



## Meta-analysis of gender and science research

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# D31 – Country report France

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## Introduction

France is one of the leading research countries in Europe. However, the general situation of research is somewhat problematic at present. R&D received only 2.12% of Gross National Product in 2006, which is well below the Lisbon target of 3%. Worse, the proportion is decreasing (2.32% in 1990, 2.13% in 2004 – OST 2006). France has a relatively strong public research sector. After a profound crisis in 2004, it underwent a number of organisational changes, with a new law on research voted in 2006. Its reorganisation continues in 2009, again amid crises. Public research includes Universities and research organisations, the latter occupying a large part. In the business sector, research is mainly concentrated in large industry (automobile, pharmacy, telecommunications, aeronautics). Numerous "grandes écoles" or engineering schools form students but are not very active in research (except for a few elite exceptions, like the Écoles Normales, the École Polytechnique or the École des Hautes Etudes for the Social Sciences).

Gender equality policy cannot be considered a high priority in research. France is much less active in this area than Britain, Germany, Spain or Switzerland, not to mention the Nordic countries. Around 2000, a movement towards more equality in research saw the creation of a number of specific support structures. At present, however, enthusiasm seems to have weakened and the question of gender equality is not very present in debates on the reorganisation of French research.

To rapidly sketch the history of French research on the question of Women and Science, its institutionalisation began at the beginning of the 1980's with a national symposium and a national research program. Before that, women researchers active on these questions were close to the feminist movements of the 1970's and their reflection centred more on the political dimensions of the identity of women than on the constitution of a structured field of study. Indeed, the question of the relation to scientific institutions provoked a constant debate during the early 1980's on whether feminist research should be institutionalized or remain in the margins. This context explains in a large part the main characteristics of research on women and science in France in the 1980's. Subjectivity, reflexivity and ideological points of view were important elements of conceptual research that considered the relation between women and science as an epistemic problem.

In the 1990's, the institutionalization of the theme of Women and Science widened the scope of research and brought in new questions and methodologies. During this period, the main focus was on education and on the reasons for the lack of girls in science and technology courses, studied mainly from psychological, sociological and educational points of view, calling more often on empirical methods.

Finally, roughly since 2000, another tendency appears, even if the main traditional characteristics of French research – primacy of conceptual approaches, permanence of the educational theme – remain. The professional situation of women in science has become a legitimate field of analysis. (Before this period, the question was only taken on board by trade unions and professional associations and their often very thorough and enlightening work was only published in their bulletins.) Gender pay gaps have begun to be considered, the institutional practices of evaluation as well, and working time and work/life balance is widely integrated. Public recognition of inequality between women and men in science as well as pressure from the European Commission provoked the publication of various reports and statistics, some proposing concrete public policy measures.

To sum up very schematically, the evolution of French research on Women and Science from the 1980's to 2007 could be described as taking place in three stages: first the recognition of the

field, then a search for the causes for the scarcity of women and finally a time of increasing pressure for action.

## Horizontal segregation

### **Research questions**

Horizontal segregation is mainly considered under an educational perspective, concerning the choice of science courses in school, during all the period under consideration.

### **Research approaches**

Research on horizontal segregation mainly focuses on the question of why girls choose science studies (or not). Indeed, it is one of the main approaches of the Women and Science question in France. The conditions under which girls enter science courses have been widely considered to be the key point that can explain the lack of women in research: there are few women in science jobs because they do not choose to take science in school. Generally, social explanations for girls' choices are put forward in these publications. Thus, the authors have explored the influence of the family and of teachers' behaviour in the classroom or the role of vocational guidance. The images of sciences and representations linked to female and male identities are also discussed, as are possible measures to improve the situation. Most of the studies adopt similar generally qualitative approaches and work on the link between coeducation, vocational guidance, social and psychological factors. A few authors propose a different analysis that, without denying that girls suffer a different destiny than boys, considers that the choices girls make can be "rational" and strategic choices to adapt to their future social roles.

### **Findings**

- Even when they have as good marks in mathematics and science as boys, a large proportion of girls prefer to choose other courses of studies.
- Family support is a very important factor in encouraging girls to choose science curricula.
- Teacher-pupil interactions and teachers' unconscious discrimination in the classroom also play an important role.
- A few publications point out that girls' anticipations of social norms and of job markets make their choices rational.
- The most common measure proposed is to encourage girls to choose science courses is to change the image of science and of women scientists.

### **Gaps**

A strong imbalance exists in French publications on this theme, school attracting much more attention than the situation in the professional context.

More analytical studies on the specific social processes of subtle discrimination need to be carried out.

## Vertical segregation

### **Research questions**

Vertical segregation is mostly considered through the perspective of the professional career. Nevertheless, the question of the gender composition of organisations has begun to be dealt with in the last decade.

### **Research approaches**

Research on vertical segregation has mainly been approached through the professional career, using the notion of glass ceiling. Nevertheless, the focus of the analyses has changed: from pure descriptions of the unequal situation of women in the scientific community to analyses of the mechanisms that provoke it, women's personal barriers, the functioning of the scientific community, the general environment... The problem of vertical segregation has led to study of various more subtle forms of discrimination. For instance, in the most recent studies, gender composition of organizations has become an angle of treatment of approach.

### **Findings**

- The glass ceiling has been described in increasing detail in higher education and in Universities.
- A few more recent studies have focused on the causes of vertical segregation, in particular in recruitment and evaluation processes.
- Some historical studies underline the very slow evolution of the situation, in particular in CNRS

### **Gaps**

More research is needed on the causes and processes of vertical segregation.

Vertical segregation has been analysed mostly in public research. The private sector needs more attention.

## **Gender pay gap**

### **Research questions**

This theme has been very little investigated by French researchers. The problem of the gender pay gap in science only appears in 1995 and only in 7 publications. No publications focus on research funding. This is probably the reflection of the non legitimacy of all gender-based claims concerning careers. However, it is also related to the fact that revealing and discussing one's earnings tend to be taboo in France.

### **Research approaches**

The articles on the theme describe the gender pay gap as an element of the discrimination that women suffer. Although the publications are scarce, each corresponds to a particular institutional sector - the CNRS, public and private research – or to specific professions and profiles : the engineering profession or graduates of elite Ecole Polytechnique. This allows us to observe that, in spite of the fact that it is little discussed, it appears to be a widespread phenomenon.

### **Findings**

- Gender pay gap constitutes one of the elements of discrimination against women in science.
- In the public sector, basic salaries are fixed, not negotiated. Pay gaps are indirect:

women earn less because they are less promoted.

### **Gaps**

The whole theme of gender pay gap constitutes a gap in French research – not a single publication is entirely focussed on the question - although it seems to be strengthening in the last decade.

No research goes beyond a description to highlight the processes that lead to pay gaps.

Finally, there is no research at all on access to research funding.

## **Stereotypes and identity**

### **Research questions**

This theme has been developed in French publications since the 1980's, but it was widely investigated in the 1990's in relation with horizontal segregation and choice of science courses in school. In fact, many of these analyses explain girls' choice by stereotypes and social construction of identity. On the contrary, cognitive abilities are rarely explored ; they reflect a naturalistic point of view totally opposed with the more constructivist approach elaborated in these publications.

Social construction of science has been developed more irregularly: it was a central subject in the early 1980's, but was then left until the end of the 1990's.

### **Research approaches**

#### *The social construction of identity*

For most of the studies that deal with girls' vocational guidance and coeducation at school, the social construction of identity is one of the main factors behind their choices. The approaches are mostly empirical, although some contain conceptual contributions. Both classroom observations and interviews with teachers and pupils are used to show how girls build their own image according to the image boys and teachers have of them. Processes such as loss of self-confidence, self-censorship, lack of interest for science appear and lead girls to avoid science curricula.

The role of the family and of stereotypes concerning the place of women in society are often explored and used as factors of explanation. Some authors conclude that it is impossible to convince girls to choose scientific courses of studies if society doesn't change and stop transmitting such traditional images of gender roles.

#### *The social construction of science*

The social construction of science has three main approaches in the French literature on Women and Science, two epistemological ones and an empirical one.

The first approach, strongest in the 80s, emerged from feminist studies and dealt with the theme from a conceptual point of view. Starting from the radical subjectivity of women, and considering that science has been elaborated on the basis of male values and references, some authors claimed that science was in fact male science, not universal, and that it could only produce male and dominant content. They suggested the possibility of another science, with other system of thought, other ways of working and another content.

The second approach, less frequent, starts from the same point: scientific content is masculine. Nevertheless, instead of proposing a female science to which many women scientists were totally opposed, some researchers proposed to consider gender relations as the central point of

focus within various disciplines. For instance, some authors proposed a general history founded on the relation between women's history and men's history. In an empirical approach, some authors point out that when observing work in a scientific laboratory, gender relations have to be considered. For others, the gender of the scientist has to be systematically considered as an essential factor to understand her or his production.

The third approach has an empirical root, founded on the study of scientific norms and the observation of the way the scientific community effectively works. When cooptation is the main way for promotion, as men are in the most powerful positions, women are excluded from the construction of science. This approach shows that women work in a different way from men: they may be less competitive, or at least, less interested in competition, choose more fundamental subjects that don't usually bring them fame, publish less than men who have a clearer career strategy than women. Women seek recognition for their competence, not for their position, and have a real sense of collective work. Therefore, the content that women build is different from men's. For some authors, the new management of science will increase inequality because women's way of doing research does not correspond to the new and competitive objectives of science.

In general, the authors who deal with this theme all propose to recognize that science is always to some degree "subjective" and use this to renew scientific methods and contents.

### *Cognitive abilities*

This theme is an irregular and not very strong axis of research. Nevertheless, it can be linked to three perspectives.

The first perspective is the relation between cognitive abilities and mathematics, showing that women have the same cognitive abilities than boys to understand and do mathematics, but that the social construction of identity leads girls to give up mathematics, losing their confidence and their interest in the field. Experiments show that girls have the same level as boys in mathematics until 10 or 12 years old, when they begin to fall behind. The social influence is demonstrated by an international comparison that shows that in France girls are affected by this phenomenon earlier than in other European countries.

Another approach is based on neurosciences, showing that there are in fact no differences between women's and men's cognitive capacities, and that no scientific experiment has never proven otherwise. This is coupled to an criticism of so-called science-based ideological claims of female inferiority, close to very traditional biological determinism.

Finally, work has been dedicated to an analysis of women's specific relation to knowledge.

### **Findings**

- Social construction of identity is used to explain, via the influence of school, family and society in general, the unequal presence of girls and boys in science sections in school. The integration of their social role as mother and of the supposed difficulties they will have to face in order to articulate their professional and private life, make girls choose other professions.
- Social construction of science is mostly an epistemic question but also an empirical one that aims to show that male dominance in science is really deep. Authors propose to answer conceptually on two ways: to build a feminist science or to focalize attention on gender relations. Empirical work has begun on professional practices.
- Girls have the same level as boys in mathematics until 10 or 12 years old, when their level begins to lag behind. In France, girls are affected by this phenomenon earlier than in other European countries.

### **Gaps**

More empirical research, particularly on the social construction of science, needs to be developed.

## Science as a labour activity

### **Research questions**

Science as a labour activity is a large theme that has been dealt with since the beginning of the period.

- It is generally associated to the glass ceiling. The difficulties in articulating professional and private life are the main factors invoked to explain the lack of women in science and their lack of promotion.
- The question of personal and professional life-course is less treated, although maternity linked to the theme of promotion is a notable issue.

### **Research approaches**

Science as a labour activity contains a large number of elements, and it widely coincides with vertical segregation.

The question has mainly been treated in publications describing the glass ceiling in French academia or in research organisations. A number of official reports appeared from about 2000 on, providing extensive statistics, as a consequence of equity policy made at the European level. A few publications go beyond a description of the situation to empirically investigate the causes. Some dimensions of the problem are discussed, such as the competitive examinations ("concours") which allow promotion, or the articulation between private and professional life. Several instances of unpublished reports illustrate the ongoing sensitivity of the theme. However, a number of in depth sociological studies have been carried out on women engineers, observing processes and evolutions of their careers.

Another way of treating this theme is by adopting a subjective point of view. Women researchers use their personal context and experiences to deal with questions such as academic practices, the entrance into and the development of science careers, and research funding.

### **Findings**

- Publications describe a "glass ceiling" close to the European average.
- The articulation between professional and private life is not only considered as an objective factor of difficulty but as a motive of discrimination. Some articles propose to stop considering maternity as a problem and to provide measures to allow support of women as mothers and scientists at all stages of their life.
- The role of homogamy is analyzed, women more frequently having scientists as partners than men.
- The "biological clock" is analyzed in relation to the temporality of careers.

### **Gaps**

Publications under this theme massively concern researchers and not technical or support staff, and mainly the academic area as opposed to the private sector.

A number of very interesting early studies only appeared as "grey literature" such as the bulletins of teachers' associations or of trade unions, and didn't find their way into scientific journals. This is also the case of recent studies carried out by CNRS but not published. (They

are not included in the database which is restricted to published documents.) It is clear that the question of Science as a labour activity has long suffered from a legitimacy deficit in France.

Most analyses deal with the case of women engineers, mathematicians, physicians, and biologists. The social sciences and humanities are often missing.

Finally, with a few exceptions, empirical work going beyond the accumulation of statistics is lacking.

## Scientific excellence

### *Research questions*

Not very many publications approach this theme. There are two axes of research on this topic :

- One is linked to French system of Elite higher education schools (Grandes Ecoles), and the place of women in this path of excellence.
- The other is linked to the measure of excellence inside the scientific community.

### *Research approach*

Concerning the French system of Elite higher education schools (Grandes Ecoles), two questions are elaborated: the reasons for the choice of such elite schools by women and the destiny of the women engineers trained there ; the effect of the arrival of coeducation in the Ecoles Normales Supérieures which had as an unexpected consequence a brutal reduction of the number of women entering the research profession. Most of these studies are micro-sociological, based on interviews of the persons concerned.

On the criteria of excellence within the scientific community, some publications show how women are excluded or exclude themselves from "excellence", choosing, for instance, fields that are less prestigious than those chosen by men. Linked to the social construction of science, these publications also show how "excellence" corresponds to a masculine way of doing science, from which women tend to be excluded. Crossing the institutional practices of evaluation, some of these publications aim to focus precisely on the processes of selection showing that they are not only based on excellence and merit but on networks.

Finally, the theme of institutional practices of evaluation is tackled, based on analyses of the selection committees in the CNRS and in universities.

### *Findings*

- Women are quite scarce in the Elite higher education schools. Nevertheless, before the introduction of competition between men and women at their entry, some of these schools were able to reduce differences between them.
- Scientific excellence inside the scientific community, linked to the social construction of science, is questioned as a masculine system in which women meet difficulties.
- The modalities of recruitment and promotion in Universities and research organisations are called into question.
- Measures of scientific productivity are questioned as a definition of excellence.

### *Gaps*

Empirical studies on scientific productivity and possible differences between women and men are lacking. More generally, evaluation procedures need more research.

## Gender in research contents

### Research questions

Gender in research content is a largely analysed theme. However, there is a strong imbalance between conceptual contributions and examples of good practices.

The conceptual contributions are numerous, linked to :

- the way feminism changed scientific content
- theoretical reflections on women and science, closely related to the theme of social construction of science.

### Research approaches

From the beginning of the period, and most of all when feminist action and feminist science were very close, a lot of articles examined the gendered construction of knowledge and discussed how feminism can or should change scientific content. Following very different points of view, more or less radical, a large number of publications analysed the changes that a feminist point of view would bring to science. An important colloquium, *Femmes, féminisme et recherches*, took place on the subject in Toulouse in 1982<sup>1</sup>. Many articles analysed the history of the conceptual change that had taken place in different disciplinary fields. A related topic was the place of gender studies in the university and the institutional and material difficulties that the feminist researchers had to face in order to see their field integrated into the scientific community.

Another conceptual approach was to reflect on science and women from theoretical points of view, linguistic, psychological or philosophical. This work aimed, on one hand, to demonstrate the masculine bases of science and to deconstruct the scientific system. It tried, on the other hand, to define the nature of the relations that women have with knowledge, investigating the psychological reasons of their choice of a science career and the personal difficulties they met in accomplishing it.

### Findings

- The role of subjectivity in science is debated. In the earlier publications, feminist perspectives were strong.
- Mainly in the fields of social sciences and Humanities, publications analyse the general improvements operated by introducing gender perspectives into theories and methods.
- Philosophical and psychological analyses of the relations between women and knowledge show the difficulties women meet in choosing science and succeeding there. For example, they may highlight that women do science with a feeling of guilt that prohibits their success or that in case of success, a woman's identity is called into question by the male scientific community and by society.

### Gaps

If the theme of the epistemic change in science due to feminism is very present in social sciences and Humanities, it is nearly absent in the case of natural sciences. Gender dimensions are now taken on board, particularly in biology and health sciences, but epistemological discussions are very rare.

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## Policies towards gender equality in research

### **Research questions**

Policy towards gender equality in science is a fairly recent theme which appeared in the middle of the 1990's. Gender mainstreaming appeared in 2003. The discussion of positive measures is more extended, and includes:

- Measures to reduce inequality tend to be evoked simply as a conclusion to articles on unequal situations, specially at school.
- Policy measures are also mentioned in government reports.
- Some articles dedicate a section to the evaluation of a specific measure, as in education.

### **Research approaches**

Different approaches are developed around this theme. First, education is the privileged environment for the measures proposed. As it has been said, in France the lack of women in science is usually explained by the fact that girls do not choose science curricula in school. Therefore, measures for changing both the image of science and the image of girls are called for. The effects of coeducation are questioned.

Some articles that analyse women's positions in research institutions give recommendations, and are sometimes even in favour of quotas..

Finally, some publications discuss comparisons between countries or to focus on other countries than France, to make an analysis of gender mainstreaming measures.

### **Findings**

- Most of the authors agree on the need for public policy measures in order to improve the situation of women in science. Under the impulsion of the European Union and of Unesco, French government has integrated that inequality between women and men in science is a problem. It began in the 2000's to produce reports on the situation and to propose some rather timid measures.
- Educational action in terms of awareness campaigns has been developed but has not obtained spectacular results.

### **Gaps**

Very little empirical research exists on public policies and even less on their evaluation. No publications deal with the theme in the private sector.

## Conclusion

The analysis of the items published in France shows the preponderance of some research questions:

- Why do girls choose to study science (or not)? This question corresponds to the themes "horizontal segregation" and "stereotypes and identity". Incidental to the question is the role of elite higher education schools ("scientific excellence"). This represents about half of the publications.
- What does a gender approach bring to science? In practice, this question massively concerns the social sciences (mainly sociology) and humanities (history).

- Career questions in research come well behind ("vertical segregation", "science as a labour activity", "gender pay gap").
- Policy is very much neglected compared to other themes

The chronological evolution of the themes shows a tendency during the last 5 years towards more empirical research aimed to focus on particular aspects of the subtle discriminations that women suffer in the scientific community, and on concrete situations in order to support policies. Nevertheless, conceptual approaches remain the most frequent in French publications.

Empirical work is often lacking and international comparisons are infrequent. An exception concerns engineers and the Elite higher education schools, where precise studies and comparisons have been carried out, but this is not the case for all sectors and fields. Notable lacks concern university students or scientists in biology and the social sciences and Humanities where women are particularly numerous.

Other main thematic gaps are the nearly complete ignorance of support staff on one hand and of the private sector on the other. Very few publications touch on money, via the gender pay gap or, even less, the theme of access to research funding. Scientific productivity is not very much analysed.

In conclusion, if French research is strong in the epistemological perspective and on education, it is quite weak in observing and analyzing the processes that operate within the scientific community. Publications on this area lack empirical studies, both qualitative and quantitative. This partial coverage of the theme brings to the fore the absence of a powerfully organized research sector in France on women and science, at a time when it seems, paradoxically, that states and institutions are slowly realizing the importance of the problem and the necessity for solutions.

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<sup>2</sup> We recall that important "grey literature", not included in this list, was produced by trade unions and professional organisations.

## Policies towards gender equality in research

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