (CSM) (Hearn, 1997). Studying men, as in men's studies, is in itself nothing new and nothing progressive or even pro-feminist. Libraries are full of books by men on men for men. In CSM, men are the critical object of concern; men are gendered; men are examined critically; and, very importantly, such studies can be done by women and men, collaboratively together or separately. CSM have developed historical, cultural, relational, materialist, deconstructive, anti-essentialist studies on men; men are seen as part of historical gender *relations*, through a variety of analytical and methodological approaches. The notion of men is social and not to be essentialised and reified, as in some versions of men's studies. Men are understood as historical and changeable, both as a social category and in particular constructions.

Critical social science approaches to men and masculinities

Critical studies on men (CSM) arise from several key challenges to and critiques of men – primarily from feminism, but also from gay and queer scholarship, and from men's responses, particularly men's pro-feminist responses to feminism and debates on gender relations; they are part of the broader body of critical theory. CSM refers to that range of studies that critically address men in the context of gendered power relations. Most influential amongst these critiques are those from feminist theory and practice, and the feminist naming of men as men (Hanmer, 1990). Other challenges have named men as gendered differently. Gay scholarship, by virtue of the reference to same-gender sexuality, necessarily names people in terms of gender. Gay, and some queer, writing and scholarship focus on men in quite different ways to feminist writing and scholarship. Indeed, there are good reasons why feminist and (male) gay critiques may diverge (Edwards, 1994).

However, in focusing on men there is a danger of re-excluding women. One way of avoiding this possibility is to consistently examine the specific and different ways in which men exist as and in gendered power relations, including power relations with women, children, young people and each other (Hearn, 2004a). This is not to say that one can assume that there are always issues of power in every social situation; nor is it to ignore the fact that there may be some dangers in emphasising a "power perspective". However, consistently asking the question is a way of avoiding the problems of many previous uncritical analyses of men and gender relations, and of highlighting power perspectives when this is empirically the case – which it certainly often is.

Thus, in its simplest form, the reference to "critical" in CSM concerns the question of power, usually men's power. And while there are all manner of ways in which power functions, flows and re-forms, it is difficult to avoid the social fact that in most societies, and certainly those of Western, advanced capitalism, men are structurally and interpersonally dominant in most spheres of life. This may be called patriarchy or, more accurately, historically differentiated patriarchies. Such an approach does not downplay the differences amongst and between men in terms of age, class, ethnicity, sexuality, and many other differences, including their relations with women. Rather it emphasises the complex interplay of unities and differences between men (Hearn and Collinson, 1993). Men vary massively in their power in relation to women and children and their locations within power relations within patriarchies, including the extent to which different men see themselves as more or less powerful. Interestingly in some situations of power – for example, men's use of violence to known women – some men tend to speak of their own experience of relative powerlessness in contradiction to their use of violence and their effects on the women concerned.

Monographs on men and masculinities now regularly appear in every social science discipline and every field of the humanities. There are now several specific scholarly journals, for example, Men and Masculinities (Sage), and several publishers' book series. One of the first, and perhaps the most successful, series was the Sage Series on *Men and Masculinities*, which published 15 edited thematic volumes from 1992-2002. There are web-based and extensive bibliographic resources, including *The Men's Bibliography* constructed by Flood (2003), now in its 11th edition.

While focused scholarship on men and masculinities has expanded in the humanities and, to some extent, in some of the natural and technological sciences, it is the social sciences that have produced the greatest amount of research on men and masculinities. While it is difficult to summarise the most important insights from such social science, the following are worthy of mention:

- a *specific*, rather than an implicit or incidental, *focus* on the topic of men and masculinities;
- taking account of *feminist, gay and other critical gender scholarship*;
- recognising men and masculinities as *explicitly* gendered rather than non-gendered;
- understanding men and masculinities as *socially constructed, produced and reproduced*, rather than as somehow "just naturally like this or that";
- seeing men and masculinities as *variable and changing* across time (history) and space (culture), within societies and through life courses and biographies;

- emphasising men's relations, albeit differentially, to *gendered power*;
- spanning both *the material and the discursive* in analysis; and
- interrogating the *intersecting of the gender with other social divisions* in the construction of men and masculinities.

This last point may need a little more explanation. While men and masculinities are the explicit focus and are understood as explicitly gendered, men and masculinities are not formed by gender alone. Men are not simply men or simply about gender, and the same applies to masculinities. Men and masculinities are shaped by differences of age, by class situation, by ethnicity and racialisation, and so on. The gendering of men exists in the intersections with other social divisions and social differences. Indeed, paradoxically, it might even be argued that as studies of men and masculinities continue to deconstruct the gendering of men and masculinities and assumptions about them, the more that other social divisions, such as age, class and disability, come to the fore and be seen as important. In this sense, part of the long-term trajectory of gendered studies of men could, paradoxically, be the deconstruction of gender (Lorber, 1994, 2000).

There has thus been a growing emphasis within CSM on the interconnections of gender with other social divisions, such as age, class, disability, ethnicity, racialisation and sexuality. The idea that gender of men is (derived from) any kind of fixed, inner trait or core is especially antagonistic to most work in CSM. There are also well-established arguments within CSM that men's gendered relations of and to power are complex, and even contradictory (see, for example, Kaufman, 1994). For example, the collective, historical power of men may be understood as maintained by the dispensability of some men, for example, as soldiers in war, even with the violence to women and children, usually as non-combatants.

Critical social science approaches to men and masculinities are various. They vary and range across different disciplines, theoretical perspectives, methodologies, conceptualisations, and positionings. Let us look at these in a little more detail.

There are as many social science *theoretical perspectives* on men and masculinities as there are theoretical perspectives in social sciences more generally. These include positivism, cultural relativism, psychoanalysis, interpretivism, critical theory, neo-Marxism, feminism (of various forms and kinds), poststructuralism, postmodernism, and postcolonialism. Indeed, it could be argued that social theory questions have been rather prominent throughout these developments over the last 20 years or so (Hearn and Morgan, 1990; Brod and Kaufman, 1994). Non-gendered traditions that are common within mainstream social theory need to be both drawn on and critiqued in terms of their implicit and explicit conceptualisations of gender, women and men.

Similarly, there are a variety of *methods and methodologies* in studying men and masculinities (Hearn and Morgan, 1990; Morgan, 1992; Pease, 2000). These include social surveys, statistical analyses, ethnographies, interviews, and qualitative, discursive and deconstructive approaches. An explicitly gendered focus on men and masculinities can lead to the rethinking of how particular research methods are to be done. For example, Schwalbe and Wolkomir (2002) have set out key issues to be borne in mind in conducting research interviews with men.

Another key issue has been the state of *conceptualisation*. The concept of masculinities has been extremely important over the last 20 years in widening the analysis of men and masculinity within the gender order (Carrigan et al., 1985; Brod, 1987; Connell, 1995). It has succeeded the concept of the "male sex role", and is generally preferred to, for example, manhood or manliness. The focus on masculinities has been partly a means of recognising both power relations between men and women *and* power relations between men (Carrigan et al., 1985), as between hegemonic, complicit and subordinated masculinities. This is, however, not a simple turn towards difference. Rather, there have been parallel concerns with both unities and differences between men and between masculinities (Hearn and Collinson, 1993). Just as a major issue within feminism has been and remains the relation of commonalities and differences between women, so men can usefully be analysed in terms of commonalities and differences, mirroring debates on

the diversification of patriarchy/ies. There is also a growing debate and critique around the concepts of masculinities and hegemonic masculinity, from a variety of methodological positions, including historical (MacInnes, 1998), materialist (Donaldson, 1993; McMahon, 1993; Hearn, 1996), and poststructuralist (Whitehead, 2002) perspectives.

Another very important source of variation is positioning of the author in relation to the topic of men. This can be understood as a personal, epistemological and indeed geopolitical relation. Researchers and analysts, men and women, may position themselves discursively in relation to the object of research, the topic of men and masculinities, in a variety of ways – for example:

- *absence, fixed presence, and avoidance:* in which either the topic (men) or the author are absent, avoided or present yet non-problematic. Indeed, one major way of studying (or not studying) men has been through ignoring the category of men (making the dominant/superordinate invisible) or of making any gendering of men implicit.
- *alliance and attachment:* in which both the topic and the author are present, yet both or either remain non-problematic. There is an alliance/attachment between author and topic.
- *subversion and separation:* in which both the topic and the author are problematic and subverted.
- *ambivalence:* in which the topic and/or the author are problematic and ambivalent.
- *alterity:* in which the topic and/or the author are problematic and made other.
- *critique:* in which the authors critically and reflexively engage with both themselves and the topic, within an emancipatory context (Hearn, 1998).

So much of the social sciences is pre-scientific that many of its specific contributions just do not notice that men are gendered beings, socially constructed and reproduced, and not just agendered, asexual, 'neutral' adults, citizens or people – as is the case in almost any standard economics or political science textbook. Many women but relatively few men have noticed that men can, first, be gendered and, second, studied in a different, more critical way. Most men scientists and social scientists continue to ignore this.

Implications for policy

The research debate is closely paralleled by the global policy debate. Following the world conferences on women, which began in 1975, there has also been an increasing global debate on the implications of gender issues for men, especially since 'The Platform for Action' adopted at the 1995 Fourth World Conference on Women. This recognised that the advancement of women and achievement of equality between women and men should not be seen in isolation as a women's issue. These issues are increasingly being taken up in the UN, its various agencies and other transgovernmental organisations and policy discussions. For example, the Division for the Advancement of Women, United Nations (2003) recently organised an on-line discussion forum and expert group meeting on 'the role of men and boys in achieving gender equality', as part of its preparation for the 48th session of the Commission on the Status of Women, with the following comments:

> "*Over the last decade, there has been a growing interest in the role of men in promoting gender equality, in particular as the achievement of gender equality is now clearly seen as a societal responsibility that concerns and should fully engage men as well as women. The global commitment to gender equality in the Beijing Platform for Action and other major international conferences and summits, and in the existing international legal framework, including the Convention on the Elimination of All Forms of Discrimination against Women and ILO Conventions, have encouraged and accelerated efforts in this regard. To further develop efforts in this area, the United Nations Commission on the Status of Women (CSW) will consider the role of men and boys in achieving gender equality at its 48th session in March 2004.*"

Men and masculinities in academic and research institutions

Most analysis and policy development in research and academia, and often even that which is concerned with gender, continues not to gender men explicitly and not to make explicit men's part in reproducing gender inequalities. In recent years there has been growing interest in the gendering of universities and other academic and research institutions (Morley and Walsh, 1995; Clark et al., 1996; Stanley, 1997; Fogelberg et al., 1999, Husu, 2001). This follows the expansion of scholarship on 'gender and organisations' over the last 20 years or more, and scholarly attempts to apply that thinking to 'our own' organisations. It is sometimes set within the frame of the gendering of the managerialising, technologising university (Davies and Holloway, 1995; Thomas, 1996; de Groot, 1997; Whitehead and Moodley, 1999, Morrish, 2000). To develop gendered analyses of academia, research and science, and gender-sensitive policies in academia, research and science involves explicitly gendering men.

Universities remain incredibly hierarchical gendered institutions. This applies both *between* universities and *within* universities. In most countries, the higher the status of the university, the more men academics are likely to work there. The primary academic labour market amongst the full-time academic staff is also profoundly gendered. There are sharp gender shifts from the levels of postgraduates and contract researchers (where in the UK, for example, the figures approach half women, half men) to the lecturer level (where about two-thirds are men) and above (about 90% of professors and equivalent are men). These general hierarchical distributions obscure some intensely gendered segregations and variations in different parts and disciplines of the universities. Many academic areas, and especially in science and technology, remain at the high, and particularly the professorial, levels almost exclusively male (Hearn, 1999).

Recent CSM have included studies of the social connections of men, masculinities and managements. There has also been some growing recognition of the importance of critically focusing on men in academia as part of its gendered analysis. It may seem either odd or obvious to talk directly about men in discussing gender and research. Gender relations are just as much about men as women, though it still seems to come as a surprise to some, perhaps many, men in universities and other research institutions that they are just as gendered as are women. And this even applies to women and men in universities and research institutions, too. There are complex interconnections between men's practices, academic practices and managerial practices. Women's position and experience in university and other organisations is clearly affected by the form and structure of management, the gendering of organisations, and the relation of men and management. To change women's position in universities and the gendered cultures of universities necessitates changing men and men's position in universities and their cultures. Transforming women's position and power in universities may be assisted by critical studies of men and management. Gender equality in universities, as elsewhere, is also about men, both men-women relations and men-men relations.

'Men' is a social category, associated with hierarchy and power; men's traditional social arenas – such as arenas of violence, the state, the military, the clergy, the law, business, sport, and so on – are also characterised by such hierarchy and power. *Management*, including evaluation and allocation of resources, is a social activity that is also based on hierarchy and power, and remains dominated by men. *Academia* is a social institution that is also intimately associated with hierarchy and power and also still dominated by men. There are many interconnections between these three social phenomena of men, management and academia – historically, socially, politically, psychologically – and the dominant and more subordinated forms of practice in research (Hearn, 2001).

The development of gender inequality in science and research in universities and related institutions can also be understood through a critical focus on men. This includes clear attention to gendered practices in universities, science and research, and specifically men's gendered practices, and how men control women there. Recent studies on men in universities have focused on several issues that are central to understanding gender relations there.

First, the historical *homogeneity or homosociality of management i*n the capitalist and state sectors has also been endemic in universities (Hearn, 1999). Second, universities can be seen as sites of *men's specific organisational or departmental cultures*, including the 'gentlemen's club', 'the family firm' (patriarchal, paternalist or otherwise), 'the men's room', and 'the boys' gang' (sporty, intellectual, hi-tech). Within different disciplines and departments, there are different gender climates and cultures, in terms of history, tradition, social organisation, curricula, relations between staff, staff and students, and students, and awareness of gender. The greater the domination of men, the more the site is likely to be presented as gender-neutral; the more (male) homosocial, the more it may appear to those there as a gender-neutral environment.

Third, specific interconnections between *men's power and managerial power* have been analysed in university settings. Patricia Yancey Martin (1996) has catalogued many ways in which men maintain managerial power, especially in the appointment and promotion process. She (Martin, 2001) has also examined how 'normal working practices' may often be conflated with men's working practices. Roper (1996) adds the specific analysis of men's relations with men, emphasising the homosocial desire that may operate between some men in universities. Fourth, universities can be understood as sites in which different *specific masculinities* can be produced and reproduced. Collier (1998) has outlined some of the ways of being both men and academics, in the context of academic jurisprudence: the Sexual Predator/'the History Man'; the Nutty Professor; the Administrator; the New Entrepreneur; the Young Man in a Hurry; the Infantilised Intellectual; even the Pro-feminist. He also notes the Empire Builder; the Aloof Cynic; the Gentleman Intellectual; and the Academic Couple. Other specific masculinities and men's practices may be identified in different disciplinary sites and national contexts (Prichard, 1996).

Patriarchal society provides the context, the material/data and the norms of social science and science, including indeed studies on men. This is the mainstream, the malestream (O'Brien, 1981). A society in which men are privileged and dominant produces (social) science in which men are privileged and dominant. Science has historically developed in a society in which men are privileged and dominant, and simultaneously has reproduced that privileging and dominance of men. Men continue to dominate science and thus the social contexts of research. Men perform gendered practices in universities, university management, research, science, science evaluation, and other relevant practices, such as sponsoring, exclusionary and sexual practices. These matters need close research and policy attention if gender bias and discrimination is to be avoided in research, research development and scientific evaluations.

The implications of gendering men for research and scientific evaluations

The gendering of universities and science institutions is as much about men as it is about women. The previous discussion highlights the importance of examining men's constructions and constructions of men and masculinities within evaluations of scientific excellence and academic merit. This applies to both men's part as evaluators and applicants, and more generally *throughout* the process, in gendering: the evaluator(s); the chairs of evaluating bodies; the evaluating institutions; the applicant(s); the applicant institutions; the proposals; the criteria used in evaluation; the decision-making process; and the outcomes. There is not just one quick fix to be had here.

These genderings of men in research evaluation need to be placed in the context of gender mainstreaming. According to *Science Policies in the European Union: promoting excellence through gender mainstreaming* (European Commission, Research Directorate-General, 2000) (the ETAN Report), the principles of gender mainstreaming in scientific institutions are:

- building equality into the culture and organisations;
- treating employees as whole persons;
- respect and human dignity (anti-discrimination);
- participation and consultation; and
- visioning.

The main tools for realising these goals recognised by the Report are:

- gender equality indicators;
- gender proofing/gender impact assessment;
- building ownership of gender equality within all levels of the organisation;
- awareness raising; and
- training.

The ETAN Report also promoted equal treatment and positive action combined with mainstreaming gender quality, with recommendations on gender monitoring for employers; Member State laws on gender balance in decision-making; Member State laws on access to public records; and removal of laws that impede women in scientific careers (Rees, 2001b). The mix between gender mainstreaming, equal treatment and positive action needs further development (Rees, 2001a; Verloo, 2001), including gendered mainstreamed policy and practice on: women in the student body; women in academia; women in scientific academies; funding and peer review; and women in policy-making (Osborn, 2001). Science policy development needs to build in regular evaluation of successes and failures of both mainstreaming policies and specific actions, the development of gender expertise in science and research organisations, and the maintenance of gender watchdogs (Husu, 2001).

What changes would be likely to occur if gender mainstreaming were to be more fully applied and developed in research and science? Some of the more important include:

- more research and science funding that addresses gender relations and gender inequalities;
- more research and science funding for research by women, so less for men;
- more direction of research and science funding to fields in which women are more represented, so less for fields in which men are more represented; more consideration of the gendered aspects of research, including conduct and control of research;
- more involvement of women in research-funding decisions and as key research gate-keepers of excellence, so less involvement of men in such decisions and as gate-keepers of excellence;
- more (at least the beginnings of) problematising what is done in research and science as 'neutral' when it is often in practice 'men's' (or some men's) research and science;
- more direct addressing, and changing, the power of men in research and science.

It is extremely important to stress gender power relations within science and research, not only to develop a more just society but also more accurate, more scientific research. This means, for example, expanding the search for solutions to scientific questions. There are many possible avenues here, but they might include such developments as:

- the development of accurate economic and financial accounting that is gendered (including unpaid work – often of women; and the gender structuring of government expenditures, e.g. most military spending is spending on men).
- the expansion of research on social practices that exclude and oppress both in society generally and in science and research. This therefore includes research on violence, abuse and discrimination, both societally and in science.
- the development of critical social science on men (as gender indeed means both women and men).
- the development of research and science that seeks solutions to world poverty problems, which often affect women and children disproportionately.

Furthermore, the connections between men's organisational/managerial practices and men's academic/theoretical practices, including research evaluation, need to be closely examined. Sexism, discriminatory action and non-gendering can occur in any of these fields and these can then bear on the others. There continues to be a very large body of research that may be called 'normal science', that involves men studying non-gendered subjects or studying men without noticing they are men.

Instead, developing contexts that facilitate scientific research on men involves naming men in science, both as academics and objects of research, and connecting men's complex *organisational and managerial* practices with men's academic practices, including *theoretical* practices. In making such connections, it is to be borne in mind that: the former produce the conditions for the latter, and the latter academic practices are also examples of the former organisational and managerial practices. Behaving in certain ways – as an academic, a manager, an evaluator, an administrator, teacher (for example, ignoring, not recommending, not reading, devaluing women's scholarship; degendering or treating as gender-neutral clearly gendered situations, etc.) is a way of also producing results, research, and theory. Gate-keeping operates not just from the managers of research funds but all the time, every day.

These inclusions and exclusions continue in terms of: particular people, by gender, by individual valuation, particular priorities, and particular theories. This assessment of men's practices in science parallels closely how men may respond to gender equality more generally: from outright rejection and hostility, to welcoming; from anti-feminist to gender-neutral (unhelpful, non-action pluralist) to gender-neutral (facilitative pluralist) to pro-feminist. Men move along such dimensions in gendered scientific practices according to political and organisational pressures and conditions.

Managers and men managers and science evaluators not only organise the organisational, technical and personnel matters in their charge, but also set and are set within the power relations between the relevant social groups in a relatively determinate way. Both aspects involve the creation of knowledge, both local organisational and managerial knowledge, and broader knowledge in and of society, indeed what counts as knowledge. This is especially important in the (men's) management of universities and evaluation, as one set of key institutions contributing to (gendered) production and reproduction of (gendered) knowledge in society (Rose, 1994; Keller and Longino, 1996; Stanley, 1997).

What has counted and still counts as knowledge has been severely gendered, so that women's relation to knowledge and its production and reproduction has been diminished and devalued. For the most part, universities, dominated as they are by men as academics and managers, do not produce neutral, less still emancipatory, knowledge. It is not difficult to see shifts in these directions with the increasingly applied, technological and utilitarian character of the fast changing 'mission' of higher education becoming apparent in the 1970s and accelerating in the 1980s and 1990s (Kenway with Langmead, 1998). These changes also structure the construction of possible practices and scenes or arenas of practices within universities. Though this process is not without resistance, it is important to note the ideological power of the apparent (usually men's) 'reasonableness', 'science' (or 'scientism'), 'objectivity' and 'excellence' in science.

These changes have implications for the content of academic disciplines and the business of knowledge production. Academic content is in part constructed through dominant managerial and men's practices. The changes described in many manner of ways restrict academic knowledge. Yet while universities and the knowledge produced are characteristically dominated by men, there remains the possibility of knowledge being produced that is *different*, that does not simply reproduce dominant relations, that provides a counter gendered view of reality, that contributes to emancipatory gender and other change (Lynch, 1999) and, in those senses, is more accurate than dominant pre-scientific knowledge. This is an intensely important issue, as much research remains pre-scientific, for example, avoiding looking at men's position and actions as gendered. Changing the matter of academic content is part of reducing gender inequalities and promoting gender equality in academia. Gender equality is not just about structures and procedures but also the content of academic teaching and research, and the deconstruction of non-gendered mainstreams.

Men in research management and evaluation need to be understood in gendered terms. Organisational power, structure and decision-making can all be reinterpreted in this context (Collinson and Hearn, 2000). This raises the

question of how, for many men in such positions, different forms of management and evaluation, and different ways of being men can be simultaneously reproduced – authoritarian, paternalist, careerist, personalist, entrepreneurial, and so on (Collinson and Hearn, 1994). In some cases, conventional 'managerial masculinity' is simply unreasonable behaviour. There is also the specific question of whether it is possible to develop pro-feminist management and evaluation (Hearn, 1994a, 1999b). More specifically, men cannot be absolved from the responsibility for equal opportunities policies and the development and promotion of women staff (1990, 1991). Different men's (by age, class, disability, ethnicity, race, sexuality) relationship to equal opportunities policies needs to be more explicit. This involves examining the interaction of gender and other social divisions; of considering the different situation of different 'types' of men (for example, black men, men with disabilities); and making explicit the category of white heterosexual able-bodied men (WHAMs) (Hearn and Collinson, 1993).

Men's cultures in university and science evaluation organisations need to be open to explicit examination, discussion, critique and change. Certain men's cultures produce a climate of sentiment that is antagonistic to women (Cockburn, 1991; Hearn, 1989, 1992; Parkin and Maddock, 1994). An especially important issue is the widespread presence of men's homosociability and cultural cloning (Essed and Goldberg, 2002; Hearn, 2004b) in science and research. This means a preference by men for men and men's company. Processes of men-men networking are highly relevant in both research conduct and research evaluation (Burton, 1998). Networking is crucial to many scientific careers, and thereby the social construction of scientific excellence.

Men's competitive behaviour, especially in mixed evaluation groups, also needs to be the subject of critique and change (Case, 1994). Explicit attention needs to be given to such issues in gender training, along with such issues as: male identity; men's prejudices; how men's attitudes and behaviours can change; how organisations reproduce dominant male values; and ways of changing organisations in these respects.

For men involved in science institutions, challenges and changes include:

- considering that if there are more women in academic evaluation, then there will be less men there, and putting this on agendas for discussion;
- setting local and national targets for numbers of men in academic evaluation and chairs thereof (such as 50%);
- assisting the creation of a minimum mass of women in academic evaluation;
- changing organisations and academic evaluation, including men's unequal sponsorship of men and women;
- changing men who are in academia and academic evaluation to be anti-sexist;
- ensuring that men doing science evaluation have academic and professional knowledge on gender and power issues;
- changing dominant models of masculinity in academia more generally;
- challenging assumptions of gender-neutrality and gender-absence within the supposedly 'objective' mainstream and in scientific excellence;
- changing men at home: giving more priority to domestic and caring responsibilities;
- structuring training budgets in evaluation for men in inverse proportion to the ratio of men to women;
- seeking how men can assist in not blocking equal opportunity policies.

There are many gendered practices to examine and change here: men's practice of sexism and discrimination; men's ignoring of women's and gender scholarship; men's misrepresentation of women's and gender scholarship; the practice of so-called gender-neutrality (as if gender is not relevant to one's own activities); the impact of managerial practices on academic practices; managerial encouragement and discouragement of particular academic practices; and the use and control of publishing, journals, and research funding to determine academic practices. It is still possible to be a respected male social science academic and not read, support or cite scholarship by women,

especially feminist scholarship. These are 'normal' academic practices that need changing very urgently indeed if gender bias in defining and evaluating scientific excellence is to be reduced.

To reduce gender bias in the definition and measurement of scientific excellence involves all participants, both men and women, in the process. It involves not only women, but also changing men. There should be excellence in the practices of definition and measurement of scientific excellence, and not only excellence in science itself. After all, the definition and measurement of scientific excellence is part and parcel of the very activity of science.

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Gate-keeping, gender equality and scientific excellence

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Gate-keepers and gate-keeping are a hitherto neglected but pivotal topic in studies of gendered patterns of science and academia. Merton (1973) called the gate-keeper the "fourth major role" of a scientist, in addition to that of a researcher, teacher and administrator, affecting contemporary science in every aspect. Gate-keepers are undoubtedly in a key position to influence the definition, evaluation and development of scientific excellence. More generally, gate-keeping processes can aim to control or influence the entry or access to a particular arena, allocation of resources and information flows, the setting of standards, development of the field and the agenda, or the external image of that arena. Gate-keeping can function as exclusion and control, on the one hand but, on the other hand, it can also facilitate and provide opportunities and resources.

Women are particularly under-represented among academic gate-keepers and leading positions in science and science policy organisations. According to the ETAN Report (2000), to a large extent, the gate-keepers of research funding in Europe comprise middle-aged male academics. Such male domination also applies to countries such as Finland, despite the fact that the proportion of women among professors in Finland is the highest in the EU (21% in 2002). Finnish National Research Councils are, however, approaching gender parity, having had to follow the quota paragraph of the Gender Equality Act since 1995. Despite this, only 16% of the referees the RCs used in their funding decisions were women in 1999, as were only 14% of the board members of the largest Finnish research funding foundations.

The paper presents ongoing research focusing on gender and gate-keeping in academia in relation to one key academic arena: research funding, which is analysed by studying both organisational and individual gate-keepers and their policies and practices. Gate-keepers refer here both to fund-awarding organisations as collective gate-keepers of research funding and to individuals who are involved in decision-making bodies of such key fund-awarding organisations.

Background

The recent EU report on national policies on women and science calls for new research that would "*throw light on complex and intangible issues, such as the gendering of excellence… in order to understand more fully the gendering of science and scientific careers, and to assess policies designed to open up science and scientific careers to women, in order to inform appropriate and effective policy making and review*" (Rees 2002, 23). In the Nordic countries, women's position and gender inequalities in academia have been on research and policy agendas for several decades (see, for example, Ministry of Education, Finland 1982 and SOU 1983:4) and in Europe increasingly since the latter half of the 1990s (ETAN 2000). Harding and McGregor in the UNESCO World Science Report noted a conceptual shift in this research from the earlier focus on "women as a problem" (their identities, motivation or individual characteristics) towards problematising academia, its structures and practices. They argued that a conceptual shift from a "*deficiency model of girls and women*" to a "*deficiency model of science and science education*" is increasingly widely regarded as crucial to reach equitable treatment of women in the sciences and to take advantage of women's potential in science and technology (1995, 16).

In order to better understand the persistent gendering of academia, it is indeed necessary to go beyond studying academic women, their under-representation, career development, or their experiences of gender discrimination, support and survival (Husu 2001). This means focusing research from a gender perspective also on influential

groups who are setting the scene in academia and scientific research and defining excellence in sciences; that is, on those who are acting as gate-keepers in the scientific community. Studying gate-keepers in academia means studying élite groups and studying men – until recently these gate-keepers have been predominantly male. Social scientists tend to study élites and decision-makers much less than those without influence, partly because the former are often difficult to identify, often inaccessible and much less open to being the subject of scrutiny (Odendahl & Shaw 2002, 299). Men have seldom been approached and studied as men in research on gender and academia (see Hearn in this volume).

I suggest that a gender sensitive approach focusing on academic gate-keepers and gate-keeping – understood in a broad Mertonian sense – could be fruitfully applied into exploring the gendering of academia and gendering of excellence in a multiplicity of arenas. Academic gate-keeping can be understood to take place, for example, in relation to policy decisions, agenda setting, appointments and creation of academic posts, funding decisions, award decisions, and publishing, and at all levels: research group, departmental, institutional, faculty, university, research council and national level, as well as in informal scientific networks.

Gate-keeping and gate-keepers are first discussed in general and in academia in the light of relevant international research and science policy discussions. Many empirical examples referred to in this paper are from my current main research context, Finland. Second, as an example of an attempt to apply a gendered gate-keeper approach in studying academia, I will shortly introduce my ongoing research project *Gender, gate-keeping and research funding: organisational and individual policies and practices*, conducted at the Helsinki Collegium for Advanced Studies, University of Helsinki. Finland can be seen as an interesting 'laboratory' to study gender in academia, with one of the highest levels of R&D investment globally and in Europe (estimate for 2002 is 3.5% of the GNP, Statistics Finland), relatively high proportions of women engaged in research activities, and explicit governmental commitment to gender equality policies, a feature shared with other Nordic countries (see, for example, Bergqvist 1999; Science and Technology in Finland 2000; Eurostat 2001; She Figures 2003).

Gate-keeping and gate-keepers

The concept of gate-keeping was introduced into social sciences by Kurt Lewin (1943). Recently, it has been applied to study various social arenas, for example, professions (Ishida et al., 2002), the allocation of services such as education (Enders 2001), healthcare (Marinoso and Jelovac 2003, Stevens et al., 2002) or welfare services (Helgoy et al., 2003), employment of immigrants (Paananen 1999), and media and publishing (Clayman 1989). Gate-keeping processes can control or influence the entry or access to that particular arena, allocation of resources, information flows, setting of standards, development of the field and the agenda, or the external image of that arena.

The dual nature of gate-keeping is important to emphasise: that gate-keeping can function as exclusion and control, on the one hand, and inclusion and facilitation, on the other. Gate-keeping may be used by some individuals or groups in gate-keeping positions to promote their own or their reference group's interests and to exclude or hold back certain groups (as in, for example, nepotism and favouritism). Informal networking within gate-keeper groups and be-tween gate-keepers is of special interest here. In small countries such as Finland and other Nordic countries (where "everybody knows everybody" in a certain field), the role of informal networking may be more crucial than in larger countries. For example, in a recent Finnish élite study by Ilkka Ruostetsaari (2003), informal encounters were mentioned by four out of five élite group members among the three most important forms of communication in trying to promote the goals of one's organisation or field of activity. Ruostetsaari stresses the central role of informal contacts among élite group members, especially in the Finnish context. Elite members belonging to informal groupings became more frequent in the 1990s. In 2001, three out of four élite members belonged to some informal grouping (in the scientific élite, 58% in 1991 but 74% in 2001) (p. 242-254).

In relation to science and academia, gate-keeping as a concept was first used only to refer to scientific publishing, and editors of scientific journals were characterised as "*gate-keepers of science*" (de Grazia 1963 and Crane 1967). Robert K. Merton argued that this usage was too restrictive (1973, 521) and that gate-keepers also regulate scientific "manpower" and allocation of resources for research. He characterised the gate-keeper role as the "fourth major role" or function of scientists, in addition to those of researcher, teacher and administrator. Gate-keeping is, according to Merton, "*basic to the systems of evaluation and the allocation of roles and resour-ces in science*" (p. 521), and "*affects contemporary science in its every aspect*" (p. 523). Gate-keepers evaluate "*the promise and limitations of aspirants to new positions, thus affecting the mobility of individual scientists and, in the aggregate, the distribution of personnel throughout the system*" (p. 523). Gate-keeping operates through both hierarchies and panels of peers, at every level in science, and in various arenas (publishing, scientific societies, appointments to academic posts, grading of students, allocation of funding, etc.). Gate-keeping is a matter of both the *process* of decision-making and the *content* of decision-making, thus affecting the differential development and direction of academic fields, for example, favouring some research questions and fields and disfavouring some others. In this sense, gate-keeping in research funding is fundamental not only to the definition of scientific excellence but more generally to the construction of scientific knowledge.

Gendered perspectives on gate-keeping in academia

Why is the issue of gate-keeping pivotal when trying to understand gendering of academia or gendering of excellence in academia? There are several reasons for this. Women are particularly under-represented among the academic gate-keepers and in leading positions in science and science policy organisations (Stolte-Heiskanen et al., 1991, Academy of Finland 1997, 2000a, Fogelberg et al., 1999). To a large extent, gate-keepers of research funding in Europe consist of middle-age male academics (ETAN 2000).

Male domination is also the case in Finland although the proportion of women among full professors is internationally among the highest, and is the highest in the EU as well as in the Nordic countries (21% in 2002). The National Research Councils (the Academy of Finland) in Finland have nearly reached gender balance as their members are government-appointed[1] and their composition has had to follow the quota paragraph of the Gender Equality Act since 1995. However, the same does not apply to the experts used by the Research Councils: of the referees used by the Academy of Finland, in 1999, only 16% were women, and in the period 1999-2002, the proportion of women among the referees varied from 11-12% (Research Council for Natural Sciences and Technology) to 34-43% (Research Council for Health Sciences)[2] (Academy of Finland 2003). Strongest male dominance is found in private research funding foundations. They are not affected by the quota paragraph. Only 14 % of the members in the boards of largest Finnish research funding foundations were women in 1999 (Academy of Finland 2000a).

According to the above-mentioned élite study (Ruostetsaari 2003), by sector, the academic élite in Finland is more male-dominated than the political élite (37% women) and cultural élite (36% women), whereas in administration and business élites women have gained even less foothold (14% and 4% respectively). During the 1990s, women were gaining more ground in the academic élite: the proportion of women in the academic élite doubled in the 1990s, reaching 20%. At the same time, the proportion of women was growing both among professors and doctoral degree recipients. In the 1990s, the proportion of female professors increased from 10 to 20%, and the proportion of women Ph.D. recipients from 32 to 45% (see, for example, Husu 2001). However, inside the academic élite, changes in gender composition were uneven. The proportion of women grew among university, public sector and the Academy of Finland (the National Research Councils) élites by 2.5 times in the 1990s. The development in the private research institutions, learned societies and scientific associations was different: the proportion of women in their élite positions diminished in the 1990s, and the largest private research funding foundations still have no women at the top

(Ruostetsaari 2003, 154). The increasing proportion of women in the professoriate did thus not translate into women gaining more influence in private sector research funding and in the organisation arena of sciences. It is also noteworthy that gender equality was increasingly on the agenda in those academic arenas where women gained a greater foothold among the élite during the 1990s. That was the case in universities (see, for example, Husu 2001) and the Academy of Finland (Academy of Finland 1997, 2000 a, b). As referred to earlier, the change in equality legislation in 1995 introducing gender quotas for public bodies affected, in particular, the gender composition of National Research Councils.

Only scarce and scattered information exists on recruitment practices to gate-keeping positions in research funding. The ETAN report on women in science argues that "*the process whereby individuals are appointed to such panels [research-funding bodies, editorial boards of journals – LH] is not always transparent or democratic: rather, names emerge from existing members. Panels tend to reproduce panels in their own likeness*" (2000, 44). The report also urges the funding bodies to address the issue of lack of transparency and regular scrutiny in their peer review system.

In general, academic gate-keeping or gate-keepers have not been studied in Finland and, internationally, most such research tends to focus on academic publishing. One of the few studies with a broader agenda is the ongoing large 'Power and Democracy Study' (1998-2003) initiated by the Norwegian Government, which includes a subproject on 'Gender and Power in Academia' (http://www.sv.uio.no/mutr/eng/). The work also includes a study of leaders in ten social arenas, among them 'research and higher education', gender equality being one perspective. Interesting gender differences were found in how the élite groups explained the persistent male dominance in top positions either in their own arena or more generally (Skjeie and Teigen 2003). More than half of the élite women agreed that direct discrimination in appointments was one important explanation for male dominance in general, and in their own arena every fourth woman supported this view. Of the male élite, only one-quarter supported the discrimination explanation in general, but rejected this explanation nearly unanimously concerning their own activity area (p. 113-114).

Noteworthy here is that those two sectors in which Norwegian élite women quite strongly agreed with the discrimination explanation were church and academia, and that the discrimination explanation received hardly any support from male academic élite (id.). Academic male and female élites also disagreed strongly in their support for the "informal networks" explanation for male dominance: academic women supported the network explanation strongly, whereas men did so only weakly (p. 116). Exploring these kinds of gender differences in the academic gate-keepers' understandings of the factors behind gender inequality may give insights into why attempts of gender equality interventions are frequently experienced as "*hard work in the academy*" (see Fogelberg et al., 1999).

Gendered divisions can be found not only in the composition of the decision-making bodies of gate-keeping organisations in research funding – women are under-represented as applicants and recipients of research funding (Academy of Finland 1997, 2000a, ETAN 2000). International research has pointed out that *seemingly gender-neutral eligibility criteria* may have gendered outcomes. The eligibility criteria can also be understood as gate-keeping practices. Contradictory results have been obtained on gender bias in funding decisions (Wennerås and Wold 1997, Blake and LaValle 2000, ETAN 2000). Extensive studies on gender and research funding have been conducted in Sweden (SOU 1996, 276-277) and UK (Blake and LaValle 2000) but without specifically focusing on the gate-keepers. The Swedish study from mid-1990s concluded that, on average, female academics obtained less than half the amount of grants that men did, if age and position were taken into account. The extensive UK Blake and LaValle study of funding application behaviour among UK academics (2000) showed a difference between women's and men's application activity, but also concluded that if women applied they were as successful as their male colleagues. However, women were less likely than men to be *eligible* to apply for certain grants: for example, some of the grant schemes were not open to certain groups with a high proportion of women, such as lower-grade or fixed-term academic staff. In Finland, no similar systematic studies have been conducted on research funding by gender, rank

and tenure. Few Finnish funding agencies volunteer to provide information on funding by gender. The exception here is the Academy of Finland that has systematically aimed to develop its gender monitoring from the late 1990s, and has introduced an action plan for gender equality for 2000-2003 (Academy of Finland 1997, 2000a, b and c, 2003).

My earlier research (*Sexism, Support and Survival in Academia. Academic Women and Hidden Discrimination in Finland*, 2001) addressed the production, reproduction and challenging of gender inequalities in academia across disciplines, using qualitative methodology and a gendered organisational approach. Finnish academic women continue to experience various forms of gender discrimination and sexism in academia. Furthermore, these experiences are not restricted to any specific career phase (pre- or postdoctoral, for example) or certain disciplinary fields or arenas of academic activities. Gendered problems related to research funding encountered by the informants were linked to many issues, such as the mismatch of parental leave with the funding systems, 'academic' vs. 'biological age', non-transparent practices in recruitment to research projects or graduate schools, lack of support and encouragement, research group dynamics, as well as sometimes overt gender bias in evaluation.

The gate-keeping project

The research project *Gender, gate-keeping and research funding: organisational and individual policies and practices*, aims to increase knowledge and understanding of the dynamics of gate-keeping in one crucial academic arena, research funding. It explores how gender is involved in these processes in an era where recruitment and allocation of resources are seemingly made on gender-neutral principles, and how gender is interconnected with other social divisions such as age. For example, the Academy of Finland's current promotion of 'young' researchers and 'female researchers' may raise contradictions. Furthermore, the project explores how gate-keepers approach gender inequalities in science and how they explain and understand the discrepancy between seemingly gender-neutral systems and gendered outcomes. The results of the Norwegian élite study referred to earlier suggest that male and female gate-keepers' understandings on this may be very different. If the majority of gate-keepers explain and understand gender inequalities in academia as outcomes of factors and conditions outside scientific organisations – such as women lacking motivation, having lower ambition, family obligations… it is obviously difficult to find support and argue for changes within academia.

Although gate-keeping in academia occurs in various arenas, and little research exists on gate-keeping in most of these, there are several reasons to focus specifically on gate-keeping in research funding. First, gate-keeping in research funding is a relatively clear and coherent field of study – as well as being amenable to quantifiable output measures in terms of academic personnel, finance and publications. Second, gate-keeping organisations and individuals have a pivotal role to play in forming future research and recruiting a future research labour force. They are in a key position to influence what kind of research is supported and encouraged, or marginalised and discouraged, and what kind of eligibility criteria and measurements of excellence are introduced and how these are applied in practice. The dual role of gate-keeping – that it both facilitates and controls/excludes – is of interest here, in keeping with a view of power that is both oppressive and productive.

The theoretical framework is interdisciplinary, drawing from studies on gender and organisations, women's studies, science studies, higher education studies, and studies on professional ethics. Other relevant literature includes research on recruitment, decision-making, élites, experts, and women in management.

Gate-keeping can be analysed as 'practical', day-to-day mundane ways in which social hierarchies, social divisions, and persistent distinctions are produced, reproduced, and sometimes challenged, ameliorated and changed. Gate-keeping processes apply across a very wide range of social arenas (from micro to macro) and in a wide range of forms of social hierarchies and social divisions, such as gender divisions. Women's *historical* exclusion from various professions, from education and training, and from several formal and informal organisations and social arenas can

be understood as a result of a range of gendered gate-keeping processes. This historical exclusion has mainly occurred in contexts where the gate-keepers have been exclusively or predominantly men.

Joan Acker's analysis of gendered dynamics and processes in organisations has been applied as initial theoretical framework, exploring gendered divisions, gendered symbols, gendered interaction and individuals' internal mental processing of these (1992). *Gendered practices and policies of gate-keeping* in research funding are explored by studying *gate-keeping organisations*, on the one hand, and *individuals in gate-keeping positions*, on the other hand. Individual gate-keepers include both senior academics and officials and governmental and business representatives. *Gate-keeping policies* mainly refer to policies of gate-keeping funding organisations, and *gate-keeping practices* to activities of both organisations and individual gate-keepers. When exploring gate-keeping policies, the analysis focuses on the rules and regulations concerning the recruitment of gate-keepers (including referees), the construction of the criteria (eligibility and excellence) on which funding is allocated to the applicants, and on explicit published policies and statements overtly or covertly related to gender (for example, policies related to parental leave or encouraging women in particular to apply for grants, age limits, and use of generic masculine language in communication). When exploring gate-keeping practices, the analysis focuses on the recruitment of the gate-keepers in practice (how the recruitment rules are applied in practice, and gender composition of the referee pool), the applications and allocation of funding to applicants in practice (applications and allocations by gender), potential activities promoting gender equality, and potential gender-related experiences of gate-keeping practices as expressed by the applicants and recipients of funding. The main research questions are:

- How are the gate-keepers in research funding recruited and how are these recruitment policies and practices related to gender?
- How do gender issues operate in the policies of gate-keeping organisations of research funding?
- How do gender issues operate in the practices of gate-keeping organisations of research funding and the practices of gate-keeping individuals?
- What are the interconnections between these policies and practices?
- How are gender issues in gate-keeping related to other relevant social divisions, such as age, ethnicity, and class?
- How do gate-keepers themselves construct gender equality and explain inequalities in science and academia?

Interviews, documents, accounts

Mainly qualitative methods are used, but there are also reanalyses of existing quantitative data on research funding by gender, if available. In addition to existing data on gate-keeping in my earlier extensive research on academic women and hidden discrimination (Husu 2001), three methods are used for gathering data:

1) *Interviews* are conducted with a sample of gate-keepers and representatives of research funding organisations (c. 40 individuals) taking into account the different funding structures in major disciplinary fields. Public funding is the most important funding source for humanities and social sciences, whereas natural sciences, technology and medicine have a broader funding base (for example, Academy of Finland 2000c, Hakala et al., 2003). Interviewees include current and previous chairs and members of the National Research Councils, chairs and members of the largest grant-giving foundations, members of the National Council of Science and Technology, and chairs and members of the university research-funding bodies. The interviews address recruitment practices to the gate-keeper position (both individual and collective), experiences as a gate-keeper in research funding in general, the 'gate-keeper career' of the interviewee, their views on the funding system and funding criteria, their experiences and views on gender equality in the activities of the funding agency and, more generally, views on the promotion of gender equality in academic research and the position of women in academia.

2) *Analysis of document material:* a) published/public documents, e.g. policy reports, calls for applications, annual reports, b) unpublished data from funding organisations, e.g. concerning referees and refereeing, statistics. The document analysis focuses on explicit policies and practices.
3) *Analysis of written accounts* on potential gender-related experiences of research funding as applicants and recipients. The written accounts from applicants for and recipients of research funding are collected by publishing a request to write confidentially on potential gender-related experiences in research funding.

These three methods of collecting data complement each other and provide an opportunity to juxtapose the views and experiences of the decision-makers with the policies and practices, on the one hand, and with the experiences of those who are the targets of these policies and practices, on the other.

Gate-keeping, excellence and mainstreaming

Increasing understanding of academic gate-keeping processes from a gender perspective is crucial for the successful implementation of mainstreaming policies in academic organisations. In European science policy, mainstreaming gender equality in scientific organisations is currently seen not only as an important goal which would increase individual female researchers' opportunities to use their potential, but also more generally as a way to promote excellence in scientific research (ETAN 2000, EC 2001). A critical analysis of the dynamics of gate-keeping in research funding and its gendered aspects can inform science policy and the policies and practices of funding organisations towards greater gender awareness and fairness. Promoting gender equality is increasingly being seen as quality assurance ("equality equals quality").

Exploring gate-keeper organisations and academics in gate-keeper positions in research funding is expected to increase understanding of gate-keeping dynamics and definition of excellence in research funding, especially their gendered aspects and their relations to other relevant social divisions. This kind of research aims to produce new knowledge on the conditions of and potential resistance to gender equality policies in academia, and especially on the complex interplay between more or less explicit gender equality policies, and actual practices and gendered outcomes. The results are not only relevant for research funding in academia; as mentioned earlier, a similar research approach is applicable to the study of gate-keeping processes in other academic arenas, such as recruitment and promotion in universities, activities of scientific societies, scientific publishing, and awarding of scientific prizes and awards, in which recognising and defining excellence plays a crucial role.

Notes

(1) The list of candidates for the National Research Councils is composed by the Ministry of Education on the basis of proposals requested from the country's 20 universities, as well as from learned societies.

(2) Four-year average; figures describe proportion of female referees in decisions on research project funding and on appointments of academy fellows and postdoctoral funding.

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Springboard or stumbling block – can research councils promote scientific excellence without gender bias?

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Whether research councils tend to conform to discriminatory procedures, or not, is a crucial question in determining strategies for policies on scientific excellence in Europe. The complex problem of gender bias is a cornerstone in that discussion. The proposed European Research Council is but one illustration of the importance of this question. Indeed, a better understanding of the procedures used in the peer review processes should be developed. Yet, very little research has focused on research councils. Although several important studies were conducted during the 1970s and 1980s, few have been carried out with new empirical material covering what has happened during the last ten to 15 years. Recent studies often report on cross-sectional investigations based on small samples. Investigations that cover longer periods and larger data sets are needed. This paper draws on data from more than 20 000 research grant applications submitted to four different Swedish research councils. Success rates were markedly lower for women during the first half of the period. However, a change in policy could be observed after 1995, probably due to the debate over discrimination. Hence, an initial hypothesis is that gender should be distinguishable as a determining factor in the research grant process even after controlling other social and institutional variables.

Research councils and peer review

An essential principle of the classical model for research councils is that scientists, unrestricted by and unaffiliated with external factors, should govern research. In Sweden, active researchers constitute a majority on the council's board, i.e. in all bodies where applications are assessed and evaluated and grants decided upon. Committee members are chosen through an electoral process involving all members of the research community in the university system. Peer review is used to guarantee the quality and diversity of basic research. A specific feature of the Swedish councils is that scientific committees are in command of the work. Consequently, and in comparison to the situation at NSF and NIH (in the USA), programme officers in Sweden have little or no influence over granting procedures, initiatives and priorities (see Sandström 2000).

Peer review is a documented, critical review performed by peers (people with technical expertise in the subject matter to be reviewed) who are independent of the work to be reviewed. It is a tool that funding agencies (and programme managers) can use to obtain high-quality technical and scientific input for decisions on allocating resources. Peer review is intended to improve both the technical quality of projects in R&D and the credibility of the decision-making process. The independence of peers should make them more effective than internal reviewers.

Generally, the procedures among the councils in Sweden were similar during the 1990s. Each applicant (principal investigator) submitted a CV, bibliography and a research proposal. A dozen of scientific committees, each covering a specified research field or discipline, reviewed the applications. Each proposal was rated by three to five reviewers in the committee to which it was assigned. Reviewers graded the proposals and 'track records' with a score which formed the basis for the ranking used in funding decisions.

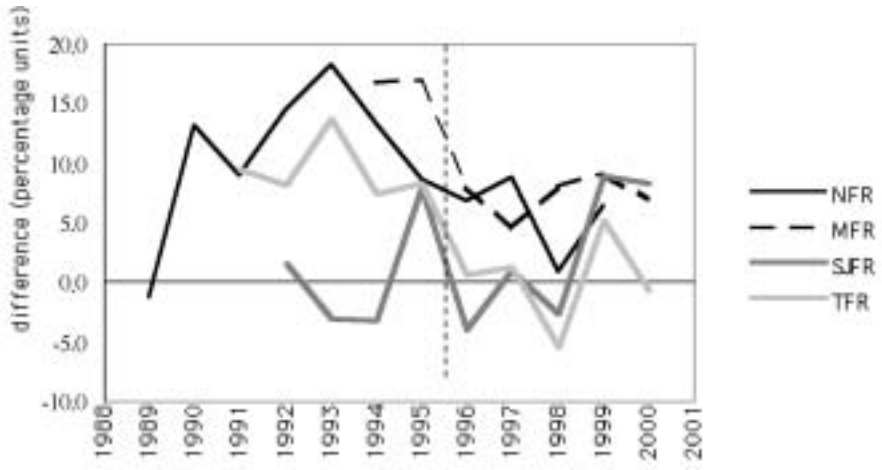
The gender gap

During the first half of 1990s, success rates for applicants to the research councils (MFR, NFR, TFR and SJFR, see abbreviations below) in Sweden were marked by a significant gender gap. Women often had 10% lower rates than men. A study in 1995 by Wennerås and Wold (published in Nature 1997) disclosed a gender bias in the evaluation of merits for postdoctoral fellowships at the MFR. Thereafter, a shift in policy was imposed by the Ministry and soon implemented. Practices among most research councils changed, and the gap narrowed significantly during the second half of the 1990s (Figure 1). This indicates a positive effect on female funding chances[2]. In a sense, we have identified "the Wold Effect".

Wennerås and Wold showed that female productivity was credited lower than male productivity in the evaluation of applications for postdoctoral fellowships (N = 114) submitted to the Swedish MFR. The conclusion was clear: "Our study," they said, "strongly suggests that peer reviewers cannot judge scientific merit independent of gender." (*Nature*, p. 341). Affiliation with a committee member further increased the chances of being funded. The disclosure of discriminating procedures and nepotism resulted in an intensive debate, and the MFR council board was replaced.

A detailed examination of male and female success rates within the research councils from 1989 to 2000 shows that success rates for males were generally 5% to 10% higher than the success rates for females. This difference had already decreased in 1993 for three of the four councils being studied, and the fourth had equal rates throughout (Figure 1). However, the success rates for male applicants remained higher even after 1995. Obviously, the differences are partially explained by male domination in upper academic positions. Hence, a positive difference in success rates between males and females is not in itself an indication of discriminating procedures. Success rates are affected by a number of factors, including the number of applications, increase in budget, granting policy, and so on.

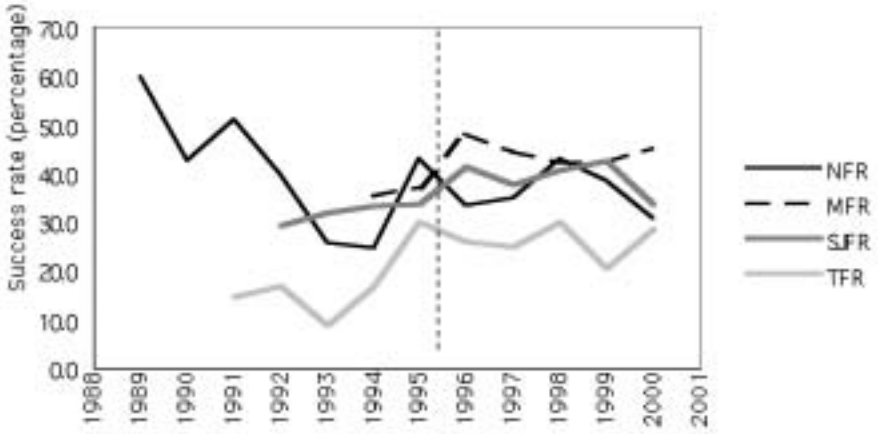
Figure 1. Differences in male and female success rates in four research councils (1988/89-2000)



Sources: NFR based on database and from 1997 annual reports; SJFR on database; TFR on annual reports from 1998; MFR on annual reports from 1998

This paper investigates the gender issue by using a large set of data generated by the research councils in the process of handling applications and grants. To our knowledge, these Swedish data have not been used previously for scientific study. The first part of the analysis shows that the gender difference fluctuates over time. Funding levels change from year to year and policy conditions are unstable. A closer look at success rates for women indicates that structural factors favour higher success rates, which leads towards closing the gender gap (Figure 2). The process of convergence started long before the Wold intervention. Nevertheless, we will need a more comprehensive approach to understand the gender gap phenomena.

Figure 2. Success rates for women in four research councils (1989-2000)



Notes, see Figure 1

Research on gender and research councils

The paper by Wennerås and Wold (1997) is one of the most frequently cited articles in this area of research. Searching the internet for 'science on-line' yielded more than 2 000 hits for "peer review". Among these articles on peer review and related subjects, Wennerås and Wold had the eleventh highest number of citations (94 citations in March 2004). Unfortunately, virtually none of the papers citing the *Nature* article from 1997 attempted to replicate or critically discuss the findings. Since publication of the article, there appears to be a lack of further investigation. There are, however, a few exceptions to this observation: reports from funding agencies in the Netherlands and the UK have discussed fairness and funding in gender research from the perspective of modernising peer review (see the EU 2000). Other research projects have presented results from Denmark and the Netherlands. We will briefly review this research before examining the Swedish data in greater detail.

It is essential that the academic community has confidence in the peer review system. The legitimacy of funding procedures is based largely on trust. Therefore, conclusions about the functions and performance of research councils should be scrutinised and well researched. The problem with several of the studies on gender bias in research councils is that they cover only small samples and short periods of time, i.e. mostly cross-sectional studies. Although most of the work to date is careful and methodologically sound science, the lack of data is of general concern, as summarised in Table 1.

Table 1. Quantitative studies on gender bias in research councils

Author	Published in…	No. of cases	…of which women	Data from year
Wennerås & Wold	1997	114 cases	52	1995
Brouns	2000	357 cases	52	1993-94
Wellcome Trust	1997	354 cases	105	1993-96
MRC (UK)	1997	276 cases	107	1993-96

Richness and quality of data is necessary if this area of research is to be developed further. Generally, investigations on this subject have had problems in finding relevant data on the applicants and their research areas. Due to restrictions and economy of the research process, many of the studies have used only simple descriptors, e.g. age, time lapse since

dissertation, affiliation, publications, review grade, etc. as explanatory factors in relation to decisions taken by the councils.

The first two papers in Table 1 support the hypothesis that research councils tend to discriminate against applications submitted by women. The other two support the reverse. Discrimination is a strong proposition and has to be taken seriously. It is contrary to earlier research findings reported, for example, by Zuckerman (1991, p. 43) on US data from NIH and NSF. Later studies by Cole (1992) and McCullogh (1989), both on NSF populations, found no gender differences regarding awards and grants. Likewise, Emery et al. (1992), in a study of NIH first award applicants, concluded that none of the identified predictors (including gender) determined whether an application would be funded.

In 1996, a governmental investigation collected information on sectoral funding agencies in Sweden regarding the number of awarded grants to men and women in relation to the number of applications in fiscal year 1994/95 (SOU 1995:110, p. 46). Comparing observed and expected levels of awards for these agencies leads to the conclusion that there seem to be no significant gender discrepancies in the material. Although the result is interesting, it should be underlined that these data have low relevance to the overall question posed in this paper as the agencies do not work according to normal council procedures. The academic community does have influence in some of the agencies, but this is not the case generally.

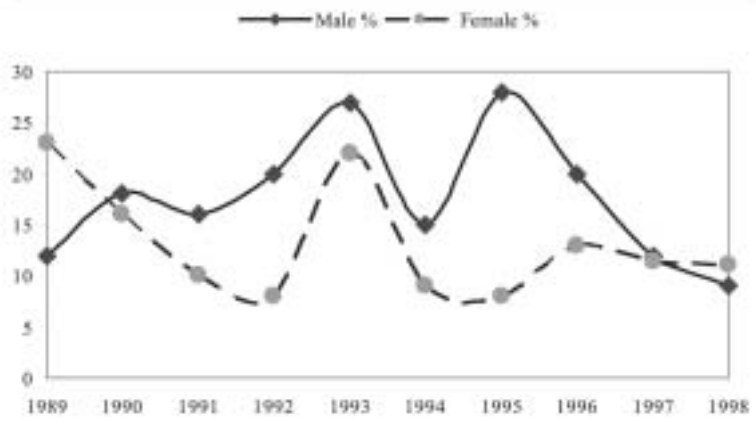
More to the point are two investigations recently published by an undergraduate student in Gothenburg (Ekström 2003 & 2004). The first paper investigates the Bank of Sweden Tercentenary Foundation (RJ), which is very similar to a normal research council, during the period 1990-2002. Valid data cover the period of 1995-2001 and include almost 2 000 cases with a high portion of applications sent in by female researchers (Table 2). Ekström found no gender differences, and concluded that there are no signs of discrimination within the RJ Foundation. Instead, women researchers seem to have an advantage compared to men. The same author has also investigated the Agency for Working Life Studies (RALF) during the same period (Ekström 2004). This agency is a hybrid of an academic council and a sectoral agency. Many of the committees are steered by academics. Interestingly, the result from this investigation is also negative to the hypothesis on gender discrimination. Her conclusion is very much in line with what she found in the first investigation

Table 2. Recent Swedish studies on gender bias in research agencies

Author	Published in…	No. of cases	…of which women	Data from year
Ekström I	2003	1 987 cases	623	1996-2001
Ekström II	2004	2 431 cases	684	1996-2000

In this paper we attempt to go a bit further into the effect of different factors related to gender aspects, but we also include new aspects and new variables that should be considered when studying granting procedures. The 1990s were dynamic years as regards research policy. Many new policy aspects were introduced, for example, gender, the need to support young researchers, interdisciplinarity, and strategic research. During this period, research councils had to learn how to adjust to a changing environment. This is illustrated by the fluctuations in success rates for postdoctoral fellowships awarded by the Swedish Medical Research Council (MFR) during the first half of the 1990s. In 1989, female applicants had a much higher success rate than males, but figures were changing as the number of applications from women increased. For a couple of years during the middle of the period, rates were more or less even between the sexes. A substantial difference appeared in 1995, the year that Wennerås and Wold used for their study. Clearly, the year-to-year variations make it necessary to use data from longer periods if we want to gain a complete understanding of the outcome of procedures.

Figure 3. Success rates by gender for MFR postdoctoral fellowships 1989-1998



Source: Annual Reports and MFR Contact 1997

Data and methodology

First, a distinction can be made between subjective and non-subjective information about application and applicant. Evaluation of applications is a subjective process, and hence information on the matter is subjective. The applicant's sex, academic position and age are examples of non-subjective information. Our data also includes institutional factors such as affiliation, sub-discipline and year of application. The latter data is important because, as we know from other studies, the total budget and number of applications submitted fluctuates over time. Before we use variables in regression models, we need to understand the associations and the interdependencies involved. Our final aim is to detect all potential interactions involving gender. However, prior to that it is interesting to discuss each variable and to investigate them individually. The effect of gender is largely explained by structural differences between the groups. These differences are discussed and illustrated below.

For the empirical analysis, we mainly utilise the project databases from two Swedish research councils – NFR and MFR. These databases include granted and rejected applications, but also information on the applicants, for example, sex, age, academic position and institutional affiliation (there are a few specific discrepancies in this formula). Table 3 describes the variables available in the different data sets. In addition, it should be noted that the project database has been cleaned and includes only regular research projects. No postdoctoral fellowships, travel grants, institutional grants or other types of grants are analysed. This was motivated by our ambition to create a database for the study of the political economy of research funding (see Sandström 2000).

It should be underlined that we use applications as the population of interest. An alternative strategy would be to aggregate applications to individuals, but this has proven to be difficult due to problems with identifying individuals in the databases. Data are extracted from the project databases, and the analysis is conducted at the population level.

The NFR database, in particular, shows considerable gender differences. Hence, it was chosen for our purposes to describe and investigate the factors that might explain the variations. We have access to NFR data from 1989 to 1995, entirely from the pre-1995 period. It is also the richest of the four databases, as is evident from Table 3. The share of female applicants in the NFR project database increased from a low 9% in 1989 to 13% in 1995. During that period, the numbers of applications grew rapidly – from 1 000 to 1 500 – and the population of applications submitted by female principal investigators doubled from 100 to 200 per year.

Table 3. Available data from the council's project databases

Variables	MFR	NFR	TFR	SJFR
Granted	x	x	x	x
Sex	x	x	x	x
Age		x		x
Academic status	x	x		
Institutional affiliation	x	x	x	x
Sub-discipline	x	x	x	x
Year of application	x	x	x	x
Renewal or new project		x		
Rookie or senior		x		
Evaluation score (grade)	x			
Period of data	1994 - 1997	1989 - 1995	1991 - 1996	1992 - 2000
N=	3 057	7 675	4 724	7 510
Number of women	534	927	248	1 873

The problem of self-selection

Earlier studies on careers of men and women scientists have shown that smaller proportions of women apply for research funding, smaller than their numbers in the pool of scientists. The studies on the Wellcome Trust and the British MRC (Grant et al., 1997) proposed that self-selection was a dominant problem. In this paper, we have considered applications to a council as our population. Another approach is to view applications to a research council as a sample of a population of scientists. Then the sampling probability (the probability to apply) for each element is unknown and may not be equal for males and females. These selection effects are yet unknown, but we have made a rough approximation by comparing the share of specific academic positions within applications to the council and within the Swedish research community (i.e. medicine and natural sciences). Table 4 presents ratios of these shares.

In the MFR, the relationship for a full-time professor is almost 1:1, indicating no selection bias. For the other positions, significantly fewer females apply. For senior lecturers and researchers within NFR, the pattern is notably the same. For full-time professors and research assistants, however, larger parts of the female population are actually represented.

Table 4. Ratios between a) female share of applications, and b) female share of research community

Academic position	MFR (1997)	NFR (1993)
Full professor	0.952	1.438
Senior lecturer (associate professor)	0.714	0.768
Assistant professor (postdoc.)	0.884	1.582
Researcher, others	0.675	0.698

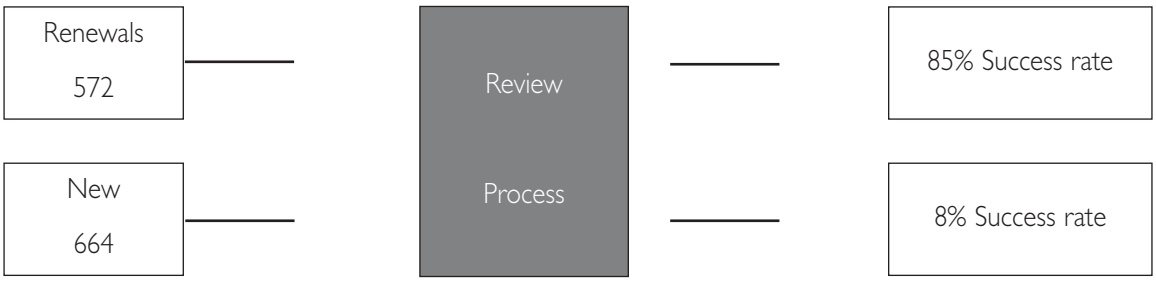
Source: Project databases and Statistics Sweden

Renewals and rookies

An important characteristic of the NFR database is that it includes two different types of projects that should be kept separate in most analyses: new projects and prolonged projects (called renewals). The first category normally includes no more than 10% of the total annual granted project stock. Therefore, it should take about ten years before the full project stock is renewed completely. Prolonged projects are those applications that can be identified as resulting from grants that have received funding during the last two to three years. This indicates a tendency towards 'conservativeness' in council procedures. If an applicant receives funding, the chances of receiving funding in the next round are much higher. This mechanism makes it more difficult for the female population to receive funding since they are largely newcomers in the funding system.

Nilsson (1999) investigated applications sent to the NFR in 1999 from this perspective. His data reveal that proposals resulting from ongoing projects granted by the council had a much higher success rate than other applications (Illustration 1). Another interesting feature of the study is, as Nilsson points out, that the other half of the population of proposals consists of two different categories. First, the council knows many of the applicants because they have received grants or have sent in applications before. Smaller shares of proposals come from applicants that are completely new to the NFR.

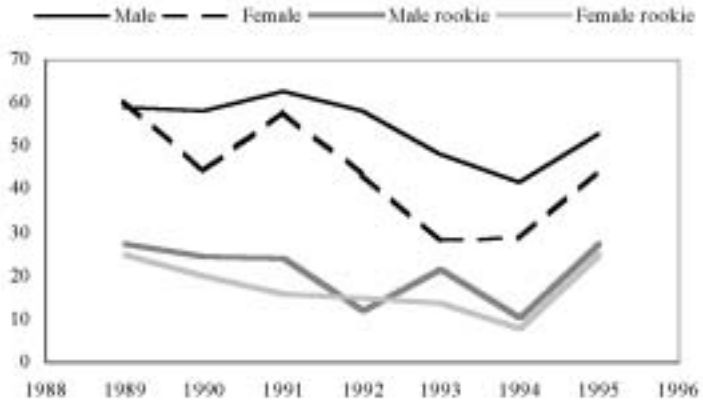
Illustration 1. The review process in 1999 (NFR)



Source: Presentation by Dr Lars M Nilsson

The category "New projects" includes an interesting smaller group consisting of "rookies", i.e. proposals submitted by people applying to the NFR for the first time. We are able to identify these applications in the database. During the period studied (1989-1996), the share of rookies among female applicants varied between 15% and 19%, while the share among the male population was between 5% and 10%. Success rates for rookies and non-rookies differed considerably during the period, but both categories show a downward trend in this respect (Figure 4). As females comprise a larger proportion of rookies, there is an important structural difference between the populations. Rookies of both genders seem to be treated by the same standards, but there is a considerable difference between men and women among those who are non-rookies. To some extent this difference is already explained by the fact that the female population is growing more rapidly than the male population. Consequently, there are differences that are reproduced and extended each year. Up to the time when the male population of principal investigators has been renewed, these differences will remain as a structural feature of the council population.

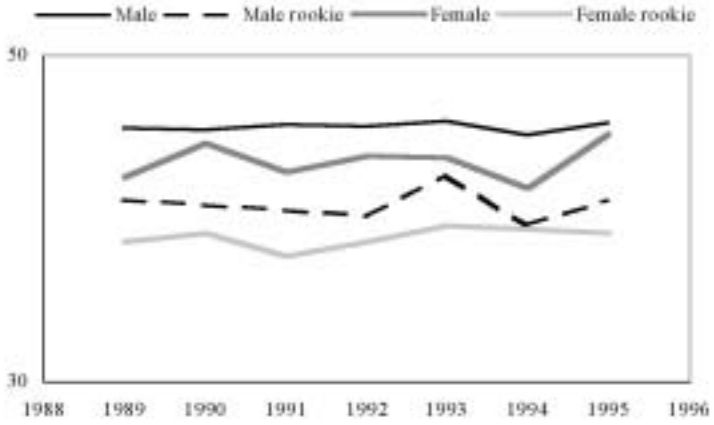
Figure 4. Success rates for rookies and non-rookies by gender 1989-1995



Source: NFR database

An effect of the process described in the last paragraph is that the female population is generally younger than their male counterparts. This is illustrated in Figure 5 where it is apparent that female applicants are younger than male applicants, irrespective of whether or not they are rookies.

Figure 5. Age (mean) at the time of application for rookies and non-rookies by gender



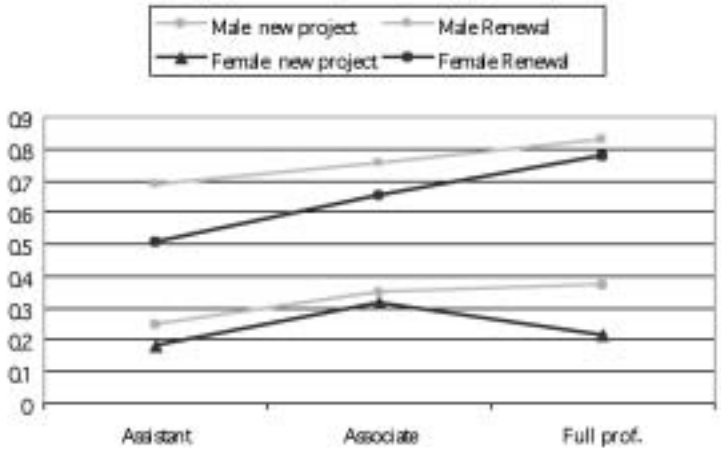
Source: NFR database 1989-1996

New projects and renewals

Figure 4 above indicates that gender differences are small and of marginal importance for rookies, but that there are disparities for other groups of applicants. In this paragraph, we will put the rookies aside and concentrate on proposals sent in by applicants with a record of former applications. For this analysis we will distinguish between new projects and renewals, a distinction indicated by the applicants themselves and noted in the application form.

Looking at success rates, the difference between these types of projects is obvious. Renewals have high rates of success while new projects are markedly lower. Gender differences are about the same for the two groups of applications with 77% and 32% for men and 66% and 24% for women.

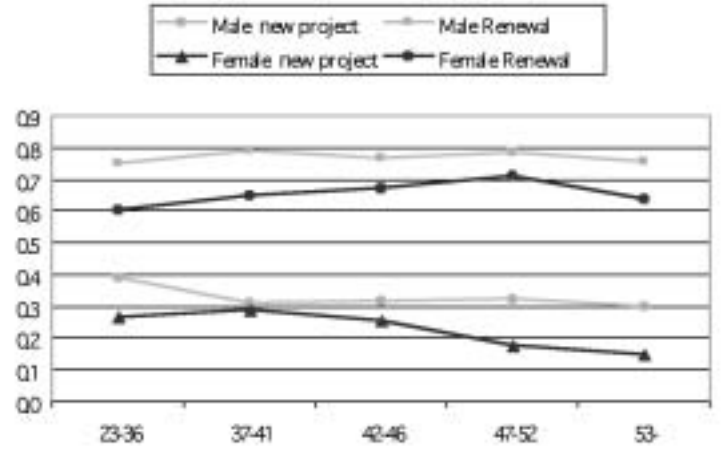
Figure 6. Success rates for status groups and type of project by gender (%)



Notes: NFR 1989-1996 (rookies excluded) N= 6828

The dynamics of the structures described above affect the distribution of grants. For reasons of simplification, all status categories were re-coded into four groups: assistant professor, associate professor, full professor, and others. Controlling for academic status (Figure 6) does not fully explain the differences between men and women. Success rates are lower in all status groups, but there is a tendency for a reduced gap with higher status at least when it comes to renewals. The disadvantage for women is lower for new projects in the ranks of assistant professor and associate professor, but these ranks experience a hard time funding renewed projects. Even if there are signs of convergence, this trend is not supported by the data on age groups presented in Figure 7. Irrespective of age, female disadvantages seem to persist.

Figure 7. Success rates for age groups and type of project by gender (%)

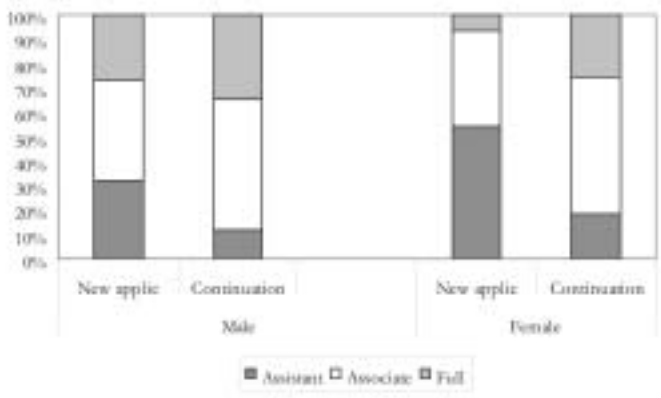


Notes: NFR database 1989-1996, (rookies excluded), N= 6878

Academic status and territorial segregation

The differences between men and women in the NFR population become obvious if they are compared according to the distribution of academic status among new applications and renewals. Since female applications come from younger academics, a large share of new proposals come from assistant professors (Figure 8).

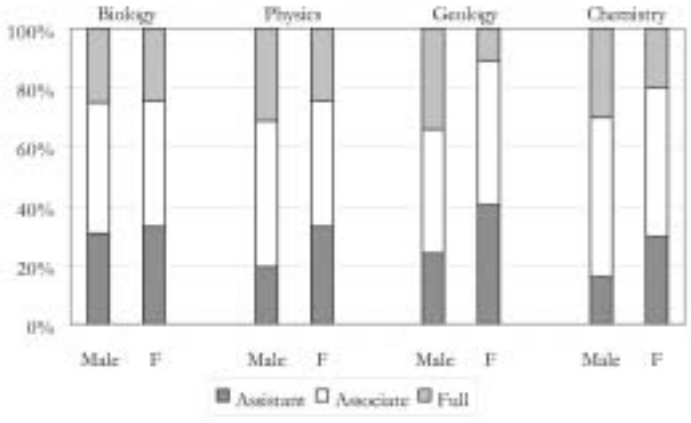
Figure 8. Distribution of gender and status by new and renewed applications



Source: NFR database 1989-1996

Female researchers who applied for funding during the 1990s were younger than their male competitors, and also had lower academic status. This is illustrated in Figure 9 where status is displayed by gender and discipline or programme committees within the NFR. In three out of four committees there are marked differences between men and women. Only the biology committee has an equal structure.

Figure 9. Distribution of status by programme committee and gender 1989-1996

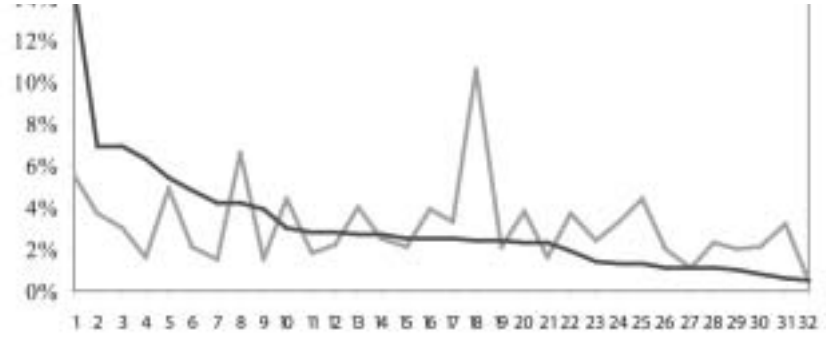


Source: NFR database 1989-1996

Hidden in the last figure is the uneven distribution of men and women by scientific field. Programme committee is an aggregated level that consists of sub-committees in the first place and scientific fields (64) in the second place. Disaggregating the material gives more marked discrepancies between men and women. While men tend to be equally distributed over areas of research, women seem to be concentrated in specific areas. This has been noted in earlier research, and Rossiter (1982) called the phenomena the "territorial segregation" between the sexes.

Figure 10 illustrates this concept with Swedish empirical material. In this figure, the areas of research are presented according to the share of female applicants. To the left are the areas that consist of a large share of females. Displayed in the figure are the relative frequencies of applications.

Figure 10. Territorial distribution by gender (Natural Sci. Res. Council 1989-1996)



Note: N= 6898. Only the 32 largest fields are displayed

Publications and citations

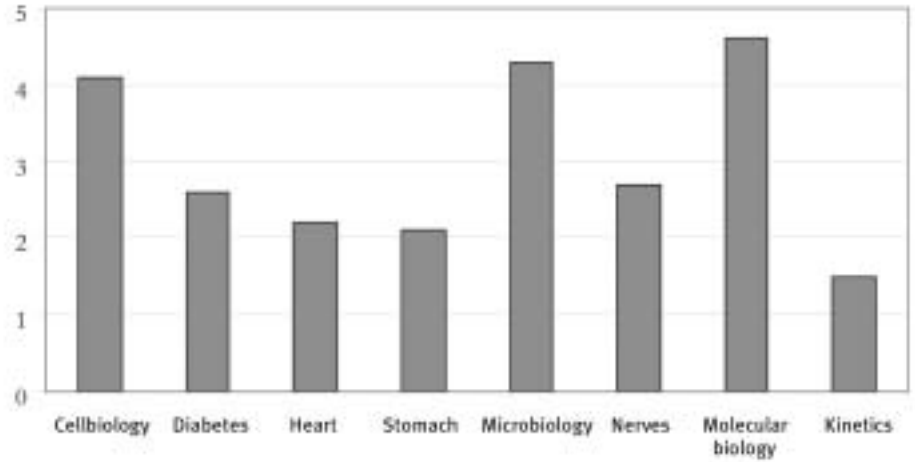
It is commonly assumed that differences in quality among researchers can be measured by publications and citations. A strength of the Wennerås and Wold paper is that they could use data of that type. Scientific productivity and impact measured by bibliometric indicators are two dominant factors that constitute much of the 'track record'. Studies by (Grant et al., 1997 and MFR 1997) have done this using data from applications while also considering gender. Neither of these studies reveals any systematic differences between men and women. The number of articles during a fixed period, impact factor, and citations were similar between the two groups of men and women (Table 5).

Table 5. Number of articles and citations by gender (MFR 1997)

	Men	Women
Number of articles per year	5.7	6.0
Impact factor per year	15.0	16.1
Impact factor per article	2.8	2.8

The MFR 1997 study will be presented in detail here as it is one of the few larger studies on research council applicants that has collected data on publications and citations. Scientific reports submitted together with application for grants formed the basis for the analysis. In May 1996, 320 reports were collected of which 40 came from female principal investigators. In the reports, each applicant lists the articles published as a result of earlier research. No significant gender differences in productivity could be detected. On the contrary, the impression from this investigation is that female researchers are slightly more productive than their male counterparts, which corresponds to earlier research on this subject (for example, Long 1992, Levin & Stephan 1998, Black & Holden 1998, Bourdons 2003). In the article from 1997, Nilsson underlined that the MFR regarded the publications and citations as an unrealistic measure of scientific quality, but thought it could help in analysis on higher aggregate levels (research groups).

Figure 11. Mean impact factor per scientific field

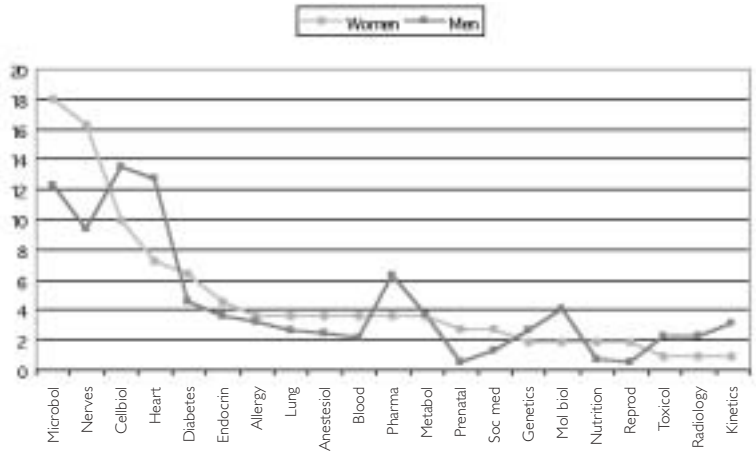


Source: Nilsson (1997)

At the same time, it became obvious for the MFR that there are noticeable differences between different areas of research when it comes to research productivity. While the number of articles per year is stable across areas, the mean impact varies according to the journals active in the fields. This creates large variations between scientific fields. Consequently, this can have profound effects for different categories of applicants. For example, when controlling for impact by age groups, the MFR investigation found that the youngest researchers had the highest mean impact. The study did not want to analyse this aspect any further, but discussed the possible explanation that young researchers were either selected in harsh competition or were concentrated in competitive areas such as molecular biology and microbiology.

Inspired by Asmar (1999), we have studied the territorial distribution of the MFR applicants in 1997. From this we can illustrate that some areas with high impact also have high concentrations of female applicants (Figure 12).

Figure 12. Territorial distribution by gender and field of research (MFR 1997)

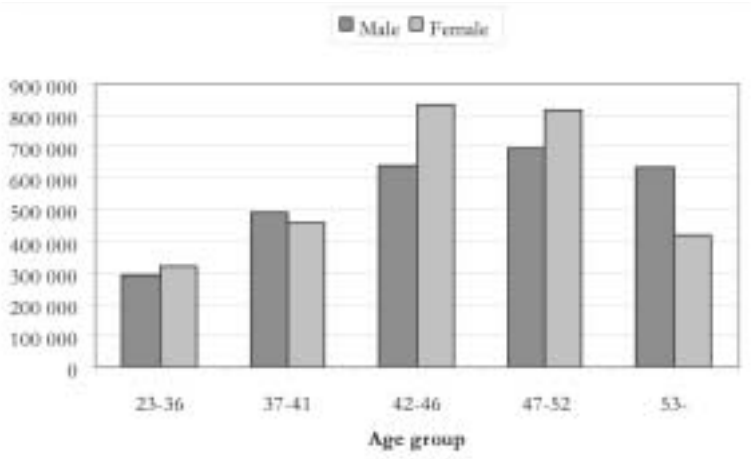


Source: Database

The outcome – distribution of grants

Are there dissimilarities when it comes to the size of grants? We finish the empirical part with a small section on outcomes for those applicants who were successful. There are small differences in the size of awards granted by the NFR during the period in focus. Overall, there is an identical sum allocated per research project, irrespective of gender, but differences exist on the level of age group, as illustrated in Figure 13. Looking closer at project sum awarded per year reveals that younger female rookies are much more successful in receiving large awards, and that older female rookies seem to experience the opposite result. There are no differences as regards the length of projects.

Figure 13. Project grants (SEK) by age group and gender



Source: NFR database 1989-1996

Summary and discussion

The research reported in this paper describes and analyses the gender gap in success rates during the first half of the 1990s. Empirically, the material used is from the Swedish Natural Science Research Council (NFR) and the project database called NAS. This database includes 8 000 applications for research grants and is comparably rich in variables with descriptors for both the application and the applicant. Together with other research council databases, this gives us a unique opportunity to analyse and scrutinise the council procedures in detail. The present paper provides a background and initial analysis using these databases from a gender perspective.

What may first appear to be an external policy effect – the Wold effect, i.e. the closing of the gender gap – can also be explained by structural trends during the period. Most of the councils in our study had already started to close the gap in 1993-1994 and continued to do so until rates were stabilised at a lower level.

However, descriptive statistics reveal a gap in success rates, and the aim of the report is to look further for different structural aspects that can explain the difference. Our first contribution is the distinction between new projects and renewals (prolonged projects). Another aspect concerns new applicants or 'rookies' to the council system. The number of rookies has grown during the period, and the category is of importance for a gender analysis as the proportion of female rookies is comparably high. Also, the analysis shows that there are significant differences in age structure and status (interacting variables) between the groups. Taking this into consideration, some, but not all, of the differences in this material between men and women can be explained.

A major drawback in this type of analysis is the lack of information on publication productivity and citations. The strength of the Wennerås and Wold paper was related to this. To discuss this aspect, we have used an investigation performed in 1997 on applicants to the MFR (the Medical Research Council). Supporting earlier research, this study

concluded that there are no gender differences in productivity, and women appeared to receive more citations than men. Being aware of this, we go on to the phenomena of territorial segregation. The distribution of female applicants appears to be skewed across the scientific fields. In the MFR study, a possible hypothesis is that they were concentrated in fields with high impact. The conclusion from this is that territorial segregation in the NFR should have been a counteracting factor that would have given female applicants higher success rates. But this is not the case in our material. A gender gap still exists and should be further analysed with more sophisticated statistics.

Acknowledgements

This paper draws upon the research project "Universities and the New Research Landscape", funded by The Bank of Sweden Tercentenary Foundation, grant no. 97-5085. We gratefully acknowledge their support. Useful comments and support from all the staff at the Division for Research Policy Analysis at the Swedish Research Council are also gratefully acknowledged.

Notes

(1) Corresponding author, email us@vr.se.

(2) It should be emphasised that the first findings were discussed early in 1995; after that the Ministry of Education financed the study by Wennerås & Wold, and the results were known to the Ministry from mid 1996. Consequently, the Ministry had time to make recommendations to the councils, at least from 1996.

Abbreviations

MFR The Swedish Medical Research Council (MFR in Swedish)

NFR The Natural Science Research Council (NFR)

TFR The Engineering Science Research Council (TFR)

SJFR The Forestry and Agricultural Science Research Council (SJFR)

RALF The Agency for Working Life Studies

RJ The Bank of Sweden tercentenary Foundation

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Gender in the publication process: evidence, explanations, and excellence

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The March 2003 issue of the journal *Feminist Economics* contains an article by Paola Villa and I, first presented at the EUI during the gender studies seminar in 1999-2000. The article, "The Editorial Boards of Italian Economics Journals: Women, Gender, Social Networking", as described by the title, is a collection of data on the sex of an important kind of 'gate-keeper' of science (Husu, this volume) and on other gendered aspects of the publication process. The focus of that article is on collecting evidence which is then presented together with some considerations about the workings of gender in academia. In the present paper, I wish to focus on explanation, on building on that evidence a somewhat more formal theoretical structure, and on suggesting new research and data collection that may help to explain what we found. In the first section, I review the evidence we presented; in section 2, I model a 'game' capable of explaining the outcome; in section 3, I develop a few considerations about my results and further lines of inquiry; this is followed by the conclusions.

1. Gender in editorial boards

The data Paola Villa and I used in that article were collected within a project on the career patterns of Italian women economists, in which a group of Italian women economists tried to pinpoint where the obstacles lay, since women full professors were then (1997) only 5.2% of the total, while women were about 27% at entry level (Carabelli, Parisi and Rosselli 1999). The intended 'audience' of that effort was the Italian economic profession. The research was presented at the annual meetings of the *Società Italiana degli Economisti*, the national association of Italian economists. Our collective aim was then to persuade people who did not see any gender bias and, even less, feel any need to minimise it, of the fact that there was a problem of fairness towards women and of completeness of scientific inquiry, and that it would be in the interest of the profession to address it. We failed in that aim, as I will discuss later.

In that article, we focused on the link between being a member of an editorial board and career advancement. I refer to that article and to a footnote below[1] for a detailed explanation of why we think that studying the editorial process is related to understanding women's career path (or lack thereof). The very different setting of the workshop and of this volume allows me to develop some other considerations about the role that gender plays in the publication process.

In that paper, we simply tabulated all the names of members of editorial boards of 36 economics journals published in Italy from 1970 until 1996. We determined the number of men and women among them, analysed their distribution across different kinds of boards, roles, and fields, and compared these figures with the presence of women in the profession. We also informally interviewed people who were members of boards in order to understand better their operating procedures.

We found the following:

a) Boards are ranked differently. Although not all journals have all three kind of boards, we can identify 'top' boards (usually under the name of '*Scientifico*'), 'middle' boards (usually '*di Direzione*', and 'lower' boards (usually 'di *Redazione*'). We can also identify two professional figures, the director and the editorial secretary who are present in most journals.

Lower boards are where the actual work of writing letters to authors – calling people up, soliciting manuscripts, checking proofs – goes on. Young members of the profession are admitted to lower boards. One of the members is the editorial secretary who can be a young member of the profession or a professional editor. If she is a professional, she will work full- or part-time in an office on behalf of the journal's director. Members of middle boards are representatives of a network of established academics. They are the intellectual core of the journal. Top boards are about honour. People are called to the top board because they are very prominent members of the profession – foreign professors, or Nobel Prize-level scholars, or public personalities – ministers, prime ministers, heads of parties, parliaments, or trade unions. They are not asked to perform any task, just to give witness to the quality of the enterprise. One wonders why they accept. We suspect that it is probably related to their being flattered by the fact that their presence is considered evidence of quality, or else, because it is a favour they give, in exchange for which they may ask favours. Some journals conflate the tasks of two boards, or even three, into one.

b) Women are absent from top boards, almost absent from middle boards, but present in lower boards. At the end of the period we considered, the proportion of women was approximately 20%, i.e. similar to their proportion in the academic profession, in only five of the 36 journals. Of the remainder, there are no women at all in 11 journals, and 14 in which women are involved only as editorial secretaries, and not as academics. In a further six journals, women are on the boards in a marginal position (only on lower boards).

c) The journals that included women were clustered in those fields that J. Nelson defines as "soft" (economic history, history of thought, development) as opposed to the "hard" fields (theory, intended as mathematical modelling of economies, econometrics). This reflects a distribution of women academics among the fields. Women are over-represented in the fields considered soft and under-represented in the hard fields. It appears that men and women have different research interests, and prefer to study different topics. It is this difference that creates a bias in the contents of the discipline. The issue here is not, or not only, that women may network better with other women (proof of which is in the literature (Ferber and Teiman, 1981), but that this difference in interests implies that some questions are deemed less important to investigate because of the sex of the proponent of the inquiry.

d) The journals that included women tended to be among the less hierarchical in that they used just one or two kinds of boards, although there were exceptions.

e) One trend in the period under consideration was that of professionalisation. Professional editorial secretaries replaced young academics. Young academic secretaries were male or female. Professional secretaries were all female. This trend reflected and surpassed the increase in female participation in the labour force in the same years, although the same trend was not reflected by the other professional figure. No woman has ever been *Direttore*, i.e. editor in chief of a journal.

f) A second trend was for a few journals to open up towards the English-speaking profession, presumably in search of a higher status for the journal. This was done either by publishing completely in English, or by using a mix of Italian and English articles, or by including English abstracts. When such restructuring took place, we find instances of Italian women academics being dropped from the boards, while English speaking all-male academics were called in. Also, women secretaries, often with an English surname, were hired.

g) In contrast to this minimal presence of women, we noted the omnipresence of some men. There are quite a number of instances of male economists simultaneously active on the managing boards of two or more journals. Sorting the data by name, we found one man present at the same time in a total of six journals, one man in five journals, ten men in four journals, and 29 in three. While a presence in two journals is almost commonplace among this group of men, it is totally non-existent for women.

In that article, we derived only very restrictive conclusions and limited ourselves to saying that our findings were:

"*...consistent with the view that the selection of members of the two sexes does not reflect the relative scientific ability or publication records of the researchers. As a matter of fact, board membership is the result of a process of pure cooptation, i.e. discretionary selection from above. There are no standard procedures of curriculum evaluation to decide who deserves to serve on a board. Our findings are also consistent with the hypothesis that value judgements based on traditional notions of gender are at work in the selection of new board members, and that women are not yet treated equally. This further suggests that evaluations of women continue to be influenced by value judgements based on traditional gender notions (sexism[2]) that would, in turn, be expected to influence not only the demand of women economists by research institutions (as in traditional discrimination), but their supply as well …*''

…"*This process of selection based on gender stereotypes rather than on scientific merit keeps women at the margin of the network, hinders their professional development, and prevents them from achieving their full scientific potential. The supply of suitable women for high-ranking positions decreases as a result. Thus, the gender gap in economics acquires a supply-side as well as a demand-side component. The journals, in turn, are to a great extent deprived of women's intellectual contribution, which prevents the journals from achieving the highest possible scientific quality, and the discipline from achieving greater objectivity. Our findings suggest that similar processes of selection to top academic positions through informal procedures may work against women in fields other than economics and in other countries. We also suspect, though, that the situation is not the same across fields and countries. Further research should investigate national and field variations under alternative arrangements of the scientific publication process. Our findings also suggest the need for a learned debate focusing on the details of the selection procedures and policies that may foster equality of opportunities for men and women in academia*."

Theoretical considerations

Finding a) is one instance of a very common event, i.e. the fact that, when trying to focus on women and gender we often end up dealing with an entire power structure, and with processes of inclusion and exclusion that were meant to create hierarchies among men and to sort 'the best from the rest'. In these processes, women appear to share the fate of 'imperfect' men, of men of 'lesser value', and therefore are unable to achieve top ranks. Research by Jeff Hearn in this volume also supports this hypothesis. Inclusion begets inclusion and marginalisation begets marginalisation but, at the beginning of the process, there is one instance, repeated many times, in which two scientists face one another and decide who is 'better'. They establish a ranking among themselves and, in the long run this ranking solidifies in institutions run according to a hierarchy.

This finding also introduces the issue of ''honour'', one of the two terms of the anthropological concept of the ''honour-shame'' complex[3]. If you are a man, you gain honour by entering a contest, and exiting as a winner, thus showing you can keep your territory and 'your' women. If you are a woman, you do not score your own honour points, even though your behaviour reflects on the honour of your family's men. Many rituals have been devised historically for men to gain honour, with or without excessive bloodshed, from medieval horseback fights, to today's football games and, I submit, including behaviour in academic seminars, workshops, and even in informal meetings.

As an academic married to another in the same field, I have noticed many times the different approach that colleagues have taken towards each of us in informal interaction. Colleagues would ask my husband about the content of economic papers, or world politics, or... and often start a heated contest of ideas. They would ask me about the children, or Italy, or the summer, chit-chat about which there could be no debate, and would often try to come back to it even if I tried to show my interest for the 'contested' ground. In my reflection about such behaviour, I came to the conclusion that not only was this gender related, but it was also related to the honour-shame complex. Or, in other words, it was a matter of risk and reward, something that may be evaluated using anthropological concepts and the standard tools of game theory.

Entering a game has pay-offs. By holding a conversation with my husband, our male colleagues run the risk of losing, but they could also win the argument. The gain from winning would be higher, the higher the status of my husband in the profession. The loss would be lower, the higher the status of my husband in the profession.

The fact that I am a woman significantly altered the pay-off of having a conversation on the same topics with me. Winning would have a small reward because everybody knows that it is easy to 'beat' women, while losing to a woman would be a heavy loss. Therefore they did not care about debating with me, or with female colleagues[4]. They preferred to debate among men because the winner of each of the ritualised private little 'matches' gains honour. A Nobel Prize is made by an excellent publication record, but also by a very long series of being on the winning side of these interactions with male colleagues. The value of the male who wins increases in the eyes of the male who loses. By not taking part in these interactions, women lose the opportunity to gain reputation and honour. In addition, in each of these matches, information is exchanged on the object of the contest, be it economics or world politics, and women are left 'out of the loop'.

Being excluded from, or limited in the possibility of entering such an intellectual contest produces a progressive marginalisation of women over time. People who are completely marginalised are considered as not even worth talking to. They have no useful information to share, and there is no honour to be gained by winning an intellectual match[5]. 'Lesser' people do not deserve to enter into any kind of discursive interaction.

Let us suppose you are a scholar[6] in charge of running a journal. Being on the board with an important member of the profession gives you the chance to engage in discursive interactions with him during a general meeting of the journal. In addition, top boards are about letting the world know that very honourable people are willing to interact with you as a member of the overall direction of the journal, thereby bolstering your worth.

There is not much honour to be gained by letting the world know that a woman – who, even though she may have written good papers, is still a woman and therefore, in the gender stereotype, is understanding of other people's shortcomings – is willing to engage in discursive interaction with you. Instead, there is a lot to lose if you really have to interact with this woman who is good and therefore you run the risk of losing.

We can make use of the standard tools of game-theory to represent this situation by a pay-off matrix.

	Compete with a woman	Compete with a man
Honour-gains from winning	SMALL	LARGE
Honour-losses from losing	LARGE	SMALL

The matrix represents the value of both the gains and losses of honour (horizontal lines) in the two cases, a man engaging in intellectual debate with a woman (column 1) or with a man (column 2). If we assume that winning requires the same effort, and the probability of winning the argument is the same, the model shows that the probability of winning a large amount of honour is greatest by engaging in intellectual conversation with a man. (The effect is compounded if you add the obvious fact that the chances of winning an intellectual argument with a man are way higher than with a woman, or the effort lower!)

The model shows that, if you have to choose between inviting on to an editorial board a man or a woman who have the same intellectual standing, it is not wise to invite the woman, from the point of view of accruing honour. It will be convenient to invite the woman only if her standing in the profession is higher than that of her colleague. How much higher, depends on the exact difference between "LARGE" and "SMALL" in the matrix.

The model also indicates how one may need interdisciplinary interaction to explain gender-related behaviour affecting networking and excellence. This model makes use of a concept from anthropology (honour) and a concept from game theory (matrix of payments of a game, mathematical economics), to talk about the organization of science (which is usually fare for sociologists).

2. Further lines of enquiry

Our work, limited in its scope, is capable of indicating new lines of research which may be fruitful. The first is about hierarchy-building mechanisms; the second is about the partial overlap of scientific interests between men and women.

Hierarchy-building mechanisms

Editorial boards are part of the power structure in economics and play a major role in defining excellence, since excellence is defined mostly as the amount and 'quality' of publications. This power structure also has other parts. There are professors, and there are those in charge of hiring new professors to the national university system. These different parts are more or less accessible to women, according to the mechanisms through which they are formed.

For example, professors in Italy may have been chosen, either by a *concorso* or by an *idoneità*. A *concorso* is a competition in which whoever fulfils some basic requirements may apply, and a committee selects the best applicants. The number of 'winners' is fixed in advance. An *idoneità*, on the other hand, is a mechanism through which the committee chooses from the applicants who have passed a given threshold of ability, and the number of winners *is open-ended*, i.e. is not predetermined. The members of the committee itself can be chosen in two ways: either elected by peers or appointed by a faculty council.

In schooling, the general method of screening to select which children will go on to higher education is an open-ended selection. The teachers set an exam and whoever reaches the grade can continue. Selection can be open-ended (anybody who fulfils the criteria will pass) or close-ended, in which case it turns into a competition. The process of screening for jobs is a process of close-ended selection: only a given number of positions are available, candidates are ranked according to who is best as regards a given set of criteria, and those who are ranked highest will fill the position (or at least have the opportunity to do so).

Other hierarchies are formed according to other methods. For example, the conclave, the mechanism through which the Pope and the cardinals of the Catholic Church are chosen, is a double mechanism of cooptation and election: the cardinals choose the Pope by election, and the Pope appoints new cardinals by cooptation.
In general, in academia but also in other institutional structures, we can identify three main mechanisms used to divide those who will be at the top from those who will remain at the bottom: cooptation, selection, and election[7], thus defined:

In the case of co-optation, those at the top choose from those at the bottom who will join the ranks of the powerful.

In the case of selection, those at the top draw up criteria: anybody fulfilling those criteria will be admitted to the above rank. There are two alternatives: a) open-ended selection: criteria are given, threshold of satisfactory performance is fixed, and the number of winners can vary. b) Fixed winners selection: criteria are given, the number of winners is fixed, and the threshold of performance needed to win is flexible according to the quality of the applicants.

In the case of election, a set of peers chooses among themselves who is to rise to the higher rank.

The question of the relationship between mechanisms of making leadership choices and the outcomes of these choices with respect to women and minorities might be well worth exploring in some detail. My pre-scientific intuition is that women, and in general minorities, are favoured more by open-ended selection than by close-ended

selection, and least by cooptation, while the result of an electoral process will depend on how candidacies are set up. Cooptation has the advantage of being more amenable to the establishment of quotas. Quotas, however, are themselves amenable to tokenism. In addition, as demonstrated in the US by the affirmative action quotas in admission to universities, the quota clashes with the principle of selection according to criteria, and appears as unfair according to that principle, rather than fair in readdressing an imbalance of opportunity[8].

In awaiting the results of this research, I think it may be fruitful to question the way editorial boards of scientific journals, other than those in Italy and in economics, are made up. It could give us important insights into the policy prescriptions that may break the hysteresis[9] of masculine domination in academia, and in other fields, including electoral politics. And it could improve our personal understanding of an art – hierarchy-building, setting up committees, choosing who is in charge, and allocating responsibilities – that many men in universities and in other institutions seem to master as if it were natural from a very early age, while many women do not.

Partial overlapping of scientific interests between men and women

As regards this dimension, I would like to draw your attention to our findings under c) [1] which repeat squarely for economics the more general fact that men and women's research interests do not overlap completely. Although there are many women interested in pure formal theory, on average, women seem more interested in 'soft' fields, and this choice is 'gendered'.[10] The fields chosen by women are either forms of storytelling, or a field (development) where until recently the preoccupation to help and nurture those in need was an underlying driving force. Although theory is just a particular form of storytelling, many people see a difference between just telling a story and producing Theory, capital T.

With respect to theory, telling stories is a more pluralist practice: I tell my story, you tell your story, the issue is not who has the right story, nor whether they are compatible, but which story better resonates in the minds and hearts of the audience. There are criteria and practices for judgements of interpretation that make one story better than another story, and even truer than another story. Disciplinary boundaries of object and method are still binding, so that in each discipline one should make use only of the elements that are allowed in the discipline to tell his/her story: In history, besides a story one needs a narrative and data from the archives; in economics, one needs to tell a story by models of utility maximisation and statistical modelling of collected data, and so on[11]. The relationship between two different stories is not as exclusive as that between two competing Theories. Theory, instead, is considered by many of its practitioners as exclusive. There is going to be only one true Theory. Thus, making theory becomes a form of contest. Whether the final product of many connected minds, which is The Theory, will owe more to the thinking of this person or the other person, is the result of a battle of minds. Great men in science are those whose thought matters more in building The Theory, overcoming the less clear, less logical, or less statistically validated thought of someone else. Competing theories exist, but in the end one Theory's life must entail all other's other theories death by falsehood. And the "excellent" theorist is the one whose theory's "truth" survives the assaults of all the others.[12] There are pros and cons for the two practices, making Theory and storytelling.

Without entering into these, on the basis of these considerations, I think it would be important to look more systematically at men and women scientists' research styles, trying to map the relations between gender preferences in topic and method, the evolution of disciplinary boundaries, and the pursuit of excellence.

Conclusions

Excellence can be defined only within a given set of criteria. We cannot define the criteria too narrowly or we will end up deciding that I am most excellent at being myself. We cannot define them too broadly because then nobody

can be more excellent than anybody else. If differences were to be accepted not ranked, there would no longer be any such thing as 'excellence'. We need to redefine excellence in a way that we, male and female scientists, all agree; and in a way such that a man and a woman have the same chances of being found excellent. If this happens, then a roughly equal amount of men and women will be found to be excellent.

In the social sciences, one aspect of this redefinition may be to gerrymander[13] the boundaries of the disciplines within which we define excellence. Greater recognition of interdisciplinarity is long overdue. An alternative many of us have found, in order to feel if not excellent, then at least visible, has been to define a field by its object, gender studies, and to accept contributions from many disciplines to it, but we have yet to devise a method for ranking them as the trouble gender scholars have in evaluating one another's contributions often reveals.

Our paper on the editorial boards and the research of which it was part had a very problematic acceptance indeed. The research was presented at the annual national meeting of Italian economists, but although we felt that we had demonstrated very carefully, according to the standard tools of validation of the trade, our point that women were not treated equally by the Italian academia, and we did not persuade anybody who was not previously persuaded that such was the case. Women's presence on editorial boards has increased very little, and the subsequent rounds of competitions for professorships have seen 'school' and 'network' lines trump most other criteria, with some residual attention being paid to the number of publications. Gender was not an explicit issue, which means it was a hidden issue which worked as it always had.

During a private conversation, a prominent Italian professor told me that it may be that women were discriminated against, but that if he had to list the first ten problems with the Italian university system, the unfair treatment of women would not be amongst them.

I suspect that we also need a preliminary campaign for academia to confront the fact that if women do not attain excellence in science in a number proportionate to their number in the rank and file, then there is a problem not only for women but for science. The issue is not fairness towards women but openness and completeness of the scientific endeavour. The mechanisms that exclude women are the same as those that make the university system inefficient and conservative, and slow down progress towards knowledge.

Notes

(1) I wish to stress that we neither assumed, nor proved, nor attempted to prove in that paper, any correlation between the number of women on the boards and the number of articles published by women authors. We claimed instead that being an editorial board member is good for the career of the said board member. We mentioned the existence of "*at least three different reasons why membership on editorial boards is good for one's career.*

- *Board meetings provide an important opportunity to contact colleagues, to exchange information about opportunities, opinions about issues, and to gain awareness of recent research to the benefit of members' own research. Editorial board members are in a better position, with respect to other academics, to set research agendas and to learn about new ideas and research trends. Becoming a board member helps one to become a better scientist, and therefore enhances one's career.*
- *Editorial boards are self-perpetuating bodies. Members are chosen because they have good relations with those who choose them. Active board members, who solicit manuscripts and manage the screening process through contacts with the referees, act as a node in the crucial network through which research turns into publications. Their visibility increases as they have reason to contact people who, consequently, become aware of their presence in the profession. Thus, membership on editorial boards is both an indicator of successful networking and a means of enhancing it further.*
- *Members of editorial boards have the power to decide what is worth publishing. This is particularly obvious when there is no refereeing process - as is still the case in some Italian journals. They can, however, influence the process, even when a double-blind refereeing process is used. They are aware of the fact that a manuscript is more likely to be accepted if it is sent to referee Y rather than to referee X, because they know the research interest of the referee and the topic of the paper, may be aware of existing relations between the author and the referee, or simply the views and personality traits of the referee. Even editors striving for maximum transparency and fairness still have the power to select referees, and being a referee is a sign of status in the profession, as witnessed by the common practice to report in CVs: 'referee for such and such journal'. Colleagues will therefore treat members of editorial boards with due respect. They become an asset for their friends, colleagues, network, and school of thought. Presence on boards is both an indicator of high status, and increases one's status.*" (Addis and Villa, 2003)

(2) Sexism in this case is too strong a word because, in its resemblance to racism, it refers to the general belief that all people of the other gender – as all people of other ethnicities in racism – are inherently inferior. As documented in Albelda (1997), most economists are willing to admit that in general women are worth as much as men. Nonetheless, it appears that when one of them, or a group of them, must select who to admit to positions of power, by co-opting them, they tend to select (and trust) mostly other men. *This note is in the original article. We added the word sexism and this note upon request of an editor.*

(3) Anthropologists have studied the "honour-shame" complex in Mediterranean cultures, that set of beliefs for which a woman's virginity if unmarried and chastity when married bear witness to the "honour" of the male members of their family, which depends on being able to keep other males off their territories, their wives and daughters. References needed here – you might also see Thomas Scheff on pride and shame, e.g. 1994, "Emotions and identity: A theory of ethnic nationalism" in Craig Calhoun (ed) Social Theory and the Politics of Identity, Oxford: Blackwell

(4) And, to be fair, gender habits may well cause women to shy away from entering intellectual debate with men, especially 'top' scientists.

(5) An indirect confirmation of this theory came to me by none other than French President Jacques Chirac's wife. She recently said of Hillary Clinton: "I admire her very much, she is a real professional politician, when she enters a room she immediately understand who is worth talking to."

(6) A scholar of any sex! A woman who wanted to run a journal would face the same pay-off matrix, unless she consciously decided otherwise!

(7) There is, in addition, the method characteristic of the feudal age – succession – where the children of the powerful become powerful in their turn, and although still alive and well in Italian universities, we will not speak about it here.

(8) We are in a situation, in Italy, were mechanisms of selection seem to have helped women to overcome men in higher education (more women than men in Italy gain a university degree) and have provoked a sort of backlash in the form of diminishing market value accorded to human capital.

(9) This term is commonplace for macroeconomists after the work of Blanchard on European unemployment but unknown in other disciplines: it means permanence of the effects of a shock through time,

(10) The "gender" characters of the fields of economics chosen by women are described in depth by Nelson (1996).

(11) On theory as a particular form of storytelling, see Strassmann (1993, 1993b), Williams (1993).

(12) If we look only within academia, mathematically formalised knowledge, empirically validated by statistics, appears to be prevailing quickly upon non-formalised, non-statistically substantiated knowledge, knowledge that expresses its truths in the frame of storytelling in a natural language, making use of metaphor, analogy, and other techniques to resonate with the feelings of the audience. This is connected to the fact that formalised knowledge is more amenable to the process of falsification, although storytelling is where hypotheses, false and true alike, are born. In economics, storytelling among academics has been almost completely pruned out. What storytelling still exists among economists, or among sociologists and historians, is often used by theoreticians as a primordial broth from which to fish out the elements that, by the transubstantiation performed by the theoretician with the help of a mathematical model, then enter true "science". If we look at society at large, the picture is much less clear, but this is not within the object of this paper. Storytelling about economics to the public so as to influence policy-making is very fashionable. We are now in a country where government economic policy is greatly influenced by a political force which has persuaded a set of voters of the completely unsubstantiated story of a Padanian race economically exploited by the Italian state. We may therefore wonder whether there is a link between the two trends, the hyper-formalisation of science and the total wantonness of the public discourse. But all this would lead us away from our main topic

(13) Gerrymander is an American slang term referring to redefining the boundaries of electoral districts to favour one or the other party. It comes from the name of Eldridge Gerry who gave a district the shape of a salamander.

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Engendered opinions in placement committee decisions

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There are indications that a greater number of obstacles, and more complex ones, are faced by women within the scientific community than by men. Indeed, studies have shown that gender-bias in evaluation processes is one of the influencing aspects that must be considered and addressed. Terms such as "hierarchal segregation" and "the leaky pipelines" have been used to describe the various forms of discrimination women continuously come up against at all levels in the university community The result of this is that the higher up the job, the less likely it is to be held by a woman.

The study presented here set out to investigate some of the inside mechanisms, and especially that of university evaluation processes, which contribute to "the leaky pipelines". The study was conducted and organised by the Committee on Equal Rights at the University of Iceland in 2001–2002 with the support of the Rector's office[1]. The aim was to investigate whether individuals who underwent the traditional evaluation process for applications to the positions of professor, assistant professors, or associate professors at the university were discriminated against, and whether the reports were gender-biased in any way. A broader goal, however, was to increase gender awareness of university staff and add to the knowledge on how gender, and gender discourse, operates within the scientific community.

Women in science – an overview

Numerous studies have revealed that women are at a disadvantage within the university community and that they are not represented in top positions (Einarsdóttir, 2000, "A study of the Status of Women Faculty in Science at MIT", 1999, Schiebinger, 1999, Toren, 2000, Todd & Bird, 2000). However, it is often maintained that for women to gain equal position with men within universities is simply a matter of time. Accordingly, the increased number of women who have completed a university education should automatically lead to an increase in the number of women in the higher echelons of the academic community. Recent figures and research, however, indicate a different situation (see e.g. *The ETAN report*, 2000, Krummacher, 1999, Toren, 2000, Sonnert, Gerhard & Holton, 1996). Thus women in the position of professor have, on average, increased in number by 0.5% to 1% annually in the Member States of the European Union. If no action is taken and we simply wait for the gender ratio to even itself out, decades will pass before women and men are equally represented in the top layers of the academic community. Attention has therefore been focused increasingly on obstacles within the system, including the evaluation process itself. Various studies have shown that gender is one of the influencing factors in scientific evaluation processes and that placement committees find it difficult to evaluate capability without taking account of the applicant's gender (Fürst, 1988, Wold & Wennerås, 1997, Steinpreis, Anders, & Ritzke, 1999). Results to the contrary were shown in a study conducted by two Swedish scholars, Riis and Lindber, in 1996. They came to the conclusion that valuation of applicants in the academic recruitment system was not the critical point for gender equality within Swedish higher education (see Linberg, Riis & Wallin, 2003). Another pair of Swedish scientists, Wold and Wennerås, however, stunned the scientific community when they demonstrated that there was an extremely strong gender-linked and nepotistic inclination in the allocation of grants from the Health Sciences Research Fund in Sweden. Their study pressured the scientific world into reviewing current ideas that placement committees consisting of peers from the scientific community were immune to the influence of gender bias or nepotism (Wold & Wennerås, 1997). According to Londa Schiebinger, a US science history professor, the problem proves to be a great deal more complicated. She uses the term *hierarchal segregation* (Schiebinger, 1999: 33) to account for the

fact that a greater number of obstacles, and more complex ones, are faced by women within the academia than by men. Another metaphor, often used when discussing the drop-out rate of women from university, particularly in the sciences, is "*the leaky pipelines*". The metaphor was used in the ETAN report, published in 2000, but the report addresses the position of women within the scientific community and it shows that the drop-out rate of women from the sciences is both systematic and escalating.

Lastly, a note should be taken of Schiebinger's conclusion, i.e. that increasing the number of women does not, in and of itself, change the academic world. Gender awareness and a political will to change the current organisation and circumstances are also necessary, and this is where both men and women who support equality can make a difference. It is therefore important to maintain an active equal rights education process that reaches into each of the fields of academia. It is necessary to ensure the continued growth and development of gender studies so that current and future generations taking their first steps into the working world learn to adopt a critical, gender-conscious view and do not accept the present situation where equal rights are upheld in word only, and not in deed.

Equal rights at the University of Iceland

University of Iceland Equal Rights Programme 2000-2004 defines the equal rights policies of the university. It clearly stipulates that equal rights principles are to be integrated into all university activities and that the equal rights work is part of the quality improvements within the academic and scientific communities[2].

The emphasis on education in recent decades has led to an increase in the number of students at the University of Iceland, especially in the number of women, who currently represent about 60% of the students. However, women are still at a disadvantage within the university community. They are a minority in committees, boards and councils and thus are not adequately involved in management and policy-making. Furthermore, in general, women are not reaching the highest positions. They account for approximately a quarter of the total number of permanently employed teachers at the university, and the number of women decreases as the ladder extends higher.

Table 1. The number of teachers at the University of Iceland 2001 by gender and position[3]

	Total number	Number of women	Percentage of women
Professors	168	19	11%
Associate Professors	139	37	27%
Assistant Professors	82	42	51%
Permanently employed part-time teachers	23	10	43%
Total	**412**	**108**	**26%**

In the study presented, 35 mixed-gender placement committee decisions were examined dating from 1997-1999 from most of the faculties at the University of Iceland. The total number of evaluation reports for that period was 132, but only those reports that had at least one male and one female applicant were examined. The study revealed that the Icelandic academic community is not immune to the influence of gender bias, any more than comparable institutions abroad. Often the gender bias is much deeper, however. The gender-biased landscape in education and employment is obvious and it is both the cause and consequence of a gender-based choice of study and employment. Gender divisions in a business and academic environment can, in some cases, have the end result that

there are very few specially trained and capable individuals of the minority gender available within a particular field. The gender difference may also have the result that people belonging to the minority gender in particular areas of expertise do not apply for advertised positions. As a result of that, the placement committees' decisions report examined here were quite unevenly distributed between departments. The highest percentage of applications examined were from the humanities and social sciences, while disciplines with strong gender biases, like business and economics, with the gender ratio of 24/1 for the permanent employed teaching staff in 2001, or nursing with the reverse ratio of 2/17, never entered the study, as no applications from these departments qualified the study criteria of gender-mixed applications[4]. The University of Iceland's Equal Rights Programme, however, proposes various actions which all attempt to react to this problem[5].

Another factor worth pointing out here, although it was not the focus of the research, is the uneven gender balance of the placement committees examined. The placement committees at the University of Iceland are not anonymous. Each committee consists of three individuals: one is appointed by the university, one by the ministry of education, and the third one is nominated by the department in question. Before a committee can formally be established, the names of the three nominees are sent out to all applicants for approval. This measure is taken in order to avoid conflicts of interest later on in the process. The strong male bias in the 35 committees examined was striking. Out of the total of 105 placement committee members, only 23 were women, or 22%. It can be argued that the placement committees are the gate-keepers of the university, thus the low ratio of women is alarming as it reflects the low representation of women within the academic community. It should be noted, however, that this problem has already been addressed – in 2000, a new clause was added to the university regulations in order to ensure more gender-balanced committees[6]

Research methods

The study investigated whether individuals who went through the traditional evaluation process for permanent teaching positions at the University of Iceland in 1997-1999 were discriminated against in the traditional evaluation process of the university. The study was a qualitative research, and the methods of critical discourse analysis were applied to a close reading of gender-mixed evaluation reports in order to examine whether gender formed a part of the interpretation framework used to assess academic qualifications. The use of language was examined to determine whether it was in any way gendered, or if stereotypes and social prejudgments concerning men and women influenced the attitudes of the committees and their deliberations concerning individuals, their activities and work. Key terms in the analysis were *gender bias* and *gendered language.* Gendered language was defined as language where gender-biased stereotypes and social anticipations regarding men and women, femininity and masculinity, coloured and shaped discussions about individuals, their activities and work, so that gender becomes a part of the interpretative framework used to assess scientific capability. At first, the research involved a close reading of all the texts to hand, then all qualitative descriptions, adjectives and assessment of applicants, positive or negative, were singled out from the text for further analysis. The placement committee reports varied enormously in tone and style, hence, it was important to compare the assessments of all the applicants for each position, and to concentrate on the similarities and the discrepancies that could be found within each report. At the next level, a broader comparison was made between different reports, and between disciplines. At that stage, dominating themes that characterised the evaluation reports were identified for further analysis. It soon became apparent that a narrow focus on the words used, or a single non-neutral adjective was not enough, as gender biases or gender discrimination often manifested themselves through the use of deprecation and silence or the things not said. A broader focus on tone, form and language style is thus necessary in order to account for gender biases in the evaluation process. This broader approach could possibly explain why conclusions of this study contradict the findings of Linderman and Riees in 1996 (see, Linberg, Riis & Wallin, 2003).

Engendered placement committee decisions – main characteristics

Certain symptoms of gender bias were discovered in the evaluations reports examined. Those gendered characteristics have been divided into five distinct, but overlapping, categories. Those are: *1) gender-biased language, 2) deprecation and silencing, 3) criticism, fault-finding and corrections, 4) marginalisation of gender-based approaches, and 5) the time issue, i.e. lifetime vs. research time.* Moreover, the findings suggest that maybe it is necessary to rethink the concept of discrimination within universities. Instead of looking for negative discrimination of women, a focus on a 'positive discrimination of men' or 'male bonus' might be more fruitful.

Another important conclusion that needs to be highlighted is that gender bias, or *gendering*, is too complicated a phenomenon to be restricted to biological sex only, or to discussions of women specifically. Scott's argument that "gender is a primary way of signifying relationships of power" (Scott, 1988:42) was thus confirmed by this study. It revealed that gender-biased language, as well as gendered characteristics, were frequently used to raise or lower the social weight of the individual under discussion, irrespective of his or her biological sex. Gendered discourse is thus used to symbolise different relationships of power. Overall, it may be said that the more male-oriented a discussion was, the more positive the evaluation. It is important to reiterate that reference to so called "feminine characteristics" in the evaluation does not mean that they were present in the evaluation of all women, or exclusively in the evaluation of female applicants, but rather that they were generally more conspicuous in discussions of female than male candidates. Thus, there were cases where gender-biased or "feminine characteristics" were used to feminise "undesirable" male applicants and thereby cast doubt upon their credibility as scientists. Also, there were cases where qualified women were discussed in a manner that was in all respects very "masculine", hence, positive. By using gender-bias language and/or gendered characteristics, which is usually done unconsciously, the confidence of the scientific community in the individuals concerned may be raised or lowered. What follows is a brief explanation of the main characteristics of each of the five categories. Because the study is based on a close reading of texts, and the exact nuances, flavour and tone can easily have been lost or misinterpreted in translation, each of the categories will be described without the use of direct quotations from the actual placement committee's reports which, with few exception, were written in Icelandic.

Gender-biased language

In many ways, this is the most obvious category. It relates to the use of gendered language or gendered metaphors which are based on, or refer to, stereotypes of men and women. The most common manifestation of this is figurative language referring to activities or characteristics that are traditionally attributed to one gender rather than another. A clear example of gender-biased metaphors could be seen in one of the evaluation reports where the male applicant was said to have been "wrestling with a difficult task" while it was said about the women applicant, that she "had something knitting". Overall, masculine language is usually more prominent and held in greater respect, perhaps because the sciences have traditionally been defined as a masculine field and therefore we are used to regarding scientific language as masculine. Definitions of what is masculine (positive) and feminine (negative) may overlap, however, depending on faculty and discipline.

Deprecation and silencing

The main characteristic of gender-biased discussion in placement committee decisions was not gender-biased language, but rather what is referred to in this report as *deprecation and silencing*. The work and the research contributions by 'femininised' candidates generally received less attention than those of their 'masculine' counterparts. Deprecation is thus used to describe when contributions from women applicants were "silenced". Their work received less discussion, and deprecating terms or remarks were commonly used to minimise their scientific abilities. Thus, references were made to *summaries* rather than *original research*, to give an example of the

belittling phrases used. The works of men or "masculine" applicants, on the other hand, were commonly discussed extensively and often without much criticism.

Criticism, fault-finding and corrections

This category is in many ways closely related to the last one. The study revealed that negative criticism, fault-finding, correction of material and error seeking was more commonly used in discussions on the scientific contributions of women rather than men. Thus, evaluation committees were more likely to criticise the work of female candidates openly. The criticism spans everything from the correction of spelling and grammar, to questioning the methodology and the research questions in use. It should be noted that the study did not attempt to evaluate the substantive basis for the criticism of individual work, but asked only whether the knowledge of an applicant's gender in any way influenced the methods used in evaluation. The principal conclusion was that corrections and fault-finding concerning language use, approach and style often replaced an overall examination of the research projects of women or "femininised" applicants.

Marginalisation of gender-based approaches

This category deals specifically with discussions by placement committees of subjects relating to gender and women's studies. The research revealed that women's or gender studies were often treated as borderline studies, and research topics that focused on women or gender issues were rated as "interesting", but not central for the field in question. An example thereof was the way in which placement committees tended to characterise research that focused on women as "*important pioneering work*" while at the same time referring to them as a "*narrow and limited field*". Here, it should be noted that the gender, and in particular the gender awareness, of the placement committee members was of paramount importance. Furthermore, there were some indications of certain gender-based differences depending on whether the applicants in question were male or female. It seemed as if when men employed gender-based views this was often seen as a sign of intellectual broad-mindedness and daring, while comparable research carried out by women scientists was in some way down-played and dismissed as narrow and marginal research interest. However, the examples studied were far too few to allow any generalisation on that point.

Effects of time – lifetime vs. research time

Emphasis on steady and continuous research activity is one of the key elements examined in placement committee decisions. Any breaks or delays in the academic career were generally seen as obstacles, as the lifetime and research-time of a scientist are supposed to be harmonised. In the ETAN report, mentioned above, it is maintained that the world of science is masculine and that the dominant criterion, "the scientist", is male. To succeed, women need to live their lives like men; their life-clock, which is often influenced by childbearing and a stronger sense of family responsibility, is therefore a deviation which, at best, is taken into account but never seen as the natural norm. Some of the placement committees specifically noted delays in the research careers of individuals (usually women), and sometimes it could be read between the lines that a pause in the careers of women was due to childbirth. There were even instances where the fires of such associative thinking were stoked by references to subsequent fertile *research periods*. The emphasis on a steady and unbroken scientific carrier, however, appeared to be more prominent in the 'hard sciences' than in the arts or social sciences.

Conclusions

As stated earlier, gender-bias in placement committees reports is not limited to the gender of the subject under discussion but may also appear as an instrument to raise or lower the academic worth of applicants, irrespective of biological sex. The study of 35 placement committee decisions from 1997-1999 from the University of Iceland, demonstrated that gender-biased language or gendered characteristics were among the factors that could affect the evaluation process. There is no denying that there were other factors that often operated simultaneously, which also had an impact and complicated the overall picture drawn up here. These were aspects such as *insider connections, department and faculty politics*, and *the nationality of applicants*. That only highlights the fact that gender discrimination does not occur in isolation, but is closely linked to other forms of discrimination. Hence, gendered discourse is frequently used to symbolise other kinds of hierarchies, unrelated to gender or biological sex. Strong gender awareness and recognition of the diverse and often subtle forms that gender bias and gender (in)equality can take can therefore help to increase sensitivity to and awareness of other forms of discrimination that also take place. In this context, it is worth examining the thoughts of Philippe Busquin, EU Research Commissioner, concerning the relationship between gender and diversity. He pointed out that the gender-blindness of the scientific discourse not only favours one gender by taking no account of gender differences, but it also tends to ignore other kinds of differences. Including gender in the analysis thus leads to the discovery of subtleties in generally accepted and generalising terms. It also brings into consideration the differences in behaviour, interests, and needs within the groups of males and females, instead of considering them as homogeneous entities. Consequently, it challenges the scientific rhetoric which aims to describe reality in terms of universal principles[7].

One of the principal conclusions that can be drawn from the study discussed here, and from comparable studies outside Iceland, is the necessity of redefining gender discrimination within the scientific community. Instead of concentrating on the negative characteristics of gender-bias, where women suffer discrimination, it is necessary to consider what has been called "the positive discrimination in favour of men" or "male bonus". It appears that women are required to make more of an effort to prove themselves; their research and works are examined more critically and it is more common for discussions about women to be neutral and grudging while men are given a "pat on the back" or words of praise for their works and experience. This extra pat on the back and bit of praise can subsequently become a decisive factor when the time comes to choose between two equally qualified applicants. Gendered discourse thus serves as a tool to maintain and reproduce the deeply rooted power structures within the scientific discourse, both symbolically and de facto, by reproducing the definition of science as a masculine field, and *The Scientist* as male.

The principal aim of the study was to increase the sensitivity of university people to gender-based stereotypes that may colour the evaluation process and thereby contribute to gender bias and discrimination. By doing that the study adds to the knowledge on how processes of *gendering* can operate at a more systematic level within the scientific community. In today's information society, where education is becoming more and more important to meet growing competition in a world of increasing globalisation, it is of paramount importance for universities to ensure diversity and equality of the sexes in all fields. The EU's Sixth Framework Programme, from 2002 to 2006, addresses the necessity of correcting the gender imbalance in the criteria for scientific excellence as a part of the modernisation of science and research. An increase in the number of women in the sciences does not, therefore, concern equality alone but is, in fact, important to science. The challenge facing the scientific community, however, is to use the findings of this, and other similar studies, to reveal the gender bias and thus strengthen the scientific quality of placement committee decisions.

Notes

(1) The study was supervised by Rósa Erlingsdóttir, the Equal Rights Officer at the University of Iceland, Thorgerdur Einarsdóttir, assistant professor in gender studies at the University of Iceland and Sigridur Thorgeirsdóttir, associate professor in philosophy at the University of Iceland.

(2) University of Iceland Equal Rights Program 2000–2004. http://www.hi.is/stjorn/jafnrettisn/Egual%20Rights%20program.html

(3) Number of employees at the University of Iceland. Total number of teachers calculated from personnel records in September 2001. Website of the personnel department at the University of Iceland. http://www.hi.is/stjorn/starf/fjoldi.html

(4) These numbers were gathered from the homepages for the departments of business and economics, and the department of nursing in 2001.

(5) University of Iceland Equal Rights Program 2000–2004. http://www.hi.is/stjorn/jafnrettisn/Egual%20Rights%20program.html

(6) Regulation for the University of Iceland, Chapter III, Article 42. This provision is consistent with Article 20 of Act No. 96/2000 on the Equal Status and Equal Rights of Women and Men and reads as follows: "Efforts shall be made, wherever possible, to ensure approximately equal participation of women and men in committees, boards and councils working under the auspices of state and local authorities. Attention shall be called to this fact whenever nominations are requested for the committees, boards and councils in question."

(7) CORDIS focus (184) published by the EU, 5 November 2001, pp. 1-2. The quote here is from Irma Erlingsdóttir, Irma, Thorgeirsdóttir, Sigrídur & Einarsdóttir, Thorgerdur (2002). See also http://www.cordis.lu/focus/en/

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Research assessment in the Netherlands
A case study

Ilja Mottier

Women have improved their socio-economic position in Dutch society in the past 40 years. Over 50% are engaged in the labour market, although the majority are in part-time employment. Nevertheless, women still face a glass ceiling as far as higher positions in institutions are concerned. This goes for industry as well as for academia.

The percentages of women in the three fixed positions in Dutch universities are, at 1 January 2003, 23.3% of assistant professors are women, 13.7% of associate professors, and 8.1% of full professors[1]. Considerable research has gone into understanding the reasons for this situation. Apart from general causes which are valid for all professions, such as the shortage or high cost of childcare facilities, fiscal and/or welfare regimes, several causes have been investigated which are specific to the university. In particular, research points to mechanisms which lead to the top of an academic ladder, such as networks, number of publications, and quality of work.

Barbara van Balen[2] studied the mechanism of social closure and how it may produce social exclusion, in which she pointed to the role of informal networks. Women tend to work and publish with women, men with men, but since there are fewer women and they are generally at lower levels, women's networks tend to be smaller and less significant. In another study, Van Vianen[3] looked at the number of publications. Men in the same functions as women have more publications, but they tend to be older and have more full-time employment. If we control these factors, the difference disappears. As for the quality of the individual researcher, the Wennerås and Wold study[4] which showed differences in the way women and men were evaluated while applying for fellowships, has lead to similar research in the Netherlands by Margo Brouns[5] which partly supported the Swedish findings. There is also a research assessment exercise in the Netherlands which looks at quality at programme level, including groups of researchers.

Quality in itself is a concept with multiple dimensions – the definition and use of this concept has been questioned, in particular in relation to gender. As Isabel Hoving argues[6], a broad concept of quality is best fitted to foster innovation; but in practice, an internal-academic model of evaluation is used the most, based on past performance. Margo Brouns analysed the concept of quality in relation to women's studies[7]. Women's studies have challenged traditional views of science. Brouns distinguishes between two models of looking at science (science in general, not only natural science), the Olympus model and the Agora model[8]. The Olympus model looks at science as an autonomous social system which produces objective, superior knowledge. Within this view, knowledge ultimately represents reality. Once developed within its own system, that knowledge is diffused to society. A growing awareness of the social construction of knowledge lead to the Agora model which connects praxis and knowledge as mutually dependent. The Agora model does not send knowledge from top to bottom, but localises the production of new knowledge in a network of social institutions in which researchers participate. The researcher does not operate alone, as in the Olympus model, but in networks with actors from all spheres of society. Referring to the Agora model, Brouns proposes a definition for quality: quality is pluriformity of connections. The scientific and social meaning of women's studies lies in a diversity of objectives: the generation of new knowledge, discussion with peers, input into public debate, etc.

Women's studies and gender across disciplines

If we look at gender and/in research, in most countries in the West we see the emergence of women's studies, on the one hand, and gender mainstreaming, on the other. Seen historically, interest in gender usually leads at first to the development of separate women's studies programmes and projects. In a second stage comes the awareness that women's studies alone cannot deal with all the gender issues and that gender should also be integrated in all the 'traditional' disciplines – physics, medicine, technology, history, economics, etc. This is called 'gender mainstreaming'. At the institutional level, the discussion then becomes: how to mainstream gender in the disciplines and, at the same time, maintain women's studies. Now, if we return to the question of research evaluation, we can draw parallels with the previous discussion. Do we evaluate women's studies projects as 'Agora' projects – considering networks, multidisciplinarity, practical application – and the means here: all the other projects as 'Olympus' projects – on their 'purely scientific' merit; or do we evaluate all programmes with gender-sensitive criteria in order to make them gender relevant?

Mainstreaming gender in evaluation

Brouns sketched the Agora model for women's studies. If we really support gender mainstreaming, this model should be used for *all* the disciplines. From a gender point of view, continuing along this line, all projects should be evaluated following 'Agora' criteria. What the Agora criteria are in the respective disciplines can be derived from critical gender analysis of the disciplines, from surveys about attitudes and aspirations, and from biographies of women researchers.[9] A good example of criteria can be found in the gender analyses in the EU's Fifth Framework Programme.[10]

The knowledge required to draw up a catalogue of issues to be taken into account has been developed. But does it reach those who carry out evaluation?

Case study

Let us take as a case study a series of recent research assessments in the Netherlands and look at how they proceeded and dealt with gender issues.

All 14 Dutch universities organised themselves into the Association of Universities (VSNU). This Association has no formal power over universities but deals with issues of common interest. It organises evaluations of teaching and research. We will deal with the research assessments here.

The results are public, they are published in book form and can be found on the internet. We will deal with some reports published at the VSNU website.[11]

In 2002, research assessments were published for business administration and management, together with economics, for chemistry and chemical engineering, for earth sciences, and for motion studies. Assessments combining teaching and research were made for aerospace engineering and industrial design. In 2001, research assessments were published for socio-cultural sciences, and pedagogics and education. This analysis looked at business administration and economics, chemistry, earth sciences in 2002, and at socio-cultural sciences, and pedagogics and education in 2001.

If we take out 'socio-cultural sciences', the other four show the following pattern: the committees were all male (as far as this could be deduced from the text). The reports deal with the content of the research programme. No mention is made of gender, not even in the committee on pedagogics and education, not even where it is known that gender is part of the programme, or of the expertise of the researchers. Some of the committees show strong

concern for societal issues and the responsibility of the academy towards society in general, e.g. the committee on earth sciences. It is also positive about multi-disciplinarity. The committee makes recommendations about what should receive more attention (e.g. water science 'because of its historical and political importance').

How is quality defined? The general concepts of the evaluation protocol are quality, productivity, relevance and visibility, but the committees have considerable freedom in interpreting the criteria. The committee on 'pedagogics and education' defines quality as: scientific interest, originality of the approach, innovative theoretical contributions and methods, and relevance of the research for societal issues. In spite of this broad definition, the spirit of the report is towards fundamental research. It is striking that most project leaders active in policy-advising receive relatively low scores. There is a chapter on human resources in each report, but the position of women researchers is never mentioned.

The report on socio-cultural sciences is different. Among the seven members, there is one woman, and she has gender expertise. Socio-cultural sciences comprise women's studies. Therefore, five women's studies programmes are included. Not only does the committee look at specific gender programmes, but it also finds evidence of the awareness of mainstreaming gender in other programmes: "*It is good that a gender dimension is fully integrated into most aspects of the programme rather than being a separate field of study*." (p. 34)

Another striking feature of the reports, from a gender point of view, is the quasi-total absence of reference to gender. The committees are composed of scholars, mostly professors, with long-standing reputations, and they are almost exclusively male. Women tend to be younger in science, but are there no experienced female professors at all? Human resources remarks mainly concern the size of the research groups, or remarks about the poor tenure perspectives of researchers, irrespective of gender.

Committees bring in their own preferences and perspectives – some look more at theoretical research, while others are more open to societal issues. They judge what they see in front of them. Although committees are invited to do so, they seldom make remarks about what they did *not* find, or about what *more* should be done in the future.

The research protocols

These procedures reflect a rather narrow view of what science is. It is time to turn to the primary basis for the work of these committees, the research protocol.[12] The assessments are performed on the basis of research protocols. In 2003, the "Assessment of research quality; protocol 1998" was still in use. (The 1998 protocol mentions four aspects to be assessed: academic quality (quality of the outcome, position in national and international context); academic productivity (taking into account the input of human resources); relevance of the research programme (significance of the research, which may include societal and/or technological impact); and long-term viability (viability of problem areas, and prospects). Little is said about the qualifications of the members of the committee.[13] Although the report does mention different kinds of research, such as monodisciplinary versus inter/multi-disciplinary research, and knowledge- versus society-driven research, these concerns receive scant attention. This protocol forms the basis of the research assessments that have been analysed above. It is therefore not surprising that we find little about gender in the assessment reports: if the basic document is 'gender blind', it demands extra awareness and effort to ensure it is taken into consideration in the reports by discipline. Not only is the protocol gender blind, it is also only weakly sensitive to societal issues.

Meanwhile, a *new protocol* has been formulated for 2003-2009, which will soon become operational.[14] Is there any change between the two documents?

There definitely is 'improvement' in the sense that there is more attention paid to socio-economic goals, to the multi- or trans-disciplinary nature of scientific work: in these cases, standards of quality and relevance may differ.

The report is also aware of the distinction between scientific areas, such as natural sciences, social sciences, humanities, medical sciences, etc. The main criteria are: quality (international recognition and innovative potential); productivity (scientific output); relevance (scientific and socio-economic impact); and sustainability and feasibility (flexibility, management and leadership).

In further detailing these criteria, we do find some promising remarks. Quality refers to peer judgment, although this is not elaborated upon. As regards productivity, the report shows awareness that quantitative approaches have gained credibility in the physical and life sciences, but remain problematic in the social sciences and humanities. Citation indexes are also problematic in emerging areas. Under *relevance*, the protocol mentions explicitly both impact on the international scientific community and on society at large, in the sense of research having a socio-economic impact. The human resources part of *sustainability and feasibility* could be expanded. It asks about the quality of the (human) resources of a programme and where there is room for improvement. Here the text could be more explicit on the careers of young researchers, female and male, as this is also related to the quality of the management and the strategy of the institute.[15]

The protocol also contains a chapter on the committee. The committee is: 1) fully competent; 2) completely independent from the research institutes involved; and 3) made legitimate and accepted by the scientific community and by society. A profile can be drawn of future members. This is all the protocol writes. It is obvious that more suggestions could be made here (e.g. in terms of gender and/or specific expertise). Overall, this protocol has a more modern tone than the previous one. It seems less exclusively academic, and is more open to societal issues. It is aware of criticisms, especially those expressed by researchers from the social sciences and the humanities toward a too quantitative approach; it is more open to multidisciplinarity and emerging issues (all issues raised in discussions on gender in research).

Statistical information on research staff is not disaggregated by gender. This may be not always necessary at the level of a programme, but these statistics are often used later for other aims, so we lose information if we do not include it at the outset.

With the changes in the new protocol, things are moving more in the direction of Agora science. Whether or not this will actually happen, and whether this will lead to more gender sensitiveness, will be seen in the near future when the protocol is used in new research assessments. From our experience so far, one can be sceptical about this. Experience shows that committees are mostly gender blind, when gender is not explicitly mentioned or at stake. We saw how well the committee operated in the case of the socio-cultural sciences, where women's studies were visible and obvious. The new protocol leaves discretion to the committees. It would be much better if the protocol were more explicit, gave examples, and put gender and societal issues in the checklists, so that committee members do not need to ask themselves *if* they are going to include gender, but *how*.

Recommendations

This exercise started from the hypothesis that attention to gender would be absent from the research assessment. And indeed, whilst it was limited, there were interesting instances of gender awareness. The new research protocol goes in a positive direction and is more open-minded than the previous one. It makes room for gender issues but an effort should be made once again to introduce gender in a more concrete way, and to add gender expertise to the profile of committee members.

What does this exercise teach us about measuring scientific excellence in a gender sensitive way? Once again, we find it is confirmed that if we do not integrate gender explicitly in our work – in the programme, in the research proposals, and in the evaluation criteria – it will not feature. Therefore, one can formulate the following recommendations:

1. Scientific excellence must be redefined as including gender relevance.
2. In human resource issues, more attention should be given to the researchers (rather than project directors) and their position and career perspectives. Personnel statistics need to be disaggregated by gender.
3. Special attention is needed in the checklists in research protocols. If gender is not a criterion from the start, it will not appear in the evaluation.
4. In order to detect gender issues, gender expertise must be present amongst the members of evaluation committees.

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Notes

(1) WOPI 2003, VSNU: www.vsnu.nl

(2) Balen, B. van., *Vrouwen in de wetenschappelijke arena; sociale sluiting in de universiteit*, Amsterdam, Het Spinhuis, 2001.

(3) Referred to in A. van Vianen, "Competitie om de schaarse functies: de publicatie-meetlat". In: *De universiteit als modern mannenklooster*. Ed. B. van Balen en A. Fischer, Amsterdam, Het Spinhuis, 1998.

(4) Wennerås, Ch., and A. Wold,'Nepotism and sexism in peer-review', *Nature,* 1997, no. 387, 341-343.

(5) Brouns, M. *De kwaliteit van het oordeel*, Utrecht, Nederlands Genootschap Vrouwenstudies, 1999.

(6) Bosch, M., I. Hoving, and G. Wekker, *In het hart van de wetenschap; naar Total E-quality in de universiteit*, Den Haag, SDU, 1999.

(7) Brouns, M., and H. Harbers. *Kwaliteit in meervoud; reflecties op kwaliteiten van vrouwenstudies in Nederland*, 's-Gravenhage, VUGA, 1994.

(8) Brouns, M. "Wetenschap tussen Olympus en Agora", *Tijdschrift voor Genderstudies* 4(2001) nr. 4, 24-33.

(9) Which does not mean that female researchers or all female researchers are the only ones sensitive to gender issues … but it helps.

(10) *Gender impact assessment studies*; synthesis report 2001. The synthesis report is available at: www.cordis.lu/improving/women/documents.htm. Separate analyses were made for all the programmes in the Fifth Framework Programme.

(11) The whole research assessment exercise is in English. The reports can be found at www.vsnu.nl under 'Kwaliteitszorg'. There were no 2003 research assessments published on the internet until September 2003.

(12) *Assessment of research quality; protocol* 1998: www.vsnu.nl under 'Kwaliteitszorg-protocollen'.

(13) But we found awareness of the possibility of female membership in the phrase: "the chair... his/her commentary (Protocol 1998, p. 11).

(14) *Standard evaluation protocol 2003-2009 for public research organizations*: www.vsnu.nl under 'Kwaliteitszorg-protocollen'.

(15) The protocol offers the possibility to treat personnel issues confidentially and not in a public report. So perhaps more will be said in future than we know.

Measuring excellence in scientific research: The UK Research Assessment Exercise

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Introduction

There has been considerable attention paid in recent years to patterns of vertical, horizontal and contractual gender segregation in European universities and research institutes. The Women and Science Unit of the European Commission's Directorate-General for Research, in particular, has commissioned a series of reports and statistical projects that have drawn attention to variations in the distribution of women and men in the academy. Indeed, whatever the country (with its own culture and equality policies), whatever the discipline, and whatever the proportion of women among the undergraduate population in that discipline, men are selected disproportionately to their numbers in the recruitment pool at every stage on the career ladder (Osborn et al., 2000). This 'leaky pipeline' through which women disappear is not just a characteristic of career paths for scientists[1] in the public sector. Women in industrial research are similarly stratified into a narrow range of branches of science, engineering and technology, and are rarely found in senior decision-making positions or on boards of companies in industrial research (Rübsamen-Waigmann et al., 2003). Moreover, women are far from being represented in equal numbers on the boards of charities, foundations and research councils that allocate research funding, nor on the appointment panels for senior academic positions.[2] They are rare among the gate-keepers to membership of prestigious scientific societies and extremely rare among the committees that adjudicate on who shall have scientific prizes (Osborn et al., 2000).

All of this means that there are few women in senior decision-making structures that decide what constitutes excellence in scientific research. This is clearly poor in equality terms, but does it make any difference to the science that is conducted? Many scientists, including women, are quick to maintain that science is gender neutral, that universities and research institutes are merit-driven, liberal institutions, that scientific 'objectivity' cannot be gender-biased. Indeed, to claim gender plays a role in the allocation of positions in scientific hierarchies both challenges the position of those in senior scientific positions and strikes at the heart of values of neutrality held dear by scientists. But there are, of course, counter claims to this view, especially from gender studies scholars who, in the light of the overwhelming evidence of gender segregation in science, see this as false consciousness. Moreover, the path-breaking study by Wennerås and Wold (1997), revealing patronage and nepotism at the heart of the supposedly neutral peer review system, makes it clear that the social construction of scientific excellence is indeed gendered.

But to what extent does gender play a role in the construction and indeed measurement of scientific excellence? Is it the case that a better gender balance would alter the focus of science itself? Would it affect what gets funded and for what, or the way that science is conducted? This paper cannot adequately answer all these questions. But it seeks to make a contribution to the debate by drawing attention to aspects of the role of gender in one of the longest established national tools for measuring scientific quality: the UK's Research Assessment Exercise (RAE).

The RAE is a quinquennial peer review based audit mechanism designed to assess the quality of research in the higher education sector. It is used to inform decisions of the Higher Education Funding Councils[3] for the different parts of the UK on their allocation of Government funds for supporting research in the various Higher Education Institutions (HEIs). It is a resource allocation tool that has had a significant impact on the work culture and careers

of academics. This paper focuses on the question to what extent is or could the RAE be a tool for exacerbating gender divisions or promoting gender equality?

The UK Research Assessment Exercise

The UK RAE was developed in the context of a Conservative Government's concern to enhance quality in the public sector. The Government was of the view that the way to do this was to mimic elements of how the private sector operated in the public sector. Hence, it encouraged competition between providers in the public service for scarce resources. Complex social processes, such as health care, education and research, were subjected to various quasi-market and other mechanisms designed to generate competition and 'drive up' standards (Le Grand and Bartlett 1993). In 1986, the first RAE, essentially a competition for funding for research, was held. There were subsequent RAEs in 1989, 1992, and 1996 and, most recently, under the Labour Government, in 2001. The next RAE, currently being designed, will probably be in 2007/8.

The RAE system is held in high regard in the research community in the UK, and indeed abroad, largely because of its emphasis on peer review for judging quality. Panels made up of senior academics, including some international scholars and 'users' of research, are appointed by the Funding Councils for each subject area (known as 'units of assessment'). There were 68 such panels in 2001. Each panel produces a set of criteria for its subject, and HEIs then make submissions to as many panels as are appropriate for their particular spread of subjects. At the heart of the exercise, the best four publications of each 'research active' member of staff are submitted for the assessment period. The 'volume' or proportion of staff returned, as well as the quality of their work, are key variables considered alongside other statistically based indicators for each unit of assessment, such as research income, PhD completions, and an assessment of departmental research strategies. Each panel then gives a score to each unit of assessment that makes a submission to it. The 2001 RAE was based on a seven-point scale, the score awarded being determined by how much of the work submitted in each return was regarded as reaching national or international standards of excellence. Funding for research for each HEI for the next five-year period is then allocated based on the scores. Low-scoring units receive nothing.

Needless to say, the RAE has become a significant feature of British academic culture and discourse (Keenoy 2003). Colleagues' performance becomes as much a matter of concern as one's own: whether they are returned and the quality of their work can affect one's own future level of resourcing for research and indeed, even one's job security, as departments with low scores may have to close. It affects human resource policies: recruitment, retention and promotion processes now inevitably involve close attention being paid as to whether the applicant will be capable of being 'returned' in the next RAE and whether they will enhance the national/international score. Senior managers in HEIs, mindful that funding is based on performance in this exercise, of course develop strategies designed to seek to maximise scores. Encouraging 'non-returnable' colleagues to retire or resign, or to be redesignated as 'teaching only' or administrative staff, on the one hand, and headhunting international stars who might enhance the score achieved, on the other, are now common practice. Universities have become highly strategic in their approach to the RAE.

Gender and the RAE

So, is there a gender dimension to the RAE? The discussion here focuses on five issues. First, how are women's studies and gender studies, highly feminised interdisciplinary areas of research, treated in the RAE? Secondly, what is the gender balance of the panels? Thirdly, what is the gender of those deemed 'research active'? Fourthly, what is the impact of the default use of the male model of labour market participation underpinning the design of the RAE? Finally, the issue of the gender dimension of research itself is raised.

Interdisciplinary women's studies and gender studies

In the last 30 years, there has been a significant growth in feminist scholarships in areas that can broadly be defined as women's studies and gender studies. This is reflected in a growth of journals in the field. However, the treatment of interdisciplinary studies in general by the RAE is problematic. While the guidelines indicate that, in the case of interdisciplinary work, a subject panel may consult other panels in assessing its quality, there appears to be little faith in the research community that this works effectively. There is no separate panel for this area despite the fact that there is a sizeable body of work across a range of disciplines that could be described as falling into it. Even if there were, heads of units of assessment are unlikely to want to lose the staff who might be returned under such a panel from their own single subject based unit. Administratively, it would be difficult to divide the financial return from a virtual interdisciplinary unit to the 'host' departments. The lack of a panel for this research field, it could be argued, makes research centres in women's studies and gender studies somewhat vulnerable financially. In short, the RAE in effect, given the way HEIs develop their strategies to maximise their financial returns, arguably undermines an interdisciplinary field that is the focus for a considerable concentration of research by women.

Panel members

In the first instance, what is the gender make-up of the panels and the many more sub-panels that make up the assessors of the RAE? How has this changed over time? What is the gender of the panel chairs? This analysis has not been undertaken and published although it should be feasible with the co-operation of the funding councils. It is clear, however, that it is overwhelmingly senior academics who are selected, especially in the case of panel chairs, and that women comprise less than 10% of the UK professoriat, the main recruitment pool (Osborn et al., 2000).

How are panel members and chairs selected? The funding councils select them, taking into consideration nominations from, for example, learned societies. There is an attempt to ensure participation from the different sectors (essentially the older and newer universities which historically have had a rather different mission). However, there is a lack of transparency in the appointment system.

'Research active' staff

Are men more likely to be returned to the RAE than women? Here again, both up-to-date research and published gender disaggregated longitudinal data are not readily available, but it should be possible to address these questions through an analysis of statistics from the Higher Education Statistics Agency. Evidence from the 1996 exercise shows that women are less likely to be returned than men (Association of University Teachers 2000). It is clear that about two-thirds of academics in UK universities are male (64%). The proportion of British academics employed on a fixed-term contract has grown considerably in recent years. Women predominate among them (50% were employed on fixed-term contracts in 1998/9, compared with 38% of men). However, unusually, women only constitute just over half the part-time staff (53%). This is because many male academics retire and are re-employed to teach on a part-time basis (Knights and Richards 2003: 216). (All statistics are from Higher Education Statistics Agency data, cited in AUT 2000 and Knights and Richards 2003).

Results from one survey of a sample of universities suggest that 78% of male and 66% of female academics were returned in the 2001 RAE. The figures are far closer higher up the hierarchy, with 97% of women and 96% of men professors being returned compared with 56% of women and 69% of men lecturers (Anderson and Fox 2003).

It is clear that not to be returned in a RAE is career blighting. Employability is couched in terms of whether the return for the individual is likely to assist the unit of assessment in ensuring a high proportion of staff of national or international research excellence status.

Women are more likely to be among those academics on fixed-term contracts or working part-time as a norm (rather than as a pre-retirement phase). Hence, they are more likely to be among those employees preoccupied with finding the next contract or who are time-poor. This reduces quality time for research.

Assumptions about labour market participation

Guidelines issued to HEIs by RAE panels sought to ensure that academics who worked part-time, had returned after career breaks, had entered late into the profession, and so on, were treated appropriately and fairly. In other words, the guidelines sought to ensure that those who did not conform to the male pattern of full-time continuous employment in the profession were not penalised and could be returned. HEIs were able to return them, making it clear where, for example, they were identifying fewer than four publications, that their return was pro rata to their full-time equivalent employment during the period.

What is not clear is how HEIs interpreted these guidelines. There may well have been some nervousness that, despite the encouragement to return such staff, that in the mass of detail, the panels would miss the 'pro rata' status. In other words, there may well have been an inclination to 'play safe', by only returning staff with a full-time profile. Again, research is needed to test this supposition.

There was a concern that the need to return as many staff as possible in the RAE (the 'volume' factor) would discourage HEIs from hiring some academics who could not be returned. These would include those at the start of their career and those returning to academic life after a career break. Neither category would have had time to generate sufficient quality publications to be returned. The stakes were high: HEIs were undoubtedly tempted to work the system as best they could. This may have meant making decisions that disproportionately excluded those at the beginning of their careers and women returners.

The problems faced by women returners was picked up in the Greenfield report (Greenfield et al., 2002), commissioned by the Secretary of State for Trade and Industry, on the position of women in science, engineering and technology in the UK. The Greenfield report made recommendations aimed at easing the re-entry of such women into the academy, which have been taken up by the Government. However, whether such an initiative will be sufficient to counter the conservatism of the universities in their employing practices, a conservatism that is almost certainly exacerbated by the RAE, remains to be seen.

In short, there are structural reasons why women were disproportionately excluded from panels and from those returned to the RAE. Institutional sexism is clearly a feature of universities affecting the gendered distribution of office and lab space in MIT (Bailyn 2003) to the gender pay gap in the UK academy (Bett 1999). It undoubtedly also plays a part in the decision-making processes that determine who and what is 'excellent'.

The Roberts review of research assessment

The Higher Education Funding Councils commissioned a *post hoc* review of the 2001 RAE, chaired by Sir Gareth Roberts. The review group received a considerable number of written submissions, discussed emerging conclusions at public meetings, held meetings with stakeholder groups, and commissioned research, for example, on international approaches to research assessment (Von Tunzelmann and Kraemer Mbula (2003). The review, published in May 2003, recommended a number of major reforms to the system (Roberts 2003). It is not the purpose of this paper to present all the proposals for change but to focus upon those elements that concern the gendered construction of science.

In the first instance, peer review remains the cornerstone of proposals for the next RAE. However, it was decided to have far fewer panels in the future, covering broader areas. They would be assisted in their work by sub-panels. Crucially, for our purposes, for the first time the proposal is to advertise positions on these panels. Evidence from

a variety of settings demonstrates that women tend to have a higher rate of success in appointments where procedures are open and transparent than in ones that rely on networks and/or headhunters. This recommendation, then, is likely to improve the proportion of women among panel members, bearing in mind that they remain a small minority of those in the recruitment pool of senior academics.

Secondly, Recommendation 15 includes a proposal that:

- the funding councils should undertake or commission further work to ensure that proposals for research assessment taken as a whole:
  do not create or facilitate discrimination on the grounds of age, sexual ordination, political belief, disability, gender, race or religion.

This is, in part, in anticipation of the planned national legislation to ensure compliance with the Amsterdam Treaty for those equality dimensions for which it does not already exist. However, it is also to explore whether concerns that have been raised about gender and the RAE in the past are at risk of re-emerging in the next one. The Higher Education Funding Councils have commissioned six studies on the position of women in higher education both in the UK and internationally. This will enable the 'gender proofing' of RAE guidelines, an essential component of the gender mainstreaming approach (Osborn et al., 2000; Stevens and Van Lamoen 2001).

Thirdly, the Review Committee was all too aware that HEIs will seek to ensure that they represent the best profiles they can and that this can lead to some unintended consequences, some of which, as we have seen, may be deleterious to new academics and to women. Hence, Recommendation 15 also specified that the Funding Councils should:

- undertake or commission further work to ensure that proposals for research assessment taken as a whole:
  are not likely to have behavioural effects which the funding councils consider unacceptable.

This is an attempt to anticipate undesirable unintended consequences of the RAE, for example, on women.

A fourth element of the proposals for the next RAE is that part of universities' returns should include accounts of their measures to develop a research culture that focuses on career development. This is deliberately aimed at reversing the indirect bias against new and returning academics. Such measures should specifically include details about equal opportunities policies.

All these recommendations, if acted upon in designing the next RAE, to an extent should help to allay what many feel is indirect discrimination against women in the RAE, in the practice of universities if not in the intent of the funding councils. However, it should be reiterated that this is an under-researched area and the data are indicative rather than conclusive.

Conclusion

The RAE has its critics, but the consultations carried out by the Roberts review (2003) illustrated that the academic community is broadly supportive of it, given that peer review is at its centre, as a resource allocation tool. However, the implications of the RAE, both for individuals, academics departments and HEIs, are considerable. It may be that the RAE, albeit inadvertently, contributes to institutionalised sexism. It is largely men who determine who will be returned, it is largely men who are returned, and the work of those returned is largely judged by men. Scientific work undertaken by women is under-represented in that being judged. Women scientists are under-represented among those making judgements.

For the next RAE, more transparency in recruitment to panels and panel chairs may improve the gender balance. The research which has been commissioned may help in the identification of forms of direct or indirect discrimination that can be avoided in the fine detail of the design of the next RAE. 'Gender proofing' the design of

the assessment exercise should go further and ensure that the RAE is closer to being gender neutral in its effects. 'Measuring' aspects of the infrastructure designed to foster career development and ensure equality of opportunity will focus the attention of universities on these areas of human resource management.

However, all this is just a beginning. The issue of gender-bias in the construction of scientific excellence would need to examine the issue of gender in research itself[4]. The Directorate-General for Research has begun to do this work, looking *post hoc* at projects funded in the Fifth Framework Programme[5]. It became clear that, in some cases, the gender dimension had been ignored altogether. A classic case is the clinical testing only on men of drugs that are then prescribed to women. This is not just gender-biased science; it is poor science. Not until this element of gender-bias in research is addressed by research funding bodies shall we be able to feel more confident that it is the genuinely gender neutral exercise we should like it to be.

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Notes

(1) Scientists in this paper are taken to include those working in science, engineering and technology, the social sciences and the humanities.

(2) Although a few European Union Member States have laws to safeguard gender balance minimum on public committees.

(3) There are separate Funding Councils for England, Scotland, Wales and Northern Ireland. The same RAE is used across the UK but the separate Funding Councils may use the results in slightly different ways to allocate resources according to the needs of the respective countries.

(4) Some preliminary work on the extent to which research addresses equality issues has been conducted by Sheila Ridell of the University of Edinburgh and Charlotte Pearson of the University of Glasgow, commissioned by the Women and Equality Unit in the Department of Trade and Industry.

(5) There are seven reports of the gender impact assessment of each specific programme of the Fifth Framework Programme: http://www.cordis.lu/improving/women/docuemnts.htm

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Does gender matter in scientific leadership?

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Women in science: a flawed career

For years, excellence in science has been considered neutral from a gender point of view. Gender differences and gaps in scientific careers, research outputs, earnings and funding have been overlooked, and equal opportunities between men and women in scientific and academic careers have not been considered a priority in setting up scientific policies. The situation is now changing due to the availability of better gender sensitive data at European level which allow for improving the understanding of the mechanisms underlying women's under-representations in the higher echelons of science.

We should consider that percentage figures of women and men in science are necessary but not sufficient to explain why women hold so few of the top grades. From this point of view, it is very important to introduce indicators measuring segregation in the scientific occupations, in particular, vertical segregation. The measurement of vertical segregation reflects a country's ability to optimise female human resources. It investigates women's share of top positions in scientific careers which indicates the level of female participation at the highest decision-making levels.

The recent European Commission's ETAN report (2000) on women in the sciences has shown that in all European countries there are few women in top university and research positions. It stresses that this under-representation of women compromises the attainment of excellence in scientific work. Furthermore, it represents a waste of talent because men and women are evaluated and considered on the basis of their sex and not their work.

Most of the measurements concerning the scarcity of women at the top of the academic and scientific hierarchy, for example, feminisation ratios, are cross-sectional period indicators. Because of the observed increase in the access to science by younger cohorts of women, it could be argued that it is simply a matter of time before gender equity is achieved.

The point under discussion is the following: is vertical gender segregation in scientific and academic careers transient? One way of answering this question is to undertake longitudinal studies on the careers of men and women who have all entered academies and/or research organisations during a given year. If gender inequalities persist, when seniority and other related factors are held constant, then this explanation can no longer be regarded as valid.

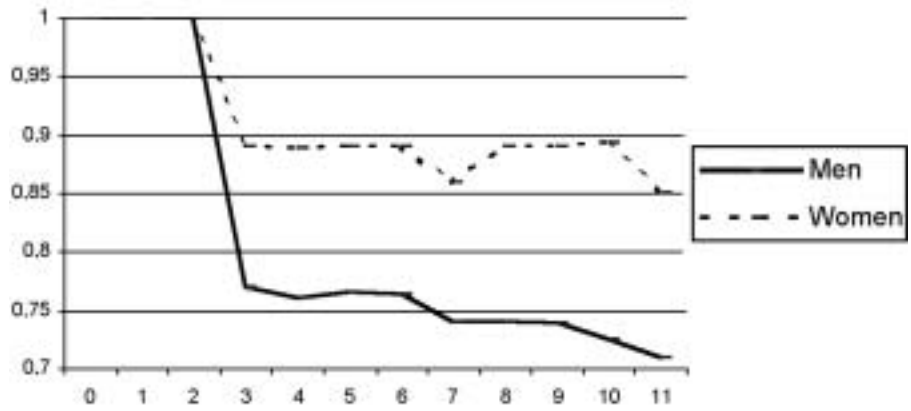
Survival analysis: the Italian case[1]

The hypothesis of a 'natural' recovery in vertical gender segregation can be confirmed by comparing longevity in grades on the career ladder. We can, in fact, hypothesise that there is a relationship between promotion and longevity in that women and men with the same length of service in a certain career grade and the same capacities and merit have the same probability of being promoted to the upper level. In the absence of gender discrimination in career trajectories, and assuming that the quality of the scientific work done by women is equal to that of men, the increase in the female presence at the entry level should result in an increase in the female share in the top scientific grades. In this study, 1 022 scientists – 224 women and 798 men – who entered the CNR-National

Research Council at B grade in the same year were studied in order to measure the existence of vertical gender segregation.[2] CNR is the largest Italian public research body, with over 6 000 scientific personnel.

Survival-analysis techniques were used and, in particular, the proportional-hazard method or Cox Model.[3] The analysis was done in two stages. First, a univariate analysis of the longevity in the grade was carried out, and the survival function was estimated using the Kaplan-Meier method. The survival function measures an individual's probability of surviving until a given event within a certain time interval. In our case, the 'event' is the promotion to A grade. The results are shown in Graph 1.

Graph 1. Survival curves of women and men in B grades, by longevity, at CNR, Italy, 2000



Source: Palomba 2000

It emerges that a positive relationship exists between the length of stay in the B grade and the probability of being promoted to the A grade: the longer the duration of stay, the higher the probability of being promoted. We also note that the female curve is always above that of men, demonstrating a systematic longer permanence in the B grade for women than for men. For example, after 11 years on the B grade, women have a 16% probability of being promoted, but their male colleagues have a 39% probability.

But longevity is not the only factor affecting the possibility of being promoted. For this reason, a multivariate analysis was carried out using the proportional-hazard method or Cox-Regression Model. Therefore, the probability of being promoted, other factors being held constant[4], was estimated.

Still, differences emerged between the sexes. For example, after seven years on the B grade men have a 23% probability of being promoted to A grade, while women only have a probability of 11.9%. After 11 years of permanence in the B grade, men have a 28% probability of being promoted, while women have less than half that with just 13.5%. The same analysis carried out for university professors showed that once again men are twice as likely as women to become an associate professor and have a 30% better chance of becoming a full professor (Micali 2001).

To conclude, the results demonstrated that factors such as age at promotion, disciplinary fields, and number of publications, are only a partial explanation of the gender differences in the career pathways in science. The main explanatory factor is and remains gender. Therefore, it would be absurd to accept that waiting for equality is sufficient when the evidence suggests that the wait would be a waste of time. Even to condone a short wait would be symptomatic of the patronising attitude towards the question of women's participation in science.

Publications and evaluation of merit

One of the most universally accepted criteria in the scientific community in evaluating research activities, as regards both the beginning of a career and the access to the higher echelons, is the quantity of scientific productivity, generally quantified in terms of published work. This aspect is very relevant in recognising scientific excellence because it is considered an intrinsically "objective criterion" and it is therefore central to gender issues. In fact, one of the explanations offered for the reduced access of women to top career levels concerns scientific productivity: women publish less and therefore have less access to the highest positions.

Research has proved that women do often publish less than their male colleagues (Marcuzzo, 1999; Kaplan et al., 1996), even if the differences are greater in some sectors than in others. A study of female economists (Carapelli et al., 1999) revealed, however, that there are no significant variations in the number of publications, but that the differences concerned other variables such as type of publication, language or type of specialisation.

Obviously, the functioning of the peer-review system impacts on all of these outcomes. There are several existing studies that examine and criticise it on various grounds. Both women and men rate the quality of women's work lower than men's work, when they are aware of the sex of the author submitting a scientific article, but not when the same person's gender is unknown (Wennerås and Wold, 1997). As a consequence, her work has implicitly less scientific merit and ultimately her career will be penalised.

We can assume that many other aspects influence scientific output and are important in studying gender gaps in depth. But the lack of reliable data is an obstacle: it is hard to find comparisons between men and women of the same age and experience. Information is equally skimpy regarding: access to the necessary financial resources to publish; participation in national or international conferences; appointments as team leader of research projects; the organisation of research tasks chosen and of the work environment in terms of the division between service, coordination, documentation and training activities – all aspects which are also connected to the field being operated in. All this is vital information which would allow us to understand – beyond simple bibliometric data – how the activity of every researcher is reflected in scientific publications, how gender affects the latter, and the underlying reasons for gender differences in career paths. It is thus clear that to obtain significant results on the subject we are discussing, ad-hoc studies are required.

Due to the above-mentioned difficulties, the number of publications and citations[5] are the most commonly used measures since the quality of work is notoriously difficult to describe through statistical indicators. In addition, very few scientific institutions have a database of publications by gender. Thus, even if the database exists, since authors' first names are often indicated by initials only, analysing data by sex is difficult, tedious, time-consuming and expensive.

An analysis of scientific productivity was carried out in two Italian institutions, INFM - the National Institute for Physics of Matter and the CNR – National Research Council, the only two Italian research institutions with a database of staff scientific publications (Palomba 2000). Data refer to 1998 and refer to 15 000 authors (or co-authors) for the CNR and about 8 000 for INFM.

Women appear to publish less than men at the CNR: adding up all publications, regardless of their typology, we get an average of 4.8 a year for female researchers and 6.2 for male researchers. Productivity is generally deeply affected by professional grade but there is less variation in productivity with respect to grade among women, and gender differences are more marked at the top of the career pyramid. Among men, current research directors (level A) make a 'leap' in average output (8.0) with respect to level C (6.0) and level B (5.8). Top grades seem to be the most productive group by far.

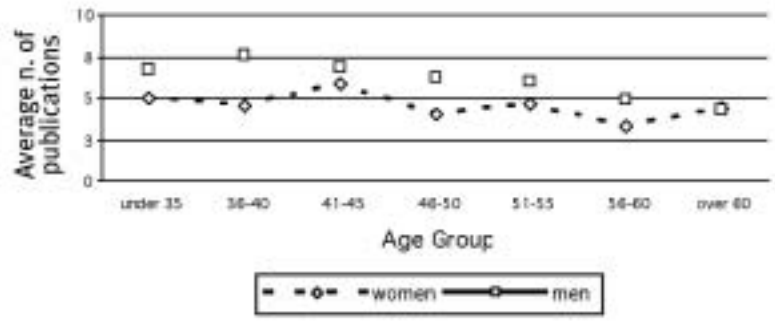
Gender gaps in output vary greatly from field to field and gender differentials are lower in scientific fields such as medicine, biology and the sciences, while in other areas the gap between male and female output is wider, reaching its peak in the humanities. Among architecture researchers, women publish more than men.

A particularly salient feature in scientific production is the quality of publications. Journals quoted in the *Journal of Citation Reports* (JCR) – are considered by many to be the most prestigious publications – though they do not cover all fields. International journals listed in the JCR are linked to an IF-impact factor which measures the average number of citations obtained by publication in each journal. It is an indicator of the journal's quality and, indirectly, of the prestige of the publication.

It is worth noting that there is no significant gap in IF values between men and women. The overall average impact factor is 1.82, and is very similar for men (1.83) and women (1.77). The analysis of the average number of authors per publication shows a difference of only 0.3 authors (the index is 5.2 for women, and 4.9 for men). This data reveals the significance of going beyond the simple quantitative figures of number of publications and examining scientific production in detail, since many aspects must be observed when speaking of publications.

Special attention was given to productivity by age as it is a proxy of what happens during the lifecycle. Looking at CNR, the most productive age group overall is that aged between 41 and 45 years, but the situation is noticeably different when distinguishing between male and female researchers as the most productive publishing period for women is when they are between the ages of 45 and 49 and, to a lesser degree, under 35. Men's most productive age categories are those between 35 and 39 and, to a lesser degree, 40 and 44. Graph 2 shows that the greatest gap between the two genders is in the 35 to 39 age group. This is the most significant period for building up a curriculum and thus obtaining a recognised position and career promotions. But this diverging trend also suggests that men invest more time and energy in their professional career around the age of 40, a time when women are most caught up in family commitments.

Graph 2. Average number of publications by age groups and sex, CNR, 2000



To conclude

Achievement of gender equality in scientific excellence is a long-term process in which existing social and political norms and rules must undergo profound changes. It also implies a new way of thinking in which the stereotyping of women and men no longer limits their opportunities or continues to reward just one of the two sexes. We have demonstrated the pointlessness and wastefulness of "waiting for equality" and the impossibility of a 'natural' recovery. Moreover, we have argued that until the gender dimension is mainstreamed into bibliometric measurements, there is no firm evidence to support the myth that women are less productive, because of other intervening factors such as family and children.

We are still fighting to demonstrate that the low female presence at the highest levels of the scientific hierarchy is an indicator of the incapacity of research institutions to follow changes in society (such as women's increased presence in higher education) which in turn highlights the dysfunction of a system for the evaluation of scientific excellence that did not abolish or weaken the 'old boys' network system' of co-optation. A system well-known by those who participated in whatever procedure for evaluation or selection where the antinomy between the criteria of "being part of" (a discipline, a 'school', an academic circle, etc.) and those of merit enter inexorably into conflict, to the full advantage of the former.

The final effect is that of discouragement, self-exclusion, mortification of the weakest subjects of the system – women. The increase in female personnel recruitment in scientific institutions and universities during the 70s and the 80s, which was reflecting the high educational boom of women, was not followed by an adequate leap forward in the female career pathways, so that recent generations of graduated women – who often, as statistics show, pass through the training period with higher speed and better performances than men – are discouraged by the limited destiny and flawed careers of the older generations of female researchers, and tend to avoid scientific careers. This is a vicious circle which responds in a very negative way to the heavy cultural resistances still working in the scientific environment, and reinforces the selection of those individuals who accepted and internalised the behavioural models of the old boys' group and are therefore able to reproduce them.

Rethinking the rules of scientific engagement from the point of view of equal opportunities will hopefully result in creating the conditions for an increase in the number of women scientists in positions of excellence and leadership. On the one hand, as their numbers grow they will serve as positive role models for the next generations of women; on the other hand, we have to expect strong opposition on the part of men who are used to being the dominant sex in scientific environments.

Notes

(1) This paragraph is based on Palomba R. (ed), 2000, *Figlie di Minerva*, Franco Angeli, Milano.

(2) The grades used here are referred to the Italian career path, i.e. in 3 grades: C, B, and A, where C is the level at entrance and A is the top level.

(3) In order to apply the Cox Model, all the conditions of proportionality of the hazard functions have been checked. Among all the candidate co-variates proposed in the definition of the model, a selection was made on the basis of statistical criteria, using the so-called "forward" selection method of co-variates, based on the partial likelihood ratio test. In this method, the partial likelihood, under the alternative hypothesis, is updated stepwise, at every step using the co-variate which maximises the value until a chosen threshold is reached.

(4) The factors consider were: age at entrance into B grade, age at recruitment, number of publications, disciplinary field, and geographic area.

(5) *The Journal of Citation Reports* publishes the so-called 'Impact Factor' of a given scientific journal and describes the number of times an average paper published in a particular journal is cited during one year. The measure has evident and intrinsic limitations as not all possible scientific journals are included in the list.

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Tackling gender bias in the measurement of scientific excellence: combating disciplinary containment

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Introduction

One of the most interesting paradoxes in dealing with the measurement of 'scientific excellence', which for the purposes of this paper I take to mean the evaluation of research proposals by supposed peers under competitive funding schemes, is that although it is widely acknowledged that there is no gold or absolute standard in terms of which to measure such excellence, scientists, academics and evaluators alike, who are involved in its measurement, act and talk outside the assessment context as if such a standard existed, even if it is blatantly obvious that we are dealing with situated decision-making.(1) Nowhere is that more evident than when we look at the gender biases that emerge in such evaluations, as the three examples below show. In this paper I will draw on personal experience and relevant literature to claim that the measurement of scientific excellence is relative to context which, in itself, is governed by specific epistemic and organisational cultures, and that these impact not only in intradisciplinary assessment but in multidisciplinary assessment contexts, too.

The original preoccupation underlying this paper centred on the impact of disciplinary bias on measuring excellence. However, I have moved away from this preoccupation because it now seems obvious to me that a key problem which inter and multidisciplinary researchers like myself working in subjects such as women's studies face is the non-recognition of these subjects for the purposes of assessment exercises. Where assessment exercises such as the Research Assessment Exercise (RAE) in the UK are undertaken within disciplinary boundaries, the question of who determines what counts as a discipline and what does not, and how disciplines achieve their status of recognition is vital. Many studies have demonstrated the importance of disciplines in establishing academic and professional cultures.(2) Few of these pay any sustained attention to the gender issues inherent in those cultures, instead viewing *homo academicus* as, by default and in actuality, male. These studies tend either to be systems-oriented (macro-educational) or mono-discipline-focused (micro-educational), ignoring the meso-educational level where funding and assessment regimes (re)produce and construct disciplinary boundaries. These funding and assessment regimes are, however, determined by more than the disciplinary structures that they service and (re)produce. For inter and multidisciplinary subjects, the failure to achieve disciplinary status(3) and recognition by funding bodies can mean not only the death of a discipline, as Gayatri Chakravorty Spivak has recently proclaimed it, but also the death of innovative research. Since this seems obvious to me, I want instead to address the issue of certain kinds of gender bias that emerge in the measurement of scientific excellence, and to focus more on the issues of 'the peer' and of organisational culture.

Gender biases in measuring scientific excellence: three examples

Example 1

In 2003, I submitted a proposal to the Arts and Humanities Research Board in the UK, under their 'leave scheme', to work on a book entitled *Objections to Sex and Violence in the Work of Contemporary Women Playwrights*. In the evaluation that I received, the following point was made, which was a main reason why the proposal was rejected: "There [is] no mention of any of the women dramatists' male peers. . .".

The notion that a proposal is inadequate if it fails to mention men, or rather, if it explicitly focuses on women, is very commonplace, as my next example, too, will demonstrate. One might argue that in our contemporary age of mainstreaming gender, equal attention to both women and men should be the norm. However, the reality is that work that routinely focuses on men, for instance if someone proposes to write on the plays of Shakespeare, does not elicit the question of reference to any of the dramatist's female peers. However, work which focuses explicitly on women immediately draws attention to itself. Women still constitute the marked category (Skeggs 1995), and mainstreaming in fact means the reintegration and re-invisibilisation of women under the category 'men'. Why else, for instance, the failure of national and supra-national governments to institute effective sanctions for the failure to implement equal opportunities policies (Suárez and Suárez 2003)? Why else the introduction of gender audits without sanctions? Women working in feminist contexts are well aware of this and some choose to respond to this pressure through self-neutralisation at the point of entry into a career. An Italian interviewee in an EU-funded project on what happens to women's studies students in the employment market[4], for example, said: "*When I did my doctorate, although I was very keen on [women's studies], I made a universal and neutral choice. . . I got a neutral qualification as a philosopher. . . In doing this, I was playing safe, in order to be recognised by the scientific community and be viewed less suspiciously as regards my feminist interests.*" (Barazzetti et al., 2003, p. 26) Underlying this woman's comments are the notion that non-feminist traditional disciplines, such as philosophy, are universal and neutral, and that the 'scientific community' consists of people, presumably men and strongly heterosexually invested women who are hostile to the feminist project. Feminists, by extension, are not part of the scientific community.

Example 2

In early summer 2003, a group of women and men who had put together a Network of Excellence proposal with the acronym 'Gender@quality' under the Sixth Framework Programme, and some of whom were present at this workshop, received the evaluation summary for this project which failed the funding threshold by 0.5. Critiques of the project included comments such as: "*The Network prioritises perspectives around feminism specifically which do not necessarily cohere with notions of gender*"; "*the focus of the [proposed] Institute on Feminism explicitly rather than gender may inhibit some avenues for potential impact*"; "*with only 1 1 male participants, it is imperative that the Network demonstrates a well-considered plan for gender equality*". The 'overall remarks' concluded: "*[The Network's] emphasis on feminism rather than gender is evident not only in the expertise of partners. . . but also in the constitution [meaning 'the membership'] of the Network which is predominantly female in nature. It is in this respect that the Network is recommended to include a wider range of topic areas already forefronting research in gender, to attend to gender bias within the Network constitution [meaning 'include more men'] and to ensure that gender diversity is clearly its area of concern.*"

In this evaluation, exception was taken both regarding the composition of the group who had submitted the proposal, a group consisting predominantly of female scientists who – without question – constitute the overwhelming majority of gender researchers in the world today, but also to the project of feminism, strangely opposed to the project of 'gender research' which was somehow viewed as feminism-neutral, as presumably ideologically uncontaminated.

There are two points to make here:

1) In terms of this evaluation, 'feminism' was viewed as creating bias in the context of scientific excellence, even though the presiding body, the EU, produces gender equality agendas which are set up explicitly, as is feminism, to change and improve the lot of women.
2) Whereas projects which foreground women are increasingly routinely castigated for not including men, projects that focus on men are, in my experience, not rejected on that basis, or indeed made to account for their biases, as my final example will show.

Example 3

In June 2003, I worked as an evaluator under the Sixth Framework Programme where proposers are encouraged to address the gender dimension of their proposals, and where evaluators now have to fill in a form on gender issues in the projects they evaluate. Three experiences have been encountered from this context:

a) Most of the evaluators were men running consultancies on how to get EU funding, or who worked in governmental organisations of various kinds. One of these men, a fellow evaluator and a scientist by training, openly admitted to me that he did not know what was meant by 'the gender dimension', that he felt that, whatever it was, it was irrelevant to the kinds of projects he supported, and that he advised clients not to worry since no enforcement process was attached to tackling the gender dimension. Paying attention to the gender dimension was not seen to pay.

b) The gender dimension of any project was only rarely if ever referred to during the evaluation process. It was treated as irrelevant to the evaluations by most concerned with the evaluation process.

c) In the context of the final ranking of the projects for funding purposes, the gender dimension also only played an albeit marginal role if explicitly raised by the rapporteurs, which only happened where the rapporteur was female with a feminist agenda – a tiny minority in this gathering.

The majority of participants in the evaluation process from both within and outside the EU were men and had internalised that the gender dimension was of no consequence to the assessment process. In this respect the responses mirrored those we find in relation to equal opportunities legislation which – since it also, by and large, lacks any kind of enforcement – is easily ignored or circumvented, and routinely disregarded most of the time in most European countries (Suárez and Suárez 2003). The lack of political will to improve the situation of women betrayed by this lack of enforcement of gender equality measures speaks volumes when it comes to tackling gender bias in the measurement of scientific excellence – in particular, it points to the need for cultural change to effect assessment change.

On not being recognised

All three examples mentioned above show that, whereas national and supra-national research funding bodies in 2003 all have explicit agendas for the encouragement of female researchers, such researchers find themselves unsupported if they venture on to gender terrain and if they create an explicit gender agenda within their research that centres on women. One of the consequences, epitomised in the quotation from the Italian interviewee, is to drive women away from innovative feminist research into traditional disciplines and pseudo-neutral research topics to avoid being stigmatised and disadvantaged on the job market. A similar phenomenon can be observed in the UK where the discipline of women's studies, despite having spawned many research centres, and post- and undergraduate courses in prestigious universities, was never granted disciplinary status by the funding councils, and, its numerical power relative to for instance South Asian studies notwithstanding, has not figured as a recognised discipline in processes such as the Research Assessment Exercise or the Teaching Quality Assessment Exercise which are vital to the consolidation of any subject. The consequence has been a gradual killing-off of women's studies as an interdisciplinary discipline, with many key centres being subsumed under 'Sociology' (e.g. at the University of Warwick, but also Kent, York, Lancaster) or, as is the case with other interdisciplinary fields such as cultural studies, simply being closed down, as has happened with the Centre for Contemporary Cultural Studies at Birmingham University, a founding centre of that discipline in Britain.

Why should we care about what happens to women's studies or to cultural studies? In my view, we should care because these disciplines, self-consciously inter- and transdisciplinary, open up new, innovative and divergent avenues for research with impact in the material world. It was through feminist research and the feminist movement that issues of equality were raised politically from the 1960s and 1970s onwards, and it is their influence that

accounted for changes to the laws in western countries during the last 35 years regarding equal pay, abortion, women's rights to property, the recognition of rape in marriage, the highlighting of domestic violence, child abuse, trafficking in women, etc. If we wish to make the most not only of female scientific potential but also of women's cultural and economic potential we need to encourage changes in the position of women; these will not come about very readily under current peer review systems of evaluation, for instance.

'Peers' and 'Others'

To understand the hostility that feminist research and research focused on women generates among peer panels evaluating research proposals, we need not only to look at the composition of panels and the notion of 'the peer' but also at the context in which such decisions are made since, as indicated before, when measuring excellence we are looking at situated decision-making and, as I shall argue, it is only by addressing the context of that decision-making that we can hope to make any inroads into changing the culture of panels which is effectively what the aim of any such intervention has to be.

The Arts and Humanities Research Board in Great Britain, shortly to become a research council, operates through multi- rather than interdisciplinary panels. This means that every evaluating panel consists of a group of supposed peers within cognate areas, each with his or her own specialism which may be sub-discipline-specific (e.g. medieval literature; Norse languages, etc.) or discipline-specific (e.g. theatre studies, music performance, etc.) all within one panel. The evaluations under the Sixth Framework Programme operate along a similar principle. The evaluating peer groups in both situations thus come to the table divided by their individual expertise, their authority as the experts in their specific disciplinary sub-areas or disciplines, and their well-developed sense of what belongs within their discipline or sub-disciplinary area and what does not. Women's studies as a discipline at this point in time belongs to no disciplinary area in any European country since it has not achieved subject status anywhere (Silius 2002). It thus automatically operates at a disadvantage, a fact which was reinforced by the research we did on 'Women's Studies and Employment' which showed that in all European countries the interdisciplinarity fostered by women's studies was viewed as a detriment to rather than as an enhancement of scholarly activity. Interdisciplinarity is thus as suspect as feminist research when it comes to measuring excellence and, indeed, as part of the evaluation I received from the Arts and Humanities Research Board, I was advised – despite the fact that the proposed book deals with women playwrights' work and the panel I submitted it to included theatre studies as one of its disciplines – to try another panel.

This raises questions regarding the supposed peers we are dealing with on evaluation panels. Although the research on this topic is slightly contradictory, a recent study by Joshua Guetzkow, Michèle Lamont and Grégoire Mallard[5](2003) shows what they describe as "*a homo-social[6] pattern in reviewers' preferences for different types of originality*", by which they mean that peer reviewers prefer proposals that are similar to their own work. They state that in this respect peer reviewing, which is a form of (disciplinary) gate-keeping, is akin to hiring and firing in academe, in which context it has also consistently been shown that a pattern of homo-social reproduction exists. They show that 81% of panellists commented on the personal traits of the proposers, thus completely undermining the 'traditional disinterestedness' and meritocratic 'universalism' which is meant to inform both proposals and peers' comments. They argue, finally, that the traditional notion of the work of an individual being separate from the individual him- or herself is untenable, and that their research clearly shows that peers do not focus on the intrinsic qualities of the research in line with the meritocratic ideal of modern academic life but, rather, that they make assessments of the person who proposes the research in terms of extra-scientific criteria which they then project on to the proposal to either support or dismiss it.

Feminist research by its very nature is invested research and as such contradicts the traditional notions of research as disinterested and universal. The explicitness of this specificity which, I want to argue, constitutes a form of

intellectual honesty missing from proposals that suggest or parade their supposed disinterestedness, sets feminist research apart from much other research, not least because that research occurs in an area in which there may be political agendas but there is little political will to turn them into reality, as the lack of enforcement around equal opportunities legislation everywhere shows.

Secondly, if the findings of Guetzkow et al. hold, then it is imperative that feminist research proposals, if they are to stand an equal chance, are reviewed by peers who match their content/ideological agenda. This does not mean women, it means women with a feminist agenda – an important but routinely overlooked distinction when it comes to dealing with equality and the representativity of panels, where biological sex is frequently equated with disposition, and to have a woman on a panel is viewed as having done justice to the demands of equality agendas. An implication of this is the need for men, for example, routinely to receive training around equality agendas.

Thirdly, it is not enough to encourage feminists to participate in peer review, a process frequently not readily accessible to feminists because of the gate-keeping involved in the selection process itself which also exhibits a homo-social pattern. One needs, additionally, to consider the context in which the decision-making occurs since that context impacts considerably on how and what kinds of decisions are made, quite irrespective of any notion of scientific excellence.

Epistemic and organisational cultures

Here I draw both upon the literature on the topic and on personal experiences to make the point that context has a decisive influence on measuring scientific excellence. Extending an argument proposed by Knorr-Cetina (1999), Mallard et al. (2003) suggest that "*the organisational context of the deliberation generates 'epistemic cultures' within competitions, through the substantive prescriptions given by funding councils to their panellists, the customary rules of deliberation adopted by panel members, and the processes of translation that panellists engage in while deliberating*". Mallard et al. maintain that the epistemic cultures which Knorr-Cetina argues govern individual disciplines and determine which particular research topics and choice of methodological approach are either privileged or disavowed within a given discipline, extend to the organisational context in which scientific excellence is measured, thus relativating the force of the epistemic culture governing the discipline by moulding it within the organisational context in which the measuring occurs. I would go further to argue that the judgments finally arrived at in the assessment process prismically express or refract the epistemic, or rather organisational, culture determining the assessment context, even if the feedback on the proposals does not make this explicit.

To produce a concrete example: at the beginning of an evaluation process I participated in, the evaluators were told that at least 50% of the proposals would be funded because of the small number of proposals that had been made. No reference was made to scientific excellence at all; the organisation was looking to distribute – rather than withdraw or otherwise distribute – a set of money among a set of proposals and, since the ratio of money to number of proposals was very favourable, the evaluators were told to bear this in mind whilst assessing the proposals. Many of the comments in the ensuing evaluation process were less focused on matters of scientific excellence than on the fact that at least half of the proposals would get funded – one therefore did not have to be overly restrictive in one's assessments, and merit could be read into many things. In another context, where the ratio of money to proposals was much less favourable, evaluators consistently looked for reasons to exclude proposals which were often, especially at the point of deliberation, not at all focused on the scientific merit of the proposal but on extra-scientific factors in which the extent to which the evaluator had a stake in the evaluation process and organisation, etc., knowledge of the proposer as a person or the relative fame and academic standing of the referees for the proposal played a key role in the terms in which the evaluators articulated their judgments.

Once the proposals had been evaluated they had to be ranked – a task undertaken by the person organising the evaluation. This ranking was arbitrary since several proposals made each grade. Nonetheless, a hierarchical list within and between grades was established. Having been told that all proposals from a certain ranking downwards would be excluded, rapporteurs were then asked to comment on the running order of the remaining proposals and to adjust it, a task made impossible – in terms of measuring scientific excellence – by the fact that the rapporteurs had read only a small proportion of the total number of proposals and were therefore in no position to comment on the scientific excellence of all the remaining proposals and their relative merit in relation to each other. The outcome of this process had funding implications. Some wild bargaining ensued, based entirely on extra-scientific criteria, with individuals defending the proposals they were familiar with along the lines described by Mallard et al. (2002a) in which evaluators sought to appeal to other evaluators by using a whole range of different codes, engaging in boundary work and translation processes[7], and on-the-spot assessments of what arguments might work. All of this had nothing to do with measuring scientific excellence but certainly resembled the democratic deliberation process which involves reconciling conflicting views through consensus in a context of plural views and positions. This, in turn, however, has nothing to do with a level playing field, equality of opportunity, or fairness in their true senses – it had everything to do with individuals' effectiveness in managing that kind of process and context. And some were clearly better at it than others. To the outside world, the process was presented as concerned with measuring scientific excellence – from the inside it looked like nothing of the kind.

Some conclusions

All of this points to a series of implications. The first of these is, of course, that work needs to be done to look at the process whereby disciplines become legitimated and institutionalised so as to constitute funding categories. Secondly, we need to think through and refine the notion of 'the peer', and in this context I recommend the work of Annette Kolodny (1998) who in *Failing the Future: A Dean Looks at Higher Education in the Twenty-First Century* details how she achieved change at the University of Arizona by changing the rules of committee compositions. Thirdly, we need to acknowledge that the role of the discipline, to which most academics are most emphatically wedded if writers such as Clark and Becher are to be believed, in measuring scientific excellence is refracted through the prism of epistemic and organisational cultures that are not discipline-specific. Many contexts in which scientific excellence is measured are *de facto* multidisciplinary. In addition, they are the objects of the organisational cultures in which such measurements occur. It is here that we need to intervene if we want to promote gender-aware change in the measurement of scientific excellence. This means, for instance, training the evaluators in the proper inclusion of all criteria we deem relevant to the evaluation process, including gender issues, and ensuring that there is appropriate reinforcement for the use of these criteria. Significantly, Mallard et al. (2002a) point to the fact that panellists tend not to receive any training in how to conduct assessments beyond instructions which spell out the objectives of the funding programme and the criteria of evaluation they should use. It also means looking, for instance, at the role of panel chairs, panel secretaries, and panel officers in promoting organisational cultures and influencing decision-making. There is, as yet, in the literature concerned little recognition of the fact that assessment of scientific excellence, far from being an exercise in disinvested and disinterested judgments, is one of situated decision-making, reproducing the cultures from which it emanates. To the extent that these cultures are hostile to feminist research, this hostility will be reproduced in the judgments of scientific excellence made. To change that, not only do feminists have to be inserted into the judgment processes, but measures to promote women have to move beyond lip-service and be enforced.

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Notes

(1) I use the phrase 'situated decision-making' in analogy to the feminist concept of 'situated knowledges' (Harding 1987, Hartsock 1998) to reference the particularity in every sense of that decision-making in contradistinction to the assumed notions of universally valid reliability and validity which the evaluation criteria in those contexts project.

(2) Key texts, all written by men and emerging in the 1980s, right when the end of 'grand/totalising narratives' was being proclaimed, include Pierre Bourdieu's (1984) Homo Academicus (Paris: Minuit); B.R. Clark's (1987) The Academic Life: Small Worlds, Different Worlds (Princeton: Carnegie Foundation); T. Becher (1989) Tribes and Territories – Intellectual Enquiry and the Cultures of Disciplines (Milton Keynes: Open University Press); B.R. Clark (1998) Creating Entrepreneurial Universities (Guildford: IAU Press).

(3) To date, women's studies has not achieved full disciplinary status in any European country (Silius 2002).

(4) For further details of this project, see the project website: www.hull.ac.uk/ewsi

(5) I would like to thank Dawn Lyon for alerting me to this work.

(6) The term 'homosocial' was popularised through Eve Kosofsky Sedgwick's (1985) Between Men: English Literature and Male Homosocial Desire (New York: Columbia UP).

(7) I take these three terms from Mallard, Lamont and Guetzkow's work (see 'References') to refer to the epistemic cultures of disciplines as expressed in their preferred theoretical frameworks and methodological approaches (= codes); the negotiations to establish the 'order' of middle-ranking proposals which are the most likely to be 'in' or 'out of' the funding process (= boundary work); and the ability to reference a range of theoretical frameworks and methodological approaches as part of the argument to persuade others of one's viewpoint (= translation processes).

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Creators, transmitters and users: women's scientific excellence at the semi-periphery of Europe

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"...epistemology and philosophy of science would always be recognised to have political dimensions. They have political origins, processes and consequences since who does and who does not gain the access to defining, making, legitimating, and deploying a culture's knowledge systems is a political matter. Power including gender advantages, is accumulated, deployed, and distributed through epistemological and philosophic processes." (Harding, 1998: 120)

"Western researchers will not give full credence to knowledge and theories of Eastern researchers." (Cahelen, 1996:24)

"An excellent student of mine from Central European University, Budapest, who obtained an award for her MA thesis, as the best MA thesis in Hungary in 2002, wanted to publish an article in one Western scientific journal based on her thesis. Her paper was returned with clear demands to supply her research findings with some Western theoretical framework. She decided to comply, but the research findings, of course, stayed the same, demonstrating that Western theories simply were irrelevant. She sent the article again, and this time they refused to publish it with the explanation that if it does not confirm to or reject Western theories, it is simply not important enough to be published." (Source: personal testimony MB)

Four theoretical assumptions

This paper will explore the field of interconnectedness between knowledge production, semi-periphery[1], gender and 'scientific excellence', which is largely an under-theorised and under-researched field of 'absence of knowledge'. It will be tackled with a combination of theoretical ideas, research findings, personal observations and concrete examples, including valuable insights gained from the work process that I developed through my participation in the Enwise[2] Expert Group set up in October 2002 by the European Commission to report[3] on the situation facing women scientists in the Central and Eastern European countries and in the Baltic States. The focus of this paper is on social sciences and especially gender studies at the semi-periphery[4] because social sciences are extremely context-sensitive sciences, and gender studies development, specifically, at the semi-periphery encompasses many of the problems which reveal the tensions between gender, creation of new knowledge and 'excellence'.

Knowledge production at the semi-periphery

The starting assumption is that the concept of 'semi-periphery' is exceptionally useful for the understanding of the dynamism of knowledge production, rewards and dissemination of knowledge, within the larger context of globalisation[5]. What makes the concept of semi-periphery a useful epistemological tool is that it reveals the dynamics quite specific to both core and periphery. Transitional countries at the semi-periphery of Europe, former communist countries which are in different stages in the process of enlargement, although in many ways different between themselves, are also very deeply embedded in their semi-peripheral position of the global market and global knowledge production. New global developments redefine the contradictory position of semi-periphery in the world system, and relevant distinction, as Arrighi (1985) suggests, is not the one between the production of industrial versus primary goods, but between intellectual activities (i.e. those that involve strategic decision-making, control and administration, R&D, etc.) and 'executive' activities. Accordingly, knowledge production at the core is accompanied by supplementary activities at the semi-periphery.

The major characteristics of semi-peripheral societies in regard to the global knowledge market are the following:

1. They intensively export the 'knowers', those who are already established or potential knowers (brain-drain), which constantly weakens the position of those societies in the global knowledge market as well as their capacity for self-reflection through scientific research and, accordingly, to effective movement towards the centre;
2. They are experiencing important shifts in scientific developments (Enwise report, 2003) which largely reshape local knowledge hierarchies and the position of local knowledge institutions in respective social contexts, often marginalising them; and 3. Their knowledge production is often, at the centre, interpreted in terms of a 'cold war' paradigm, meaning that it has inscribed inferiority, irrelevance, or simply value, or even validity, limited to local communities.

In other words, knowledge which is being made at the semi-periphery is in the global knowledge market something like 'semi-knowledge' never 'quite there', as the semi-periphery itself. That knowledge is seen by definition as partial, limited, and often as not 'objective' enough, it is mainly reduced to 'evidence without theory', to some register of 'exemplary' or 'extreme' cases. Knowledge produced at the semi-periphery about the semi-periphery usually functions only as 'background' or 'back-up' for generalisations produced by the centre and for the sake of the centre, which retains an ambition to create 'universally valid' knowledge. That kind of knowledge, universally valid knowledge, is a necessary condition, more political than cognitive, for the socio-economic-political engineering of the contemporary globalisation process, and for the reproduction of the semi-periphery itself.

Social, economic and political engineering, to which the semi-periphery is exposed, is performed on two levels: on the structural level and on the discoursive level, where symbolic capital of the core dominates. This is also happening in science and social science in particular. One of the major consequences of this parallel intervention is that a gap exists between the structural realities of semi-periphery and their discoursive realities, especially scientific discourses addressing those realities. Imported and often imposed concepts, such as 'multiculturalism', 'human rights', 'identity politics' and other key concepts for the political process of globalisation, exercised through a number of different international institutions and translated into the realities of semi-peripheral societies by local NGOs heavily dependent on exterior funds, create quite unique discoursive environments for scientific production of social sciences. A new kind of 'political correctness', instead of communist political correctness, in tune with the process of economic globalisation, establishes the discoursive framework for social sciences of transitional societies (Salecel: 1994).

Semi-peripheral societies are very diachronic societies, often perceived as societies with a slowed down, or an impeded process of 'modernisation'. However, they are often assumed to be 'slow' but immanently similar, not different, which is not the case with the third world countries. Both core and semi-periphery represented by scientific élites have interests in retaining meta-narrative on modernisation and different speeds of modernisation, without really investigating the dynamics of the relationship between core and semi-periphery. With the collapse of communism, the process of European enlargement and increasing ambitions of semi-peripheral societies to become part of the 'promised land', discourse on modernisation, or lack of it, perfectly corresponds to the prospects of European integration, being a kind of 'moving target'. So wherever the process of enlargement is slowed down, it is due to the lack of 'modernisation'.

The prevailing absence of the scientific discourse on the relationship between centre and semi-periphery including the role of 'transition' in the overall globalisation process, nevertheless, has its negative consequences: transitional countries have paid extraordinarily high human costs for social change. Many ill-designed measures with disastrous effects could have been prevented or diminished if the knowledge which already existed at the semi-periphery, and the knowers, had been taken seriously. As only recently, after a decade of transition, has been observed by Stiglitz, Nobel Prize winner:

"Some of our problems abroad were caused by how we interacted with other countries, especially weaker developing nations. Acting as if we had come up with a unique, guaranteed formula for prosperity – sometimes with the assistance of other advanced industrial countries – bullied other nations into doing things our way. Both through our own economic diplomacy and through the influence of the American dominated International Monetary Fund, Uncle Sam became Dr Sam, dispensing prescriptions to the rest of the world: cut the budget, lower that trade barrier, and privatise that utility. Like some physicians, we were too busy, and too sure of ourselves – to listen to our patients with their ideas. Too busy sometimes even to look at the individual countries and their circumstances. The economists and development experts of the third world, many of them brilliant and highly educated, were sometimes treated like children." (Stiglitz 2003: 23)

Arrogant 'prescriptive' behaviour by core institutions imposed the speed of change, counterproductive policy measures, or even counterproductive political and military interventions, which is most evident in the most drastic cases of ethnic conflicts, but also in much of the policy-making in general, increased the costs of transition, contrary to political and economic interests of the majority of the population at the semi-periphery. At the same time, 'transitology', as a scientific field dealing with the process of transition from communism to post communism, became one of the fastest growing fields of social sciences, without really affecting social change in positive terms. So, this paradox is the framework for investigating the phenomena of scientific excellence in social sciences at the semi-periphery as well as the validity of imported paradigms from the scientific centre.

Another paradox of knowledge production at the semi-periphery is questioning the problem of 'excellence' as well. In the third world countries, the discrepancy between scientific discourses and social realities of those countries was exposed to much of the criticism of post-colonial theories. However, there are few efforts of a similar kind related to the semi-periphery (Todorova 1997; Goldsworthy 1998; Bjelic, Savic 2002). The process of critical examination of the centre's theoretical paradigms dealing with the semi-periphery is impeded for two reasons: political and epistemological. The political reason could be described as the 'desire for the West' together with strong anti-communism, phenomena which shape much of the political atmosphere in most of the semi-peripheral countries, and create a discoursive environment which is too unfavourable to allow for a critical stand on transition. Epistemological reasons, on the other hand, are related to the lack of possibility to make research on peripheral societies independent of the centre's agenda, expressed in dependency for funding in conditions of limited local resources or, further, impossibility to create epistemic communities at the semi-periphery independent from the centre's mediation which is often a knowledge distortion as well.

The paradox could be expressed in the following way: societies at the semi-periphery are not different enough to be recognised as different (being former industrialised societies). Moreover, there is no genuine political interest, neither in the centre nor at the semi-periphery, for these differences to be acknowledged and researched. Instead, a short cut is advocated: promotion of policy measures which should help those societies to 'adjust' to the centre. The result is often formalised and related to formal adjustment, full of traps of counterproductive effects. While at the formal level, these societies comply with the demands of the centre, on the societal level there are evident processes of de-development, resistance, chaos, entropy or anomy (Heinrich 1999). What concept will be used to describe this condition is a matter of theoretical approach, but the fact is that transition being part of globalisation process is producing very different effects for different segments of semi-peripheral societies, often enlarging differences between semi-peripheral societies themselves, and increasing an overall uncertainty about the future direction of societal change, at the state level, as well as at the global level. The cost of 'globalised' ignorance is global uncertainty.

How does all of this affect scientific excellence at the semi-periphery? If scientific excellence in its abstract meaning is related to originality, innovativeness, creativity, but also to ethical principal of value for humanity, then it seems that these qualities could hardly be attributed to a large extent to social scientists of the semi-periphery. They neither formulate new paradigms, nor do they have possibilities to communicate them to wider epistemic

communities at the semi-periphery, nor have they profoundly contributed to the critique of the high costs of transition, in fact the globalisation of their societies.

In other words, excellence in the conditions of the 1990s, and even today, could be seen as a highly contradictory individual project which demands a clear choice which a scientist at the semi-periphery needs to make between 'being excellent' as regards the standards of the centre – which often implies acceptance of the dominant paradigms, accompanied by 'political correctness' and often the withdrawal from the critical thinking – or to make a choice in favour of critical thinking, possibly useful and usable for the local epistemic community, driven by personal ethical standards, but to remain isolated and to function in small marginal networks incapable of creating new paradigms, lacking resources and power. Another possibility is also open, which in reality is often combined by one of the two previously mentioned, and which in fact enables economic survival for the scientists at the semi-periphery: to produce a kind of supplementary knowledge about semi-periphery, but within the theoretical framework provided by the centre. Social scientists from the semi-periphery are often perceived and used as suppliers of the more or less 'raw' material which needs to be theorised from the centre, to be generalised, neutralised, objectified, through the mediation of core institutions, and thus to become – 'scientific'. This knowledge is produced within the coordinates determined by the knowledge institutions of the centre, often accompanied with many distortions (Kim Lane Scheppele, in Csepeli, Orkeny, Scheppele 1996; Cahalen 1996).

Standpoint epistemology at the semi-periphery

What is essential from the epistemological point of view is that semi-periphery is not some unimportant residual category, but that semi-peripheral position creates deep needs for very different knowledge paradigms. The essence of semi-periphery is its instability because it is open to two different possibilities at the same time: to catch up with the centre, or to be pushed further into the periphery. The major characteristics of the semi-periphery, which is caught up in a vicious circle of "being different, but not being different enough" reflects, in fact, structural dispositions of semi-periphery, which is 'transiting' between structures, in the condition which is more often structureless than structured, more often in dynamism than in stability. Ambivalences, paradoxes, discontinuities, unintended detrimental consequences, chaos, entropy, are only some of the records of such 'in-betweeness'. In other words, change at the semi-periphery is as much structural as structure itself. In many ways, economic and political forces in semi-peripheral societies have a different dynamism than is the case in core countries. The lack of structurally based determinism, which comes out as a consequence of structural void, is reflected in "epistemic void" (Ivekovic 1993). So, the epistemic consequences are simply large. This is what is certainly validating a need for specific paradigms, coming from the semi-periphery itself. In other words, it would be unreasonable to claim that knowledge created at the centre could 'cover' the realities at the semi-periphery. This starting point challenges the issue of excellence from another perspective: namely, what could be recognised as excellence by the centre and from the centre, could be more or less irrelevant, even distorting knowledge for the semi-periphery, and vice versa. Many of the structural changes in the globalisation process could not be understood from the semi-periphery itself, which inclines to overemphasise 'small differences' and overlook wider, more general global trends of social change. In a way, standpoint epistemology should be advocated both for the core and for the semi-periphery, or periphery. However, the precondition for the cognitive leap is not in summarising different standpoints, but in creating a deeper understanding of why and how different ways of knowing and different knowledge are shaped by those standpoints.

Or to go one step further, as it is useful for understanding the globalisation of production and its implications by the use of the concept of "commodity chains", which refers to the network of labour and production processes necessary to produce a finished commodity (Martin 1992: 50), a parallel concept could be constructed such as "knowledge chains", which would imply different but interconnected roles of knowledge institutions and knowledge networks along the continuum core-semi-periphery-periphery. At present, damagingly for the essence of scientific

excellence, different locations on this continuum largely determine what could possibly be given the attribute of excellence, what could be possibly recognised as excellent, and by whom. Excellence in science thus appears to be very context-dependent, but within the powerful configuration of the continuum core-semi-periphery-periphery, which is clearly counterproductive for real scientific excellence and which is decreasing the overall possibility of humanity to govern itself in a productive and efficient way.

Being a social scientist at the semi-periphery during the transitional period offers the opportunity to be in a unique social laboratory. Observation, political commitment for change, creative thinking, can all be intertwined in extremely new and creative approaches. Social change itself is creating the possibilities for the change of paradigms. However, from the level of individual insights and valuable contributions, to the level of well-accepted paradigms and, accordingly, recognised excellence, there is a gap which can be bridged only by communication in epistemic communities. No challenge of dominant theoretical and conceptual frameworks is possible as a purely individual act. But, also, every individual insight is deeply embedded in the shared cultural, contextual understanding of the social change. The problem of the recognition of excellence here comes both from the inside, local epistemic communities, as well from the outside, larger globalised epistemic communities. From the inside, excellence may not be recognised because it operates within a well-established cultural consensus (nobody is a prophet in his/her village); therefore, the specific creative contribution may not be visible because it is not estranged enough. On the other hand, excellence may not be recognised from the outside because it can easily fail to adequately translate contextual, cultural background into the dominant paradigms. The complexity of the local context often demands sophisticated multidimensional analysis which, from the perspective of the centre, usually seems to be irrelevant or too complicated.

Standpoint epistemology, although the only heuristically fruitful position of the social scientists at the semi-periphery, bears a high risk of producing both marginal knowledge and marginality of scientists, especially in the conditions of the absence of wider epistemic communities at the semi-periphery, capable of creating adequate context for scientific evaluation.

Mechanisms of exclusion

The third assumption is that between globalised knowledge production mainly shaped by the centre, which creates coordinates for both scientific knowledge and scientific excellence at the semi-periphery, which in fact influences conditions of the knowledge production at the semi-periphery, on one hand, and the individual women scientists from that very semi-periphery, on the other hand, there exists a system of 'translations', mechanisms through which and by which her position, her way of knowing, her production of knowledge, and the possible recognition of her excellence are connected. The global-individual link, which cuts through semi-periphery, different statehoods, different local knowledge institutions, local gender regimes, cultural traditions, symbolic orders, and group experiences, and even different histories of resistance, at the end largely shapes her possibilities to produce excellent knowledge, or the knowledge which will be recognised as such, regardless of her personal talents, capacities, even productivity. In other words, there are many structural barriers to the recognition of scientific excellence for an individual woman scientist.

Gender bias in measuring scientific excellence is in many ways only secondary to the hierarchy in the evaluation of the knowledge coming from the location of the scientists on core-semi-periphery – periphery continuum of knowledge production. As was succinctly stated by one woman scientist in Serbia during research conducted in 1989: "*It is much more important where you are born, than whether you are male or female.*" (Blagojevic: 1991)

Gender regimes at the semi-periphery

Finally, the fourth assumption for this paper, which connects the concept of semi-periphery and the concept of gender, relates to the specificity of gender regimes at the semi-periphery. Because semi-periphery is continuously shaped by an on going effort to 'catch up' with the centre, women's human resources are often additionally mobilised and exploited for the gap between the centre and semi-periphery to be bridged. The semi-periphery regularly produces a paradoxical combination of strong patriarchies which exhaust woman's resources in the private domain, together with the ideological 'fog' of gender equality. The result is, from a Western point of view, a strange amalgam of 'super woman', and a strong, sacrificial woman who is 'more than equal'. This is very similar, but not identical, to the 'development' of third world countries, where intensive exploitation of women's resources has been the precondition for the 'modernisation' of those societies (Harding 1998: 105-23). In comparison to third world countries, in semi-peripheral societies the use of women's resources does not differ so much by the extent but by the quality: former industrialised societies with a strong egalitarian ideology created educated woman power with a high inclination for employment. Women's relatively high inclusion in science, and fast feminisation of academic posts (Enwise report, 2003), therefore is the consequence of two very opposing sets of conditions: those favourable to women as part of a communist legacy (education, employment, egalitarian ideology) as well those unfavourable for women ('normalised' high level of exploitation of women's resources as a precondition for the development or transition, and a very unfavourable position of science, in general) (Blagojevic1991; Enwise report, 2003). In other words, without the wider context of the habitually high exploitation of women's resources and cultural patterns which support this, it is impossible to understand women's self/sacrificial behaviour, both in private and in the public domain. Scientific excellence of women in this kind of environment, of prescribed women's sacrifice, where women's individual ambition is treated as ultimately negative, an 'unwomanly' feature, is something which is seen more as an excess than as a desirable quality. However, in that same environment, women's valuable resources could be quite efficiently used without adequate recognition, often even without any expectations for recognition coming from women themselves.

Doing social science at the semi-periphery: laboratory without a roof

Social scientists at the European semi-periphery, where the process of transition took off in the late 1980s and is still continuing for some countries, at a different speed and in a different manner, have been faced with very many new challenges: vastly changed conditions and environment in which to work. Here, some of the problems will be discussed which underlie the difference in 'doing social science' East and West, and which more or less directly influence both the scientific excellence and what could eventually be recognised as such.

One of the most important features of the scientific environment in post-communist societies is the destruction and transformation of 'academic capital' through external and internal migrations. External migrations are recognised as the 'brain drain'. But the effect of internal migrations, movement from academic institutions to NGOs, is heavily under-researched and unrecognised 'from the outside' as a problem. An overall effect of both types of migrations is a constant weakening of already weak epistemic communities. As brain drain affects younger generations of scientists much more intensively, the organisation of scientific production is heavily misbalanced: absence of younger researchers leads to the impossibility of the productive 'division of labour' between younger and more experienced researchers. Because of the limited funds for the research (Enwise report, 2003) the scientific organisation is already heavily damaged. In reality, this translates into the impossibility to work on more complex, more demanding, and accordingly more heuristically rewarding projects. And all this affects excellence directly.

NGO scenes in post-communist societies is yet another interesting phenomena, affecting research in social sciences in semi-peripheral societies, in many ways incomparable to core countries. One of the major differences is the fact that many of the NGOs are heavily dependent on external funding. As they were targeted by different international and foreign agents as the major 'enzyme' for fostering social change in post-communist societies towards

'democratisation and the market economy' they also encompassed much of the actual ongoing research in semi-peripheral societies, but with the clear agenda coming from the core. In more concrete terms, this means that throughout the 1990s and also today, social scientists from the semi-peripheral countries of Europe were surviving and working in many ways under the regime of NGO scenes, not an academic regime. The implications are numerous: hyper-production of low-quality so-called 'policy researches', ad-hoc creation of 'expertise' on different issues without any academic recognition, further marginalisation of academia in the public life of semi-peripheral societies, unhealthy competition between academia and NGOs, and creation of parallel educational programmes with many more resources than in academia. The NGO sector, in fact, pulled much of the academic resources and redirected them in the direction of agendas formulated by the donor organisations.

What are the consequences for scientific excellence? The research problems, theoretical and methodological approaches, have not been formulated by the epistemic communities of semi-peripheral societies, but by the core agendas mediated by donor organisations so, in a way, they were external to scientific interests of semi-peripheral societies. The effect is the production of knowledge which is compatible to the knowledge produced by the centre about semi-peripheral societies. Weakening of the local epistemic communities led to a decrease in the possibility to articulate alternative conceptual frameworks and scientific paradigms which would reflect the position of semi-periphery and would be based on standpoint epistemology. Scientific excellence in these terms has quite a dubious meaning.

At the beginning of the 1990s, transition became one of the most popular, fastest growing topics in social sciences. To denote this explosion of 'scientific research' in this field, one Hungarian sociologist, Anna Wessely, coined the term ''transitology'' with inscribed irony. However, the term, once again ironically, was very quickly accepted in social science circles, so transitology really became one of the 'new sciences'. It had tremendous attraction for many of the scientists in the core countries, especially where they originated from one of the 'transitional' countries, and spoke 'one of the local languages'. One of the very popular and fast ways of 'collecting' knowledge from the 'local knowers', but to reduce it to the 'information', was done by international projects, or even more often, by international conferences. Although international projects were very rewarding for the local scientists because they enabled some decent payments, contacts and exchange, often even the continuous networking, at the same time they were major channels for imposing the hierarchy between the knowers: those from the semi-periphery being in a role of suppliers of 'raw' material, while those from the core having the authority to 'theorise'. The imposition of Western theories was strong and undisputable. Whatever had been produced by Eastern scientists would immediately be located in the framework of 'Western theoretical debates', following 'déjà vu' logic. Knowledge was continuously distorted by false 'theorising' on semi-peripheral realities, often 'pushing' them into the alien theoretical constructs which were reinforcing the myth of modernisation. In return, these conceptual frameworks were also reshaping semi-peripheral realities by the force of imported symbolic capital (Baudrillard, 1996, 2000).

The very idea, deeply embedded in the Western world, that the transition from communism to post communism would be fast and not so difficult (Heinrich 1999), together with the idea that the semi-periphery is 'not all that different' produced an emphasis on fast policy solutions instead of research-based policies. That created a much better environment for so-called expertise than for knowledge. Assumed similarities, and assumed inevitability of the 'modernisation' road, encouraged fast policy-making without profound research on social structures of the transitional countries. The result was that policy-making was faster than knowledge-making. This is a situation very different from that of the core countries where knowledge-making usually precedes policy-making. But, because it was assumed that knowledge from the core was applicable to the semi-periphery, policies were designed without substantial knowledge about semi-peripheral societies and their capacity for change. The costs were often simply disastrous. Policy orientation of social sciences in semi-peripheral societies also adversely affected the prestige of research based, scientific knowledge.

Overnight, scientists from the semi-periphery were exposed to academic cultures very different from their own but, unfortunately, also to much arrogance, even "aggressive ignorance about the particulars of European history, politics and culture" (Cahalen: 24). The specific communications problem was related to very different intellectual traditions East and West and different academic cultures. The roots of misunderstandings were/are deep, structural, and deserve recognition and serious intercultural scientific communication. These differences, per se, deserve to be treated as a scientific research problem par excellence. Instead, they are ignored or misinterpreted. The lack of appreciation of intellectual difference among Eastern scientists, which has originated not from any kind of 'intellectual inferiority', but from very different intellectual traditions and different roles of intellectuals in semi-peripheral societies, and arrogance expressed towards this difference in West-East scientific communication was structurally parallel in many ways to arrogance of andocentric knowledge in the history of Western science. "Theoretical fence" (Cathleen 1996) simply made the scientific communication very difficult, let alone quality scientific communication. Instead, what was assumed was the superiority of the Western model to which Eastern scientists should adjust, regardless of whether that really makes sense. The 'burden' in formulating new cognitive, conceptual, epistemological approaches which would 'cover' semi-peripheral realities in their connection to core realities, was simply not shared equally by scientists East and West.

Social scientists were faced with many quite new and, in many ways, irresolvable problems with the beginning of the transition. What influenced their position mostly was a very asymmetrical position in West-East scientific projects, and their high dependency on funding from the West. The consequences were detrimental for the social science itself: it became disconnected from its traditional contexts of local societies, it became non-responsive to the needs of local communities, and finally it became incapable of producing valuable concepts and paradigms to theorise adequately the tremendous social change occurring during the transition. The scientific excellence was not only denied to the social scientists of semi-periphery, simply for the matter of 'arrogant ignorance' and power misbalance but, which is even worse, became almost impossible to achieve under the new conditions of the new division of labour along the continuum of core – semi-periphery – periphery of globalised knowledge production, which was largely trivialising their scientific capacities. Mechanisms employed for the new marginalisation of social scientists were numerous: distribution of funds through NGOs; the setting up of research agendas by donor organisations; inadequate treatment of 'local' scientists in journals, at conferences, in international projects; prioritising the command of the English language over scientific knowledge; prioritising skills over knowledge; and the imposition of methodology, paradigms and simplistic explanations. The epistemic void thus persisted, while the excellence of the Western scientists being specialised in transition has most probably been rewarded and recognised. New conditions made it even more clear that 'creators' of the knowledge come from the core, that semi-periphery is compliant with translation of that knowledge, or even simpler, to transmission, and that the final users, 'local societies' will be further objectified through the exercise of policies based on that kind of distorted knowledge.

Doing gender studies at the semi-periphery: debates and alliances

Gender studies in the semi-peripheral countries of Europe have been a very dynamic field with a high attraction for women social scientists. One of the important explanations for the relatively fast growth of the field could be found in the fact that much of gender studies development was connected to NGOs, where they were often organised as "parallel educational organisations". Funds were available, and often very stimulating in comparison to funds in academia (Blagojevic 1988; Milic 2002). Although women's/gender studies at the semi-periphery have rather a short history (they were mainly established after the 1990s) they are facing the same challenges as women's/gender studies in the West, which only proves that there are some structural constraints connected to the conservatism of andocentric academia and self-positioning in relation to the movement, which exist regardless of the location, trans-culturally (Grunberg 2003: 2).

In any case, these dilemmas connect to both production of excellence, as well as to recognition of it. For example, establishment of gender studies outside academia highly relativised their academic contribution. And although in some cases this could be attributed to the conservatism of academia, in other cases the problem was the real absence of academic criteria behind knowledge production and dissemination in the field of gender studies. The rapid expansion of courses, seminars, and training related to women and to women's/gender studies, included very many 'newcomers', among them some who would not, under the normal academic quality competition, be able to stay in the field. In other words, while the positioning outside academia eased some developments, it also inhibited quality control.

Although, at first sight, rapid quantity development of gender studies at the semi-periphery seems to be a 'success' story, many more facts should be factored into the picture in order to understand the complexity of their developments. For example, at the semi-periphery, gender studies are not recognised as a scientific field, and function mainly as highly ghettoised intellectual endeavour without any substantial academic dialogue with non-gender scientists. Even when scientific excellence exists, it simply cannot be validated by local epistemic communities because they are very small and, in addition, in the case of gender studies, fragmented across discipline boundaries (social sciences versus humanities). The true 'interdisciplinarity' of gender studies has not yet been reached because they are still basically structured around the disciplines. However, sometimes interdisciplinarity covers the lack of quality, and sometimes it is stretched over too many disciplines to be adequately appreciated. Additionally, the lack of clear rules and academic criteria, together with funding possibilities, created very tough competition in the field which gave rise to the influence of network-based selections (better referred to as 'clans'), while meritocracy, quality and originality have been marginalised. In many instances, gender studies, usually organised by one or several 'women leaders' in the highly unregulated setting of NGO scenarios, tended to repeat all of the weaknesses of male hierarchies, exclusions, and 'old boys' clubs'.

Gender studies in semi-peripheral societies were mainly 'imported' as part of the knowledge from the West which largely corresponded to Western post-modern realities. However, although very exposed to the Western knowledge paradigms, in a very similar way and mainly through the same mechanisms, gender studies at the semi-periphery took a much more critical stand and resistance than was the case with other social science disciplines. Following Mohanti, Slavova suggests that: "*Emerging East European feminisms seem to be engaged in a similar double-sided project: on the one hand, critically appropriating and subverting established Western feminist models, on the other, striving to construct their own feminist identity and politics*" (Slavova 2001: 5). This was vividly expressed in the so-called 'East-West Feminist Debate' which had already started by the beginning of the 1990s and is still ongoing [(6)]. The explanation for this more autonomous and more critical stand of gender studies at the semi-periphery could be traced to two facts: that they relied heavily on post-colonial feminist critique and, secondly, that their criticism was encountered with much more openness and benevolence than was the case with other social science disciplines. In a way, marginality of gender studies, both in the core and at the semi-periphery, contributed to the more balanced exchange of ideas, to alliances which have the potential to become epistemic communities along the continuum core-semi-periphery-periphery.

Excellent woman scientist at the semi-periphery: living in limbo

For an excellent woman scientist (in social sciences, possibly doing gender studies) living at the semi-periphery during transition, scientific excellence is a highly ambivalent issue. Contrary to the models of 'normal' career development in the West, her position is full of contradictions and high costs of possible choices. In addition, her 'choices' are often not really choices, but the result of accidents and circumstances which, in the highly chaotic environment of semi-peripheral societies, create sudden possibilities, or marginalise her still further. There is not much regularity in career development at semi-peripheral societies.

Different strategies, which are at least theoretically at her disposal, include: brain drain with more or less fixed alternate location in the core; endless mobility (going back and forth from her native country) which is, in fact, 'scientific

nomadism'; stable employment in the scientific institution in the home country; or giving up a scientific career all together. If she decides to brain drain, she can hardly expect to be evaluated according to her quality in the core countries. Lacking the important cultural, symbolic and social capital, she will most probably remain marginal, pushed into the role of a 'specialist' for her native country. However, in most cases, the triviality of her professional tasks will exclude any possibility of working on really challenging issues, doing the 'excellent' work and obtaining recognition for scientific excellence. If she chooses to become endlessly mobile she will need to give up family life, stable relationships and support networks. She will gain a lot of knowledge from the careful observations of different settings; she will develop her adaptability and skills of intercultural communication. However, her nomadism might not materialise into 'excellent knowledge' for the very reason that too much effort is put into nomadism itself. A stable environment with good working conditions might be constantly out of reach. If she stays at a home institution, she might be integrated into the local community but be confined to the fringes, and the more original and creative her work is, the smaller the audience she will have. In other words, choosing to produce 'real excellence' is either impossible or unrewarding.

The position of transmitter is much more comfortable. In fact, this is the ideal position for the social scientist at the semi-periphery, which means that she simply disseminates knowledge from the West. The Western colleagues are generally very generous and supportive to those who assume the role of transmitter. They are invited to conferences, supported with scholarships, and even become friends. From the point of view of pure rationality, being a transmitter is the most rational strategy for the individual woman scientist at the semi-periphery. She can succeed in improving her quality of life, even her references. Her scientific excellence might be recognised even without excellent work.

In other words, an excellent woman social scientist at the semi-periphery can hardly be the creator of excellent knowledge while staying at the semi-periphery, even if she succeeds in doing such impossible work, mainly because there will be no one to take notice of it. Measuring invisibility is, indeed, difficult.

Notes

(1) Semi-periphery in this paper refers to post-communist European societies at different stages of the enlargement process.

(2) Enwise: Enlarge Women In Science to East

(3) Enwise Report: "Waste of Talents: turning private issues into a public debate", ISBN 92-894-6750-9, 2003

(4) Therefore, in this paper when reference is made to the scientists from the semi-periphery, it is taken to mean scientists from social sciences.

(5) It is important to note that the concept of semi-periphery in this text has a different starting point to the one it would have had in the case of Joseph Ben-David's conception (Ben-David 1971) of the *science centre* and the *science periphery*. The emphasis here is on distinctive features of semi-periphery which present a different epistemological challenge, invisible from the dichotomy centre-periphery, and which could be very relevant especially for social sciences. However, on another level, this theory is very applicable to the countries in the semi-periphery of Europe, as shown in the Enwise Report (2003), chapter 2.

(6) The East-West feminist debate started at the beginning of the 1990s when Salvenka Drakulic, a feminist from Croatia, and Nanette Funk, an American feminist, exchanged views. Later it included almost all major feminist scholars from Eastern Europe. The focus of the debate was how and why Western feminisms are not simply applicable to Eastern realities. However, it should be noted that focusing on these differences and explanations took a lot of intellectual effort and resources from the already small and weak feminist communities at the semi-periphery. So, in a way, this debate, although precious for delineating the field for feminist theory and research at the semi-periphery, was often imposing the 'wrong questions', thus drawing attention from many of the burning issues during the transition. Eastern feminists were caught up in a vicious circle of explaining "their difference" using Western conceptual frameworks, without being able to do the research and/or communicate the problems first in their local, or semi-peripheral epistemic communities.

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Gender and the assessment of scientific quality[1]

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Abstract

The poor representation of female scientists in senior positions of the academy is usually analysed as an issue of personnel and human resources. This paper develops a sociological analysis of the relationship between gender and conceptions of 'science', especially the notion of 'excellence', in evaluations of scientific quality. First, I will make some remarks on the procedures of selection and evaluation. Second, I will investigate the way scientific standards are applied to male and female scientists. Third, I will investigate possible gender bias in these standards.

Reflection on criteria for excellence will show that certain conceptions of science are dominant within the evaluation procedures. I argue that these conceptions are in fact a reflection of the hegemonic position that privileges masculinity. The conclusion suggests that reflection on images of the sciences, in combination with a plea for more transparent evaluation and selection procedures, are important strategies. Finally, I will describe some measures taken by Dutch universities in order to make procedures more transparent.

Introduction

In recent years, the longstanding gap between men and women in terms of scientific education has diminished. Nevertheless, the low representation of women at the highest levels of universities remains virtually unchanged. How can one understand the persistence of this masculine dominance? Since overt discrimination is prohibited and "not done", it is necessary to analyse institutional practices, particularly the way gender is inscribed into these practices, resulting in indirect discrimination (see, for example, the MIT report on women and science 2000; Harding 1998). A better understanding of the way scientific quality is defined and put into practice will aid understanding of the slow progress by female researchers.

Mainstream ideas on the attribution of scientific competence are strongly related to the meritocratic view that individual performance determines and reflects competence. It is an old idea, rooted in the heart of the scientific ethos, connected with the struggle of science to liberate itself from theology and other societal powers (Merton 1942). At root, it was a plea for democracy within the sciences: that the accomplishments of the individual should be what counts, and that the scientific community should evaluate scientific accomplishments. From this perspective, the scientific forum is the best institution to evaluate the results of research. Peers, therefore, should assess the quality of research proposals and products. In this way, the scientific community produces "certified knowledge". Disinterestedness and the ability to be objective are cornerstones of this scientific ethos.

Bourdieu called this claim to objectivity and disinterestedness one of the strongest myths of contemporary science (Bourdieu 1976). It functions to mask the specific interests of individual scientists and scientific communities. Gender neutrality has been part of that myth, as many feminist reflections on science have shown (Harding 1998; Harding and McGregor 1995; Rose 1994; Morley 1999).

Following the widely accepted critiques of Lakatos (1974), Kuhn (1962) and, most recently, postmodernism, the central theses of this scientific ethos have been severely destabilised. Put bluntly, there is no truth, no universalism, no straightforward objectivism. The positioning of the scientist in an academic and societal force field is crucial for the way research is conducted and knowledge is produced (Haraway 1998). Facts do not hide behind a curtain

waiting to be discovered by the researcher; facts are made manifest (constructed and created) within a seamless web of social and academic practices (Latour 1987; Mol 1989).

However, there remains a gap between these theoretical debates and discourses on science as an institution of knowledge production on the one hand and, on the other, the actual functioning of this institution, including the everyday power mechanisms regulating decision-making processes. The twin concepts of objectivity and disinterestedness have not disappeared, rather they remain at the core of rules and regulations within scientific enterprise. In evaluation procedures and their underlying criteria, the classic image of science is still dominant. The central presupposition is that these evaluation systems are relatively objective, fair and open. Competition regulates and separates "bad science" from "good science": the "best" researchers succeed in open competition.

In this paper, I discuss some aspects of the gendered construction of scientific quality. What about gender? Does it matter? According to the normative standards of scientific enterprise – the scientific ethos – it does not. A closer examination reveals three issues:

1) Gendered procedures
2) Gender schemes in the perception and attribution of scientific competence
3) Gendered definitions of scientific quality

Finally, I will discuss some of the measures taken by some Dutch universities, relating, in particular, to the gendered procedures.

Gendered procedures

Recent research on the so-called 'glass ceiling' within organisations highlighted the importance of selection procedures. The paths to the top are far from transparent, and women seem to have less information on how to handle these shadowy pathways than men. Very little empirical investigation has traced the relationship between the success rates of women and the transparency of procedures; this section will demonstrate that lack of transparency often accompanies low success rates for women. Recent research by Van Balen (2001) involved comparing the positions of women at three universities in different countries, and provides some evidence that this is also the case in the higher echelons of the academy.

Another study, investigating the selection procedures for KNAW fellowships – one of the most prestigious research awards in the Netherlands – concluded that the transparency of procedures was crucial. The research focused on the University of Groningen. Only 11% of the candidates put forward for a postdoctoral fellowship were women, a lower proportion than would be expected, given that one of every four of those completing doctoral studies was a woman (see Brouns & Spits 2001, for a complete description). Most faculties were found to be rather reluctant to nominate female researchers for the award (see Table 1 below).

Table 1: Nominations of men and women for the KNAW stipend at the University of Groningen (1996-2000)

Nomination*	**Men**	**Women**
Medicine	14	3
Mathematics and Natural Sciences	26	-
Arts	9	4
Social Sciences	5	1
Total	(63*)	(9)
* Only the largest departments are represented in the table		

Particularly revealing is the fact that even those faculties with relatively large numbers of female doctorates – mathematics and natural sciences with 131 women and the social sciences with 85 over a ten-year period – either did not nominate any women or nominated only a few compared to male researchers. The only faculties with a nomination sex ratio comparable to the sex ratio of their successful doctoral candidates were arts and medicine. More detailed investigation of the procedures and files demonstrated that these faculties are also the ones with the most transparent procedures in terms of clarification of criteria, public announcement of the call for applications, and clear reporting on selection procedures and outcomes. Other faculties had almost no documentation of their selection procedures and it looked as if the selection was strongly influenced by the informal network. One of these was the faculty with the lowest representation of female scientists as applicants for the stipend. Based on these findings we can hypothesise that women have a greater chance of success in those faculties in which the messiness of selection procedures was minimised and selection commissions were accountable for their decision-making.

Van Balen (2001) argues that a comparison of three university recruitment procedures for new professors reveals that the Dutch system is one of the least transparent. The justification for this confidentiality and secrecy is to protect the privacy of candidates. But does "protection of privacy" serve as a veil, disguising the reproduction of masculine hegemony? Although there is currently no way of demonstrating a causal relationship (more investigation is needed), it is nonetheless widely recognised that 'old boy networks' which privilege "the boys" function best in the twilight of an institution. Transparency of selection procedures and accountability of advisors and decision-makers is, therefore, an important strategy guarding against the bias and arbitrariness of secret processes, and the reproduction of barriers to women's career progression in universities.

Decreasing these power processes would be rather simple: women, and other newcomers to the academy, could demand open and transparent procedures. The next two aspects of the gendered construction of scientific quality are more complicated to understand and address.

Gendered schemes in perception and the attribution of scientific quality

The scientific forum is the best institution for evaluating scientific quality and competence (De Groot 1982). Peers are the ones who decide upon scientific quality. However, this statement is not undisputed. Evaluators are themselves competitors for scarce resources, and as such they are stakeholders with personal goals, masking their own interest in general statements on scientific development (Bourdieu 1976). Doubts have been expressed for a long time about the reliability and impartiality of judgements by peers (Becker & Van Raan 1985; Van der Meulen & Rip 1994). The Matthew Effect (Merton 1960) – in which achievements are frequently attributed to the more famous researcher – has been documented extensively. The gendered variant, called the Matilda Effect, has also been well documented: achievements of female researchers are frequently attributed to their male colleagues (Rossiter 1993; Stamhuis 1995). Evaluation is not free of subjective elements, prejudice and stereotypical images partly related to gender differences, nor from hierarchical position and reputational status (Boon & Vroon 1985).

American research based on interviews with female scientists found that 'gender schemes' are active in the interpretation of the achievements and performance of men and women scientists (Valian 1998). Such schemes – stereotypical interpretations of events and behaviour – often lead to an underestimation of the performance of female scientists. Research by Wennerås and Wold (1997) found that the peer review system was not as neutral as expected. Gender and affiliation both influence the chances of obtaining a grant. A study of the peer review system of the NWO (Dutch Organisation for Scientific Research) did not completely confirm these findings (Brouns & Scholten 1999). Possible discrimination against women was found in some disciplines, while in others women appeared to have received preferential treatment. We investigated the two most remarkable disciplines: one in which women were very successful (science and mathematics), and one in which women were not

(biology). We expected a correlation between the scientific qualifications of the applicant, the results of the assessment, and the decision by NWO. For the male applicants, the hypothesis was confirmed: greater accomplishments led to a better assessment, which in turn was related to an increased chance of an award. However, the connection between qualification and success was not so straightforward for women, mainly due to the low success rate for women in biology who were, on average, as qualified as the male candidates. The study resulted in the hypothesis that gender matters, but differently depending on the discipline. Analysis of individual files in the fields in which women were not very successful showed that, even when women had a track record comparable to that of men, male researchers were much more likely to be labelled as 'excellent'. In interviews, decision-makers mentioned the situation of the labour market as one of the explanations: scarcity of jobs is a risk for women.

This indicates that evaluation procedures must be viewed in a wider context of available opportunities and future expectations for a scientific field (the boundary work; Gieryn 1983, 1999). Evaluating past performance is not the same as predicting prospects on the basis of this past performance, and it is possible that the gender bias is especially active in the translation of past performance into prospects for the future. A combination of the Matilda Effect and the 'gender schemes' of perception may provide one part of the explanation for the underestimation of female scientists: women are not expected to become famous scholars. In this respect, we can suppose that affiliation with one of the evaluators or decision-makers is a powerful element in enhancing the credibility of a candidate (sometimes linked to the nepotism issue; Wennerås & Wold). Having the right connections seems to be crucial in a successful career trajectory. This is what Etzkowitz et al. (2000) have called "the Kula Ring of scientific success". However, only the outcomes of the evaluation procedures have been researched, not the assessment process itself.

Gendered definitions of scientific quality

The concept of scientific quality is at the heart of the micro-politics of the sciences as a social institution. According to Bourdieu (1976), epistemology – forcing a demarcation between science / 'non-science' – is part of a legitimising process masking positions and strategies. Or, as Van der Meulen (1992) stated some years ago: "*The quality that is ascribed to the objects evaluated is not a property of the object but a relation between the object and the frame of reference, ascribed by an evaluator.*" (Van der Meulen, 1992: 14)

Assessments of scientific quality reflect positions and visions about the field of science. What kind of 'frames of reference' are activated in the evaluation process, creating the difference between 'excellent' and merely 'good'? What does 'science' mean to those responsible for evaluating scientific quality? What indicators do they deploy?

The position of key national funders – in the case of the Netherlands, the National Research Organisation (NWO) – is crucial in this respect. For some years there has been a debate on the assessment procedures and criteria of the NWO, with questions being raised about the dominance of a quantitative-empirical framework, especially in the social sciences, but also in the humanities. Research proposals characterised by a elaborate quantitative research design and style (large surveys) are more likely to be funded than more qualitative research projects, or less mainstream research designs. Moreover, monodisciplinary projects are more likely to be positively evaluated, due to a perception that interdisciplinary projects have difficulties developing a sound empirical basis. From the point of view of some evaluators, the only 'real' science is that using a deductive/hypothetical design, and which produces statistical data. This is a disadvantage for many women in the social sciences and humanities since they often prefer more explorative and qualitative, interdisciplinary research designs, which also holds true for researchers engaged in gender/women's studies (Fox Keller 1985; Harding 1986; Morley 1999).

In some cases, the measure of productivity rates for individual researchers or teams is limited to articles in scientific journals, excluding the importance of scientific books and book chapters in some fields. These standards explicitly privilege publications addressing the international scientific community above those directed at a wider audience.

All together, these criteria reflect the normative ideal of the hard/natural sciences as they are represented as an ideal for all scientific research. The normative standards for scientific quality reflect to a large extent the practices of the natural sciences: primarily targeted at the academy, the esoteric sciences publishing for the scientific community. Not only does this apply more to the behavioural repertoire of a large group of male scientists, but it also reifies some functions of science and ignores other important functions of the sciences as a social institution.

In the classic model, science is an autonomous social institution which produces superior knowledge: only science delivers true and objective knowledge. This epistemological claim to truth is reflected in academic social relations: a strong pyramidal structure, and an exclusionary scientific community, admitting – at least in the Netherlands – full professors only (Van Balen 2001). One of the powerful metaphors for science is the Olympus model, which situates the scientists, in their unselfish and disinterested quest for truth, at the top of the pyramid, far removed from the concerns of everyday life (also called the 'Mode 1' of knowledge production; Gibbons et al. 1994). It represents scientific work as ultimately an individual activity. The epistemological claim to superior knowledge and truth is reflected in the dominant characteristics of the scientific community: a strong pyramidal social structure, and a scientific community limited – at least in the Netherlands – to top positions, the full professors (Van Balen 2001). Scientific output is primarily targeted at other scientists. In the assessment of scientific quality, interaction with a wider audience, and with other loci of knowledge production and transmission, is close to zero. The classic model, however, is increasingly under attack. Many alternative visions of science point to a strong interaction between production of knowledge, transmission and translation of knowledge. Science is one of the loci of the market place of exchange, firmly rooted in, and interacting with, the knowledge society. In the Agora model – a metaphor in opposition to the Olympus model – science is analysed as a societal practice, tightly bound up with other societal practices (Harbers 1986, 2002; Brouns & Harbers 1994). In this model (also called 'Mode 2', Gibbons et al. 1994) there is a strong interaction between production of knowledge, transmission of knowledge, and translation of knowledge. According to Nowotny et al. (2001), in the context of the knowledge-based society, the sciences move into the agora.

Back to the future?

Recent debates have, to some extent, produced a sense of unease among national research funders. The NWO has changed its policy, committing itself to supporting more interdisciplinarity, more creative research, and more attention to the heterogeneity of scientific practices and practitioners. Nevertheless, it may not be that easy to translate these principles into practice. The decision-making processes overall are conservative, even in those programmes aimed at a renewal within the scientific field (the so-called "Vernieuwingsimpuls"). The key question is whether this conservatism is inherent in judgements and decision-making about 'science'. As Arie Rip noted a few years ago: "*Scientific establishments being influential with the intermediary sponsor could reproduce themselves, and did so (up to the reproduction of gender asymmetries [my emphasis, MB]. The incestuous element in such a set-up reinforces the risk-aversive tendencies of a bureaucracy. Careful judgements and due procedure limit the nonsense, at the cost of limiting some of the novelty as well. In general, without external stimuli, awarding decisions tend to be conservative*." (Rip, 1997: 33)

If this is the case, then the only way to reduce conservatism is to develop new assessment procedures in which different actors and stakeholders in the heterogeneous field in which sciences actually function are represented. Pluriformity of assessors is one possibility which, in turn, will require reformulating the image of science, and the classic scientific ethos.

Besides these questions considering the reliability and justice of evaluation systems – which tend towards an Olympus model image of sciences – new issues arise considering the adequacy of traditional indicators of scientific quality for the evaluation of scientific endeavour in a knowledge-based society (Gibbons et al. 1994). It may be expected that images of scientific excellence and 'the excellent scientist' are changing as a result of contemporary pressures.

The Agora model is not only an epistemological notion of diversification of truth claims, it is also a model for the social structuring of the scientific field. It implies a strong network and an open interaction between universities, research and education organisations and other social institutions of the 'knowledge society', and provides a basis for direct exchange and transmission of knowledge. As a result, academic institutions and their dynamics will become more visible for a wider audience, and there will be a stronger appeal to their public accountability and social responsibility. In order to act in concert with the network of diversified institutions, universities will also need more transparent organisational structures, processes and language. This will have consequences for procedures concerning the selection of academics, and also for the assessment and attribution of scientific quality. Selection decisions can no longer be the sole domain of established scholars, other parties (like students and policymakers) will also have to have a say in the matter. Their involvement means that academic mores that are taken for granted will have to be explained and that selection and promotion procedures will become more transparent. A total commitment to research is no longer compulsory; instead the Agora approach acknowledges the value of knowledge transmission and teaching, and of social services and connections to other social fields. This leaves room for more flexible working relations, too. Scientific quality is no longer solely related to the output (defined as the number of articles in international refereed journals), but also to the processes of gathering and distributing scientific insights. The audience the sciences are addressing becomes more diversified; alongside the international scientific forum, there are also national or local social actors in search of contextualised and situated knowledge. This aspect of social responsibility induces a cultural change within the institutions, possibly bridging the gap described between value orientations of female researchers and of scientific institutions.

Measures

To summarise, if the implicit gender bias in assessment procedures is to be addressed, two strategies at least are needed:

- first, that the procedures and decision-making process are transparent
- second, that the gap between theoretical debates about science, quality and excellence and actual everyday evaluative practice is lessened. This requires a profound discussion about science as a social institution in the knowledge society and reflection on the gendered constructions currently implicit in conceptions of 'quality'.

Clearly, the first strategy is by far the easiest to realise. The plea for transparency and accountability is generally acknowledged. At the University of Groningen this has resulted in the design and implementation of a so-called "protocol for gender neutral selection procedures", a short checklist to force selection committees to make their criteria explicit and to justify their selection process and the outcome. Each committee has to fill in the checklist and deliver it to the university's Executive Board. As the protocol was only implemented last spring, we cannot yet present any information on the direct or indirect effects.

University of Groningen protocol

The heart of the protocol is a questionnaire about:

1. the procedure:

- Public announcement or behind the scenes?
- What sources and channels are being used to attract the attention of candidates?

2. the measurement of scientific excellence:

- the proportional impact of 'research', 'teaching' and 'management' on the assessment of scientific excellence
- the way the research qualification is measured.

How did you assess research competence?

- Publications in international journals
- Publications in national journals
- Books and contributions to books
- Professional publications
- Teaching/introductory books
- Grants

How did you assess teaching competencies?

- Description of courses
- Evaluation by students
- A public lecture
- References

The expected results of this protocol are:

- more transparency
- more public accountability
- gender awareness.

Next year, a first evaluation of this protocol will take place and its effects can be evaluated.

Notes

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From scientific excellence to research performance: the influence of production situations and of research collectives

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Evaluation procedures in research institutions, particularly in relation to recruitment, research funding and promotion, tend to focus primarily on one aspect – academic production (the title selected for the workshop is very revealing about this exclusive focus) – and consider de facto classical productivity measures.[1] This appears to be a long-standing situation, although there have been numerous studies and policy documents that highlight the need to consider other factors relating to the career of a 'researcher'. We are all aware of the importance of teaching and training, especially training through research: numerous studies have noted the decisive role of doctorate students in the dissemination of 'knowledge in the making' (what science studies label "embodied knowledge").[2] Science policy analysts (like Ben Martin) consider that universities have now been given a third mission which can be described as a responsibility to ensure more direct links with the needs of society and the economy. Industrial-university relations (including all aspects relating to technology transfer, IPR and spin-offs) or the development of "problem solving research"[3] are translations of this third mission. Similarly, it is now difficult to consider the relations between science and society solely as an issue of 'public understanding of science'. The development of public debate – both on research priorities and on research work practices (should researchers make field tests of GMOs? Should they work with stem cells?) – has driven research institutions to reconsider fully the relations of researchers with policy-makers and society (expertise), requiring new forms of involvement, and thus new professional activities.

Together with my colleagues from the Centre de Sociologie de l'Innovation, I propose a visualisation of this complex world through the use of the 'research compass card model' (see picture below).[4] This model is the product of a series of empirical studies which examined the ways these different activities are linked to one another. In this paper, we present some of the results of these empirical studies, and the questions they raise when considering the management of human resources in research and, within it, the role and functioning of evaluation.

The variety of research labs: implications on the evaluation of performance

Using the results of the sociology of science making of the "laboratory" – the operational entity of research[5] – we have developed a series of laboratory studies, in one institution, in one region, in one field (within a country and across EU countries). Generally, research laboratories do not only have one involvement, but tend to have one or two 'strong' involvements, while keeping 'weak ties' with other environments. These involvements are not random but tend to gather in typical 'activity profiles'. The 'academic only laboratories' (those with only a strong involvement in academic publications) is one of the profiles among those identified (from seven to nine depending on the experiment). In all experiments, these profiles cross disciplinary and/or institutional borders. This shows that: (i) one can no longer consider that there is one 'best' way to undertake research in one field, (ii) different profiles will be found in any institution (so-called 'fundamental' or 'applied'), and (iii), in whatever field, there are diverse ways to position one's laboratory, these 'de facto strategies' being central to the analysis of performance. Finally, we hypothesise from the data that moving from one profile to another is neither trivial nor usual practice, and that positions are often settled quite early on in the trajectory of laboratory. These results bear significant importance for the individuals involved.

First, by examining involvement in different research activities, we have 'characterised' the choices made by laboratories. We have not measured performance. But we have demonstrated that it would be counterproductive for institutions to consider only one aspect of performance, such as academic excellence, especially when, at the same time, policies call for developing the aforementioned second and third missions. However, it appears that we are still prepared to tolerate the consideration of only one aspect of performance. This is apparent from recent benchmarking exercises made at the EU level, and the wide discrepancy between the general discourse about the multifaceted dimensions of excellence and pure bibliometric and co-nomination exercises. This shows that the effort should not be about improving the already overly developed sciento-metric tools, but developing indicators of performance (and not only of involvement) in other research activities (for example, is patenting or licensing an indicator of performance?). To summarise, laboratories and individuals belonging to them should be evaluated taking into account strategic choices made and the 'activity profile' that translates them. This is why I propose that we should move from scientific excellence to research performance when evaluating laboratories and individuals, the former being one specific aspect of a more general evaluation framework.

Second, when you belong to a 'socio-economic-oriented laboratory'' (representing one-third of laboratories in our experiment on human genetics in Europe), the average publication profile is far lower than in the 'academic only' laboratory. This is not because researchers are less 'academically productive', but because the rules applied differ. In a socio-economic-oriented laboratory, researchers are expected to demonstrate professionalism (or academic research performance) by publishing a minimum number of papers, assuming that there is a quality standard that they have to abide by – this standard can be expressed in terms of publications or interest raised through citations. It is not a race to achieve the most publications and/or citations. Should we continue avoiding the issue of ''quality standards'' in a profession, which will become increasingly important in a ''*knowledge society, when quality standards are taken into consideration in other activities (cf. chartered engineers)*''? In a way, this is what the periodic review of researchers' activities at INRA[6] does (it is not connected to main career stages and acts only as a warning signal telling the 'evaluated' researchers and their hierarchy that, as far as academic standards are concerned, they do not match with what the committee considers as a fair standard).

Third, in many cases, the production of articles in laboratories has been boosted by a few researchers with a high number of publications. This was notable in internal specialisations, which raised questions relating to rewards: should only those specialising in academic aspects get career rewards? How should we consider 'team members'? Should we apply a 'winner takes all' policy (as is often the case in US career stages) for academic production (this is assuming that teams are made of interchangeable manpower)? How should we manage complementary assets (to take onboard the economic language)? In a word, if research is a collective activity, the rewards must take into account the collective dimension. This requires a significant change in human resource management, articulating success at the collective level to progression in career stages for participants. There is no reason in such a scheme why there should only be one way (basically peer review) to manage careers (on the contrary, this tends to show that peer-review processes might well be relevant only for a limited number of situations).

Research production situations: how to handle variety?

In this section, I describe the results of two experiments conducted between 1997 and 2000 in the 'directorate' in INRA dealing with social sciences and applied mathematics (some 300 researchers).

The first experiment was linked to the reconsideration of career stages and the conditions under which researchers can access 'professorship like' positions.[7] The initial assumption was that, in a supposedly applied research institution, there were career paths other than the stereotyped one imported from the US, which is based on academic recognition. By and large, the group, for which I was rapporteur, agreed that there was a range of activities researchers undertook which mirrored quite well the research compass card.[8] The group added another

activity relating to 'managerial' activities required for the deployment of research activities, ranging from project to laboratory management, including participation in numerous collective activities developed by research institutions or agencies (from foresight to evaluation). The group then concluded that there were no typical trajectories but successions of periods with different dominant activities depending upon personal and/or environmental choices.[9] This implied that the evaluation should not be similar for all (i.e. it should not be 'standardised'), but instead it should be linked to the strategic choices made, or when asking for a promotion, to the directions into which the researcher proposes to invest.[10]

This raises the issue of conditions for acquiring experience in different activities and their articulation to research performance. Thus, we performed an analysis of working situations: were all the situations encountered identical in terms of fostering research outputs, and what was the articulation between academic and other outputs. Five configurations were identified[11] which differed in duration, team composition (in terms of critical mass, inter-disciplinary, and the role of complementary competences; in this case, engineers), relations with partners, the importance and role of external public funding (mediators, direct users or "mécènes"), of outputs (software, methods, reports, databases, consultancy and expertise) and their articulation with academic ones (before and after, e.g. in the production of DBs, or central to the discipline versus addressing very specialised communities), of articulation with research training (central in three of the five configurations), and of effects on teams' future activities (source of new methodological competences, via returns from users…). The main lesson learnt from this experience lay in the variety of conditions under which the same standard product (an article) was arrived at in the same discipline, in a similar environment. Furthermore, it highlighted two aspects: the critical importance of the doctoral thesis (both as a source of manpower, and as a yardstick relating to the standard research project: one individual doctoral student over a period of three years; this is a very different format from the US); in all cases (even the so-called academic research project), there was not one sole output but a mixture of outputs, the 'other' outputs having a strong impact upon the publication pace. In particular, young researchers' academic production appears to be strongly dependant upon the situation to which those researchers have been assigned (in most cases, there was very limited extant knowledge about their implication).

Long-term implications for evaluation

We conclude that overall research performance, and not scientific excellence alone – which is only one aspect of it and, when phrased in this term, only relevant in a few situations – will be increasingly considered in evaluation procedures in research institutions. Individual research performance cannot be disconnected from 'collective' performance, i.e. from the productive entities in which researchers are embedded.[12] The criteria for performance that will be applied will, to a large extent, depend upon the strategic choices made by this collective entity and the 'activity profile' it exhibits, implying that different activity profiles require different sets of evaluation criteria, and different analyses of the same indicators of activity. This should entail three main developments: (i) foster the development of indicators of involvement and criteria of performance in activities other than academic ones; (ii) integrate within human resource management the growing tendency of (at least temporary) specialisation within productive entities (with probably more and more situations not being well addressed through the classical peer review system); and (iii) consider in a great number of situations the satisfaction of 'quality standards' rather than ranking-based evaluation approaches (enabling a clearer articulation between the two present activities of university staff: education and research).

This ad-hoc tailoring of evaluation is reinforced by two trends. The stereotyped career stage-based trajectory is being replaced quickly by ad-hoc mixes as a result of the unfeasibility for any individual to address simultaneously all the dimensions of professionalism (as mirrored by the research compass card) and the need to focus on one or two dimensions over limited periods (e.g. between five to ten years). The evaluation will have to take into

account the very different conditions under which 'similar' outputs are arrived at, depending upon the type of 'project' in which researchers are involved, with a growing impact of the 'external' relations associated to the development of projects.

Such phrasing can be seen as the expression of one among many scenarios. However, there are numerous 'factors', 'indicators', 'trends' that reinforce the plausibility of this scenario over a 15-year period. What can it bring to our debates? I see at least three main lines of thought:

(i) Make a clear distinction in what can be done between short-term actions (e.g. improve the composition and functioning of peer review committees) and longer-term perspectives (where the central issue is locating the sphere of relevance of peer review based management of human resources);

(ii) Focus more on 'dimensions' other than 'scientific excellence' since innovation studies have long shown that early 'small events' are often central to future trajectories;

(iii) Discuss the relevance of productivity measures, both at the level of principles – should not "quality standards" be preferred – and at the technical level (on all three ingredients of the equation: numerator, i.e. the vector of outputs considered, denominator, i.e. the notion of person of "full-time equivalent", and the duration, i.e. the time window taken into account in the calculation).

Notes

(1) i.e. how much of a given selected output or outcome (e.g. publications in ISI journals, citations received) per individual during a given period of time.

(2) There is also a growing body of literature which considers 'quality issues' in teaching and which tends to develop specific tools for evaluating the teaching performance (including pedagogical innovation) of university staff.

(3) See the work by Gibbons, Nowotny et al. on the well-known "mode 2" type of research.

(4) B. Latour skilfully demonstrates the research compass card model using, as an example, the methods F. Joliot used to develop research on nuclear fission between the two world wars (in M. Serres, 1989).

(5) The author has often expressed that laboratories are to science what firms are to the economy, the basic unit of production.

(6) INRA is a so-called mission-oriented institution dealing with agronomics, agro-food production, and rural environment. It has been subject to numerous studies and I have proposed (Laredo 2001) to replace the notion of mission-oriented by that of "domain-oriented", meaning that the role of the institution is no longer inscribed in a linear model but in an approach where it covers the realm of research activities focusing on a defined "domain". It gathers some 8 000 people, 2 000 of whom are researchers.

(7) Directeur de recherche in French.

(8) O. Philipe, then in charge of evaluation at INRA, developed the "INRA sunflower" whose petals were adapted to the situation of the institute, including the numerous engineers that belong to it.

(9) However, there were trends that the periodic evaluation system had just uncovered through a change in the type of reporting made by researchers. It showed that the time devoted to "research as such" tended to diminish over time, researchers being more and more involved in 'other' activities (transfer, expertise, management). It showed, in particular, that involving oneself very early on in transfer might prove counterproductive, especially if young researchers had not yet reached what was (implicitly) considered as the required level of scientific production and recognition.

(10) One has then to answer predefined quality standards in terms of professionalism and to demonstrate the acquisition of competences relevant to the direction he/she wants to invest. This evaluation, based on (still implicit) quality standards and tailored to proposed individual projects, has since been applied for the access to directeur de recherche positions.

(11) The situations are described by the author in French: projet de recherche académique, aide à des collectifs délimités, "problème général, cas exemplaire", innovation produit et concervatoire/banques de données.

(12) I do not address the issue of physical vs virtual (or networked) collectives here.

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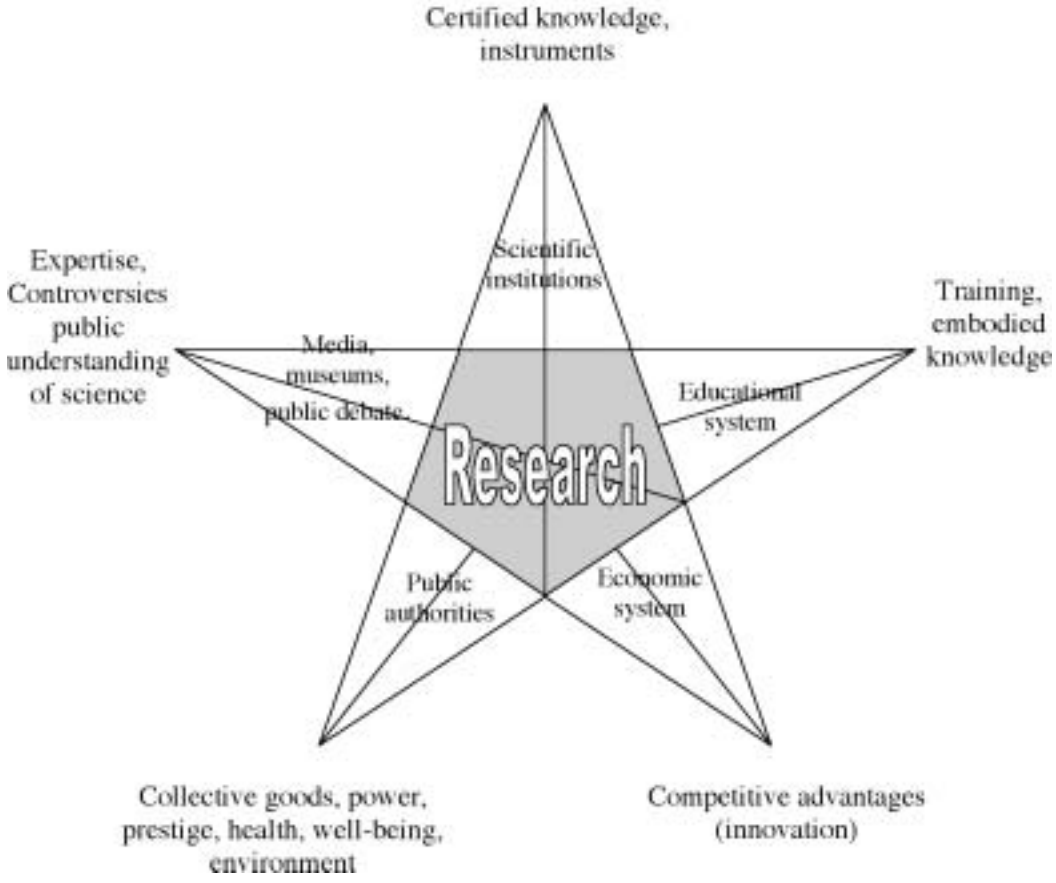
The research compass card



Leadership: A masculine past, but a feminine future?

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Introduction

Gender and leadership

Leadership research like most, if not all, of the research in management, has been gendered. Studies from the days of 'The Great Man/Trait Theories' to the emergence of the 'new paradigm' charismatic and transformational models, have been the studies of men, by men, and the findings have been extrapolated to humanity in general.

It is this body of research that informs organisational assessment processes, such as selection, promotion, and performance management activities. Thus, the basis for entry into higher, and more influential, echelons in organisations, is largely informed by what emerges from these studies as the 'received wisdom' of leadership.

It can easily be argued that any investigation into women's lack of access to power in organisations must take into account an understanding of the nature of the history of research into leadership, since the study of leadership represents the study of individuals who are particularly effective in influencing others in the achievement of organisational objectives.

We dared to challenge this male hegemony and began with a clean sheet when we started our investigation into the nature of leadership. Beginning with the elicitation of constructs of leadership from samples of female and male managers and professional at all levels in public sector organisations, including a significant proportion of individuals from various minority ethnic groups, we developed a pilot questionnaire which was distributed to over 600 organisations. Analyses of the responses from over 3 500 individuals enabled us to create the first truly gender-inclusive model of leadership. This model turned out to be of a fundamentally different tenor from the existing US-developed 'new paradigm' models of charismatic leadership. Rather than the notion of leader as role model, our model emerged as 'leader as servant' and 'partner', with quasi-heroic charismatic elements being demoted to a much lower position of importance. *The Transformational Leadership Questionnaire* 360-feedback instrument was then created.

It is the data from the development of this questionnaire which forms the body of our research base examining whether there appear to be gender differences in approaches to leadership. But first here is some background on the topic of gender and leadership style.

Gender and leadership style

The conclusions from the literature are equivocal which is, in part, due to the differences by which leadership is measured. Some studies, for example, have found that on measurements of women and men on the autocratic-democratic dimension of leadership, women are considerably more democratic than men, in general (Eagly & Johnson 1990). However, studies published later suggest that these differences are diminishing (e.g. Komives 1991).

Increasing use by organisations of 360-feedback processes have provided organisational psychologists with substantial databases for the examination of leadership style. One example is a study conducted by Perrault and Irwin (1996) which compared the ratings of 645 men and 270 women. Female managers were rated significantly higher by workplace colleagues than male managers were, on 28 of the 31 competencies assessed, which reflected six out of

the seven competency clusters, namely, problem-solving, planning, controlling, managing relationships, leading, and communicating. These competencies appear to include mainly transactional, or managerial, aspects of leadership.

Another benefit of 360-feedback data is that it enables comparisons to be made between the ratings of different groups of co-workers. Church (1998), investigating moderating variables of co-workers rating managers, found that: "*The trend was for women managers to receive slightly higher or better ratings overall … more specifically, women managers were more consistently rated significantly by their direct reports as being more adept at the communicative and facilitative aspects of managerial behaviour (e.g. providing clarity, communicating openly, ensuring participation) as well as some of the more leadership- or charismatic- related aspects (e.g. standing up for principles, inspiring others, taking appropriate actions regarding poor performance) compared with male managers. Peers, on the other hand, rated women managers as being more encouraging of new ideas and focused on the development needs of their direct reports, compared with male managers…. Clearly, among the present organisation, women managers were seen as being more communicative, effective and inspiring compared with their male counterparts*."… (p. 4)

Other findings from 360-feedback instruments have provided evidence of women being rated significantly higher than men in the transformational approach to leadership (Bass, Avolio, & Atwater, 1996; see also a particularly impressive meta-analysis recently undertaken by Eagly, Johannesen-Schmidt, & van Engen, 2002). The role of organisational context on leadership style is under-researched (Yukl 1999).

One of the important variables highlighted in studies of gender and leadership style has been the proportion of the sexes occupying the particular managerial level. Eagly and Johnson (1990), for example, reported that sex differences diminish in studies of women and men in male-dominant managerial layers in organisations. Van Engen, Van der Leeden, and Willemsen (2002) propose that this suggests that female managers use styles congruent with the gender-typing of the context in which they are working. They also state that the sex composition of the subordinates also affects the style adopted by managers of both sexes, with male managers acting in a manner "more task-oriented, more autocratic, and more people-oriented among male subordinates".

In a manuscript in preparation, Eagly and co-authors comment that by acting in a transformational way, women may "overcome the dilemma of role-incongruity, namely, that conforming to the leader role can impede their ability to meet the requirements of their gender role and that conforming to their gender role can impede their ability to meet the requirements of their leader role. As Yoder (2001) argued, transformational leadership may allow women to avoid the overly masculine impression they can produce by exercising hierarchical control and engaging in narrowly agentic leader behaviour." (p. 15)

Whilst several studies have now appeared comparing the ratings of female and male managers from data collected from anonymous ratings of their staff, few studies have investigated the ratings by sex of the 'ratee', that is by the sex of the subordinate rating the manager.

Most of the studies which have compared the transformational leadership style of women and men have adopted the instrument developed by US scholars, Bass and Avolio (1990), the Multi-factor Leadership Questionnaire (MLQ). This instrument measures four dimensions of transformational leadership, namely: idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration. The MLQ is regarded as the most commonly used instrument for measuring transformational leadership (Carless 1998). However, it should be noted that this instrument was based on data collected by a predominantly male population, and was based on the norm of a sample of senior US army officers rating their commanding officer (Bass 1997).

There are few published UK studies of gender and leadership style, but many published studies based on US samples of managers, although there are increasing numbers of studies emerging from studies conducted in other countries (e.g. Van Engen, van der Leeden, & Willemsen, 2001) and reviews of international studies (Eagly, Johannesen-Schmidt, & van Engen, 2002, under review).

Finally, a relatively neglected aspect of related research is the impact of leadership style on psychological dependent variables, such as motivation, job satisfaction, organisational commitment, etc. The authors regarded this aspect of investigation as crucial in exploring gender and leadership style.

The objectives of the study

The present study was intended to investigate: (1) whether the leadership style of women and men in an organisation in which men dominate senior managerial positions, namely, the British National Health Service (NHS), was rated any differently on the 14 transformational dimensions of a leadership questionnaire developed by a gender-inclusive sampling methodology (these 14 dimensions of transformational leadership are described in the Appendix); (2) whether the ratings of leadership style of the female and male managers differed by the sex of the subordinate rating them; (3) whether the leadership style of the women and men in the sample appeared to impact differently on a range of psychological outcome measures, and whether sex and level of subordinate significantly affected the impact (now the subject of a separate paper). (For more information, please contact authors).

Method

The sample for this study comprised the 2 013 female and male managers at middle to senior management level who completed the pilot Transformational Leadership Questionnaire (TLQ). A fuller description of the methodology is found in Alimo-Metcalfe & Alban-Metcalfe (2000; 2001).

Comparisons of mean scores on each of the scales by the same – and opposite sex – rater were undertaken.

Results

Clear patterns emerged from the data:

Middle managers rating their bosses/supervisors

(1) When data from female and male subordinates rating their boss were combined, female bosses were rated higher than male bosses on all of the dimensions, of which 11 out of the 14 differences were significant.

(2) When the raters are divided by sex and level, the male middle level managers were seen to rate senio female managers higher than the males on all the 14 dimensions, of which 13 of the 14 differences were significant.

(3) Female middle level managers rated female senior managers higher on nine of the 14. On none of the remaining dimensions were male senior managers rated higher than females.

Senior managers rating their bosses/supervisors

When the ratings of the senior managers rating their managers were examined, by gender of rater and ratee, the picture was very different:

(1) Amongst the male senior managers rating their managers, no significant differences emerged in how they rated females and males.

(2) For the female senior managers rating their managers, only two significant differences emerged. Female top managers were rated higher on the dimensions labelled 'Showing concern for others' and 'Resolving complex problems'.

The data may be interpreted as suggesting that whilst female senior managers are perceived as more transformational than their male colleagues, females at top levels are not, with the exception of two dimensions of leadership, 'Showing genuine concern' and 'Resolving complex problems'.

It should be noted that 'Showing genuine concern' was found to be the most important leadership dimension measured by the TLQ, as it explains more than twice the variance contributed by that provided by the remaining 13 TLQ scales. It is also the most important predictor of the ten dependent variables, or 'Leadership impact measures' assessed by the TLQ. These include: reduced stress, increased motivation, increased motivation to achieve beyond expectations, job satisfaction, organisation commitment, etc.[1]

Possible explanations

Why are females in senior positions rated more transformational than male managers, and why do most of these differences disappear at top levels of the organisation?

The fact that women were rated more transformational than men at the same level may be related to the explanations proposed by Eagly et al., 2002; and Yoder 2001. Namely, that by acting in a transformational way, women may "overcome the dilemma of role-incongruity, namely, that conforming to the leader role can impede their ability to meet the requirements of their gender role and that conforming to their gender role can impede their ability to meet the requirements of their leader role. As Yoder (2001) argued, transformational leadership may allow women to avoid the overly masculine impression they can produce by exercising hierarchical control and engaging in narrowly agentic leader behaviour." (p. 15)

However, it contradicts the suggestions of Van Engen, Van der Leeden, and Willemsen (2002), that female managers use styles congruent with the gender-typing of the context in which they are working. They also state that the sex composition of the subordinates also affects the style adopted by managers of both sexes, with male managers acting in a manner "more task-oriented, more autocratic, and more people-oriented among male subordinates".

In relation to our finding, the senior managers of both sexes perceived only two differences in the leadership style of their bosses, albeit that one of the differences 'Showing genuine concern' is the most important dimension of leadership measured by the TLQ. This might suggest that, generally speaking, top managers of both sexes are either selected for their less transformational, and more transactional (managerial command and control) behaviours, or become socialised by organisational influences at the top of their organisation.

Questions thus arise such as:

- Is there a generational-related cultural gap in the sample of managers?
- Do top and senior managers become socialised into internalising different value systems?
- Is being seen as predominantly transactional in one's behaviour a role requirement of being promoted into a top management position?
- Are the selection criteria for top positions biased towards the style of leadership of the dominant group, i.e. white males?
- Is only transactional behaviour rewarded in top positions?
- Do women and men act like their transactional peers/colleagues?
- Does the culture at the top and senior levels require the adoption of an almost exclusively transactional style?

Implications for organisations

The implications for organisations are immense. There is substantial research which supports the notion that the transformational style is significantly more effective than the transactional style alone (e.g. Bass 1998). But those in top positions who are the 'gatekeepers' by virtue of playing key roles in promoting and selecting managers at top levels, are likely to be male (90% of such posts are held by men in the UK), and therefore may be more transactional.

There is another body of evidence that consistently finds that the notions of what men, in general, believe characterise an effective manager, are strongly related to the characteristics they associate with men, but entirely unrelated to the characteristics they associate with women in general. Hence, the fact that a female working in a traditionally 'masculine' job, but who has apparently succeeded in her job, creates 'cognitive dissonance' in the minds of a male boss/assessor. Given the need to reduce this apparent dissonance, a different attribution may be made of why she is successful, despite being a non-traditional occupant – namely, a female! This may lead to success being attributed to external unstable factors, such as 'luck' or having had to put in extra effort, rather than the cause being attributed to a stable internal cause, such as 'ability'. The evidence is the field of management and leadership that often appears to be the case. How generalisable is this to other male-dominant occupations, such as the field of science?

How can we change the attitudes of top managers? When will organisations recognise the folly of underutilising the wealth of talents offered by female managers, and transformational males? Sadly, there is, as yet, little cause for optimism since, in a separate study, we found that the major block to the success of leadership initiatives in private and public-sector organisations (Alimo-Metcalfe et al., 2000), were to do with the attitudes of the most senior managers. They did not recognise a personal need for leadership development, but sent their middle managers on such events; they role-modelled leadership styles which contradicted the models being developed on such programmes; and they did not support the enthusiastic suggestions and initiatives proposed by the middle managers, on their return to the organisation.

Times are changing. There is increased cynicism with the lack of integrity and leadership of top managers, evidenced by recent high-profile cases of poor corporate governance, and the sudden collapse of previously successful organisations. Those organisations that grasp the challenge of selecting, promoting, and developing transformational leadership at all levels, but particularly at the top (since this will predict organisation culture), will undoubtedly reap the benefits.

Dimensions of leadership assessed by The Transformational Leadership Questionnaire ©

Leading and developing others (1)

Valuing individuals

(Genuine concern for others' well-being and their development)

Genuine interest in staff as individuals; values their contributions; coaches and mentors; develops their strengths.

(13 items; *a* =0.95)

Enabling

(Empowers, delegates, develops potential)

Trusts staff to take decisions/initiatives on important matters; delegates effectively; develops staff's potential.

(6 items; *a* =0.86)

Being accessible

(Including approachable, intouch)

Approachable and not status-conscious; accessible and keeps in-touch.

(5 items; *a* =0.84)

Encouraging change

(Encourages questioning, and critical and strategic thinking)

Encourages questioning traditional approaches to the job; encourages new approaches/solutions to problems; encourages strategic thinking.

(8 items; *a* =0,88)

Personal qualities (2)

Being honest and consistent

(Transparency: Honesty and consistency)

Honest and consistent in behaviour; more concerned with the good of the organisation than personal ambition.

(4 items; *a* =0.93)

Acting with integrity

(And openness to ideas and advice)

Open to criticism and disagreement; regards values as integral to the organisation.

(9 items; *a* =0.89)

Being decisive

(And risk-taking)

Decisive when required; prepared to take difficult decisions, and risks when appropriate.

(5 items; *a* =0.83)

Inspiring others

(And stays in touch)

Inspirational; exceptional communicator; inspires others to join them.

(5 items; *a* =0.84)

(Resolving complex problems)

Analytical and creative thinker

Capacity to deal with a wide range of complex issues; creative in problem-solving.

(5 items; *a* =0.85)

Leading the organisation (3)

Networking

(And achieving)

Inspiring communicator of the vision of the organisation/service to a wide network of internal and external stakeholders; gains their confidence and support of various groups through sensitivity to needs, and by achieving organisational goals.

(12 items; *a* =0.92)

Focusing effort

(Clarifies individual and team direction, priorities and purpose)

Clarifies objectives and boundaries; team-orientated to problem-solving and decision-making, and to identifying values.

(9 items; *a* =0.90)

Building shared vision

Has a clear vision in which s/he engages various internal and external stakeholders in developing; draws others together in achieving the vision.

(7 items; *a* =0.90)

Supporting a developmental culture

Supportive when mistakes are made; encourages critical feedback of him/herself and the service provided.

(9 items; *a* =0.90)

Facilitating change sensitively (And skilfully)

Sensitivity to the impact of change on different parts of the organisation; maintains a balance between change and stability.

(6 items; *a* =0.85)

Notes

(1) More details of the Leadership impact measures can be obtained from the authors. Contact: b.m.alimo-metcalfe@leeds.ac.uk

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Gender issues in US science and technology policy: Equality of what?

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In a series of collaborative projects over the last few years,[1] my colleagues and I have been seeking ways to design and evaluate science and technology policies and programmes so that they reduce rather than increase inequalities. Minimizing gender bias in the evaluation of scientific excellence, the topic of this workshop, is one example of an attempt to reduce inequalities within science and technology. In this final paper in the workshop, I would like to place this one example in the larger context of gender issues in US science and technology policy.

We can think of S&T policies and programmes as falling into three areas: (1) research policies which invest in the knowledge base; (2) innovation policies which stimulate the development of new products and processes, with a primary focus on private industry; and (3) human resource policies which develop the technical talents needed in an economy. The topic we are discussing falls first and foremost into the area of human resource policy, although it has implications in the other two. Gender issues have been raised in the United States primarily in the human resource area, somewhat in research policy, and to a very limited extent in innovation policy.

The most common form of 'women's programme' in US S&T policy is one that aims to recruit or advance women in science and engineering careers. In this paper, I will refer to such efforts as 'women in science' programmes. The key indicator of success for women in science programmes is movement toward proportional participation of women at all levels of the system. The ETAN report on gender equality, one of the stimuli for our workshop, identifies three common rationales for these efforts: "Beside being *inherently* unfair, the under-representation of women is not only a huge *waste in terms of human potential, but also threatens the goals of excellence in science*".[2] The first italicized phrase identifies gender under-representation as a violation of general principles of justice or equity. The second identifies it as a problem of efficiency, keeping society's performance at a suboptimal level. The third portrays gender bias as a problem of morality, something that undermines the operation of key norms in the scientific community. For those who see the impartial judgment of excellence as the process that keeps science as a truth-producing enterprise, the last problem ultimately undermines the effectiveness of the institution.

Since our conference organizers have invoked the language of justice, it is appropriate to turn to a theory of justice to help frame this paper. In a key conceptual work on the concept of equality, Nobel Prizewinner Amartya Sen (1992) asks, "Equality of what?". Women's programmes in science generally focus on equality of opportunities, but less often equality of outcomes and benefits in everyday life. By viewing what has been done on gender issues in S&T policy in the US through the framework Sen provides, I hope to reveal a number of areas where there is still a great deal to be done.

Human resource policies

There are a variety of efforts to attract and maintain the interest of girls in science and engineering careers. Informal and formal educational materials for children increasingly include maths and science content and diverse role models for science and engineering careers. Second, the programmes work on providing the resources girls need to have the capability to move into science and engineering careers. These include raising awareness of the importance of appropriate maths and science courses in pre-college education, and special campus recruitment programmes. When young women go to college, the set of supports they need to stay on their chosen career

paths changes. Funding is available for research experiences, and social supports become the focus for women on co-ed campuses, to counteract the harsh climate created by being in a gender minority in maths, science, and engineering classes.

A woman's entry into work or graduate school after college is really her entry into the professional world of science or engineering. US firms which employ a technical workforce are working with government to understand the experience of women scientists and engineers in the industrial workplace, with women in IT careers receiving particular attention. For women in graduate school, many professional societies have formed women's organizations which provide a place for women still earning their degrees to share experiences with more senior professionals. Significant attention is also going to career advancement within academe. Our campus, for example, is focusing on the promotion and tenure process, the ladder women must climb to move into academic leadership. We are both opening up the process to scrutiny and rationalization, and addressing bias directly through training with promotion and tenure committees, using scenarios to raise awareness of bias of many sorts. A federal programme funds this campus effort.

Gender bias in evaluation can play a role at many stages of this career process. Girls and women whose talents and achievements are undervalued may not receive crucial resources, or they may become discouraged about careers in science and engineering and drop out of the career path. Even if they struggle over the hurdles and stay the course, if women's contributions are undervalued, society will not receive the full benefits of their talents because they will not be put in the positions of influence they deserve. Gender bias in evaluation is thus a key issue in achieving the human resource goals of equal participation and achievement.

Research policies

Let me turn now to a different angle on gender bias in evaluation, the role of that process in allocating research resources and determining the research agenda. Both of these are fundamental, lifeblood processes in research policy. For women, the goal in the first area is fairness, that is, allocation of resources to women on the same basis as to men. The goal in the second area is less clear. A narrow definition would call for the research agenda to include 'women's issues', and a broad one would call for the agenda to be less masculinized and more humanized, attending to a balanced set of human concerns through a diverse set of intellectual approaches.

It is important to note, however, that a discussion of the gender issues that actually appear in research policy in the US does not need to move far beyond the issues of recruitment and advancement I have just reviewed. Common wisdom in US S&T policy includes what I call the 'gender representation hypothesis' – that the solution to any gender bias, regardless of content, is to recruit more women into science and engineering careers, including into leadership positions. In other words, we need to solve the human resource problem before we can address fairness in evaluation processes or balance in the research agenda. I find this hypothesis intriguing. When voiced by men, it can sound like either a willingness to share power, an abrogation of the responsibility to be fair and to serve the whole public, or a stalling tactic. When voiced by women, the hypothesis can be read as essentialist (only women understand women's issues) or based on frustration. Empirical reality, of course, always defies simplified hypotheses.

Most of the attention to gender issues in the allocation of resources has focused on the operation and fairness of federal funding programmes. Appointment as a reviewer, programme officer, or top manager in one of these programmes is itself one of the kinds of achievement the women in science programmes are striving for. Thus, in the United States a great deal of energy has been put into getting women on to review committees and into decision-making positions. There is still a long way to go, but there has been considerable progress. NIH and NSF have both had female directors and deputy directors; women have held the top science posts at Agriculture, Defence, DOE, and NASA; and women have been well represented in the White House Office of Science and

Technology Policy, although no woman has yet accepted the post of Science Advisor to the President. Most of the top-level women have been of European descent, although Latinas and African Americans have been included.

Fair treatment through the review process has been adopted as another goal for the federal funding system. A corollary of the 'gender representation hypothesis' is that if women make the decisions, they will treat women fairly. There is some counter evidence,[3] but it is certainly true that once a critical mass of women are participating in a review process, the egregious application of stereotypes or masculine standards is much less likely. In the meantime, NIH and NSF watch the success rates of female investigators carefully, and report that they are equal to those of male investigators in the overall numbers. These two agencies, however, have the most open and accountable processes for allocating funds. The other major funding agencies all do more in-house research, where the dynamics of resource allocation are less visible. And even at NSF and NIH, women are still under-represented as investigators on larger grants and centers. The gap probably appears in applications for these types of awards as well as acceptances. This is the same gap we see in other university leadership positions, and reflects the same bias towards the characteristics men bring to those jobs.

Outside the grants system, the organizations that employ women as researchers allocate the basic resources of a laboratory, namely, space and equipment. In a rare empirical effort, women at MIT documented the extent to which they were being short-changed in the allocation of research space and equipment. But, by and large, neither the processes nor the outcomes of these allocation processes have been studied extensively. For those of us who work on campuses, the connections between these allocations and the fundamental networks of power among men are clear. But within the organizations, both processes and outcomes of space and equipment allocation tend to be kept quiet, if not secret. Openness and accountability – which benefit the whole community, not just women – thus become major objectives of the women in science movement.

Just as higher levels of women's participation in decision-making processes are thought to bring more fairness to the review process, higher numbers of women in power are thought to be a force for change in the research agenda. The most dramatic example of such a change in the US is the Women's Health Initiative at NIH, a multi-million dollar effort which began in the late 1980s to study those health issues that only appear in the lives of women. This example illustrates a complicated intersection of forces at work, not all of which were within the research system itself. The story is too long and complicated to tell here in full, but a few features are of particular interest.

First, it is worth noting that this initiative did not come out of the blue. Women's health, and especially reproductive issues, had been at the center of the agenda of the US women's movement since the 1970s. If biology was being used to justify exclusion of women from a wide range of opportunities, then biology was a key field in which to take control. By the 1980s, women were entering the life sciences in reasonable numbers, and beginning to take up positions of power and influence. It was thus women within biomedical research who identified the problem that women were being left out of clinical studies, although the results of the studies were being used to diagnose and treat them.

This problem did not reach the political agenda, however, until women's power also built up in elective and appointive offices. As the Congressional Women's Caucus grew, it adopted women's health issues on its agenda. There was a longstanding joke in the US that NIH spent particular effort to study the diseases of ageing male members of Congress and, in the 1980s, the Congressional Women's Caucus also put the issues of ageing female members of Congress on the agenda. The programme started under the directorship of the only woman so far to head NIH, Bernadine Healey who was not known, before or since, as a feminist. But as a politician (she later ran for political office from Ohio), she recognized the opportunity to win friends in Congress and make a good political impression with the initiative.

In retrospect, the decision was a good one. The study has produced finding after finding that corrects previous smaller-scale studies, and changes the instructions around treatments. Women's lives will certainly be improved and saved by the effort. And from the beginning, the initiative has been accompanied by a lobby effort, whose agenda includes getting more women into biomedical research. In this case, then, the goal of women in science and the goal of better biomedical knowledge of women's conditions have gone hand in hand.

In the terms I introduced earlier in this section, the Women's Health Initiative is an example of introducing women's issues into the research agenda. It is a relatively isolated instance, however, and it is notable that it is so closely connected to the definition of womanhood as reproduction. Some feminist theories of knowledge would suggest that the higher levels of participation of women in decision-making positions in research would change the agenda more broadly and in more fundamental ways as well, moving it towards a wide range of issues or towards different styles of knowledge production. I know of no study that has tested this hypothesis, and I must report that I have never been in a conversation in my years in science policy that suggests that this has been the case. Where women have taken positions of leadership outside the health area, although I have plenty of indications that they helped other women along in their careers, I have no indication that they have changed the questions their organizations were addressing. One good example is the Department of Energy. For a while, a woman headed the department (Hazel O'Leary), a woman headed the Office of Science (Martha Krebs), and women were being added as heads of divisions (for example, Pat Dehmer). I have never heard a peep either from these women themselves or the people they worked with that their gender affected the research agenda of that department.

By the time women reach positions of leadership in research agencies, however, they are no longer representative of all women in the country. Even if they started in poverty (and a few did), by that time they are educated, affluent, and heavily influenced by ideas shaped historically by men. Should we then define the 'capability' of American women to influence the research agenda they pay for with their taxes in terms of the number of women in leadership positions in research agencies? If we convened a participatory consensus conference of women, with representation from all walks of life, and asked them to design a national research programme, would they reproduce the federal research agenda as it now exists? Let us keep this question in mind as we move to the third major area of S&T policy.

Gender issues in innovation policy

Innovation policy, the reader will recall from the introduction to this paper, is government stimulation of the creation of new products and processes. While, in theory, innovation policy can be aimed at government, in practice it is largely aimed at private industry, with the goal of raising productivity and increasing national economic competitiveness. The category applies across countries, but the configuration of policy instruments takes an unusual shape in the United States. US technology policy includes a few funding programmes at the federal level (the Advanced Technology Programme and the Manufacturing Extension Partnerships in the Commerce Department, and the Small Business Innovation Programme which is spread across many agencies), and some at the state level, where efforts to stimulate economic development through strategic research are more common. The US also uses tax policy for innovation, giving a tax credit to stimulate R&D spending in private firms. And patent and intellectual property policies are central elements of US innovation policy, elements currently in flux and under some criticism. Somewhat more subtly, four of the six major agencies in the US federal government that fund research and development also therefore invest in certain technologies. These agencies are defence, space, energy, and agriculture, a list that gives a flavor of the range of technologies they develop.

In terms of participation, innovation policy is a strikingly male domain, by the current standards of US S&T policy. Although all of the agencies just named have had women as chief scientists, the veneer is thin, and it is not clear that a critical mass of women has been achieved in any of them, especially in defence, the largest by far of the set. Where

innovation policy interacts with private industry, it also interacts largely with men. Women high-technology entrepreneurs are being celebrated in the United States, but there are precious few of them to hold up as role models.

According to a slight variation in the gender representation hypothesis – that gender issues will not arise unless women are present in critical mass – innovation policy should be quite short on gender-oriented programmes or controversies. And it is. For the most prominent ones, we must turn back to the health arena, and therefore back to NIH, where women are better represented. Reproductive technologies have certainly been the object of debate, in particular over the focus of these technologies on women, when preventing conception is simpler through the male body. Access to and safety of both contraceptive devices and fertility treatments have received attention. Drugs that are either designed for or disproportionately prescribed for women have received attention, for example, hormone replacement therapy and Prozac (an antidepressant). The new interdisciplinary perspectives on industrial design also often introduce gender variables, like height assumptions and colour preferences, and a trip to the toy store, grocery store, or car dealership indicates that industry is paying attention.

Looking over this set of examples, we see that gender roles in innovation policy are still drawn along quite traditional lines. Men are in charge. Women participate either as consumers or in protest over the continuing male domination embodied in reproductive technologies. My own hypothesis on the relationship between women's leadership participation and change in the innovation agenda would be that the closer the female leader moves to the hard core of technology, the lonelier she is, and the less likely she is to call attention to her gender by raising uncomfortable issues that do not fit the mainstream view.

But again, as with research policy, the issues at stake in innovation policy are obviously broader than representation. Take the topic of 'productivity'. Every time the word appears, someone's job is on the line. Whose? Whose skills are being incorporated into new systems of automatic control? Whose skills are being displaced? Innovation policy issues are critical to the capability of women and their spouses to turn abilities into decently paid, steady employment – a 'functioning' that undoubtedly appears in all their concepts of well-being. Take defence technologies, for example. How would US women assess these, in comparison with other investments, if they were given a chance? I do not know the answers to these questions, but I know that the movement focused on programmes for women in science has not put much effort into getting the answers.

Conclusions

This workshop is about freedom, the freedom of women to enter science and engineering careers and to move to the highest levels those careers have to offer. Women in science programmes must be designed to take a wide variety of personal circumstances into account. This observation highlights the important but limited focus of feminist activism with regard to the research agenda, in which the vast majority of effort has gone into reproductive issues. And it creates a background against which we can see that the achievements of women in the worlds of innovation and innovation policy should be both celebrated and supplemented with a broader movement toward participatory technology assessment.

How these insights will be evaluated by the current yardsticks of S&T policy, I cannot say. But I invite my colleagues, female and male, to consider them thoughtfully. Given the amount of change I have seen around gender issues in S&T policy in the United States – and Europe – over the last 20 years, I would not be surprised to see at least some of them become policy in 20 years from now.

Notes

(1) The project started in discussions of the Committee on Science, Engineering, and Public Policy of the American Association for the Advancement of Science. The subcommittee sharing the project has included Steve Nelson, Willie Pearson, Skip Stiles, Rad Byerly, Reid Adler, and Per Pinstrup-Anderson. The framework has been developed in close collaboration with two doctoral students, Kamau Bobb and Isabel Bortagaray.

(2) Quoted in the background materials for the workshop (emphasis mine).

(3) Studies at NSF have shown that female reviewers are more critical of female applicants than male reviewers are.

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To what extent are the existing procedures, definitions and criteria regarding scientific excellence gender neutral?

To investigate this subject, a workshop entitled 'Minimising gender bias in the definition and measurement of scientific excellence', was jointly organised by the Women and Science Unit of the European Commission's Research DG, the Women and Science Network of the European Commission's Joint Research Centre, and the Robert Schuman Centre for Advanced Studies of the European University Institute.

Based on evidence presented from their own research, participants agreed that scientific excellence is not "a universal fact" but rather a social construction and, as such, it is open to many kinds of biases. Gender dynamics as regards scientific excellence are multifaceted, are often invisible, and apparently related to gender differences in social capital and in the attribution of competence, and to a scientific culture in which the 'similar-to-me' process unwittingly seems to favour men scientists.

As the future of European science depends partly on an increased participation of women in the scientific community and on excellent research, it is urgent to reflect further on these unintentional, but still influential, effects of existing definitions and measurements of scientific excellence.

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