



Meta-analysis of gender and science research

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## **D31 – Country report Ireland**

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## 1. Introduction

Ireland has a relatively small population of 4,239,848 (Central Statistics Office Ireland, 2006) and therefore the volume of research produced in Ireland reflects this. There is a lack of gender and science, engineering and technology empirical research which has been undertaken in Ireland in particular. Research found focuses on horizontal and vertical segregation and descriptive evaluative reports on institutional representation of women in SET (focused on Higher Education). Women in Technology and Science (WITS) was set up in 1990 and is a very active network for women in SET promoting practical interventions and projects and has been the author of a number of reports on the situation for women in SET in Ireland. In April 2005, the Science Foundation Ireland (SFI) introduced a scheme aimed at boosting the number of women scientists in Ireland. The initiative comprises three SFI funded programmes aimed at addressing the under-representation of women in Irish science and engineering research. One of these programmes, the SFI Planning Grant and Institute Development Award appears to have stimulated some research in 2005 into the gender composition of researchers and universities in Ireland. Scholarship programmes for young women in engineering were launched in 2006 which have brought attention to the recruitment of women in engineering in Irish universities as figures from 2004 illustrated that women comprised 18% of undergraduate students in engineering in Ireland.

The Centre for Women in Science and Engineering Research (WiSER) was established at Trinity College, Dublin, in November 2006 as the result of an initiative from Science Foundation Ireland, which aimed to address the under-representation of women in Science, Engineering and Technology (SET) careers. Despite significant and increasing participation by women in SET in third-level education and at career level, extra measures were felt to be needed to open up the field further. Through organisations such as WiSER, SFI aims to ensure that highly accomplished women researchers will have an opportunity to use their skills in an environment which has been adapted to suitably meet the needs of all who work within it.

The Irish government has now recognised that in order for Ireland to be able to compete internationally in SET it is vital to engage greater numbers of women and aid their career progression within the field. This was seen as a matter not purely of equality, but also as something that would provide great economic benefit to the country. A greater involvement by women in SET research would not only provide larger numbers of skilled researchers, but would add a different perspective to the discipline, leading to new innovations. This new emphasis reflects Ireland's part in a growing worldwide movement to increase the numbers of women in science and engineering. As this is a relatively recent Centre, WiSER is in the early stages of promoting research into women and SET and as such the situation may begin to change in Ireland in terms of the lack of focus on this area to date in academic papers. The lack of empirically based studies produced in Ireland may also be linked to social factors such as many Irish researchers migrating out from Ireland to work in research institutes and universities outside of Ireland.

Ireland has tended to lag behind leading countries in terms of research and science funding, but in recent years has invested increasing amounts and is catching up, with several major initiatives started in recent years and substantial increases in research funding (SFI, 2008). The National Development Plan for Ireland (2007-2013) outlines priorities for investment in research during this period. The NDP has a gender equality unit, which is committed to mainstreaming gender, which is a requirement of all NDP policies (NDP 2008). It is acknowledged that whilst public investment in Research and Development has increased substantially in Ireland (more than doubling between 2000 and 2005), it is not yet on a level with the leading countries, which is likely to explain the lack of research funded into the area of gender and SET in particular.

## 2. Analysis by topics

### 2.1. Horizontal and vertical segregation

#### *Research questions*

This topic is one of the main areas of research carried out in Ireland. Research in this theme focuses on the description of the situation for women in SET, particularly focused on academic contexts such as under-representation of female academics in Irish universities and the gender imbalance at higher levels within academia ('the higher the fewer' concept). Research focuses on barriers for female researchers and on practical recommendations to address these barriers. The research also looks at the reasons behind females career/subject choices in SET when exploring horizontal segregation and also exploring the impact of legislative changes on horizontal and vertical segregation in education and professional fields. A comparatively large focus of the research on gender and SET in Ireland is focused on the medical and healthcare fields. This could be linked to funding opportunities for research in these areas being greater than in the social sciences in Ireland.

The main research questions addressed focus on:

- Representation of women in SET in education predominantly (researchers/academics and students) in terms of grants received, career structure, employment status
- What practical interventions could be introduced to support the promotion of female academics in SET in universities?
- What are the barriers to promotion for female academics in SET?
- What are best practice models for promoting career progression of female academics in SET?
- How does Ireland compare to other countries in Europe in terms of best practice models for promotion the career progression of female academics in SET?
- What are the links between educational segregation and occupational segregation by gender?
- What is the role for women in Ireland in contributing to areas of skills shortages in SET?
- What are the influences and factors relating to gendered career choices e.g. male nurses in public healthcare.
- What are the gender role perceptions of males in 'female' careers such as nursing?
- What is the educational attainment and performance of females compared to males in medicine and why is this not reflected at senior levels for medical careers e.g. consultants/senior registrar level?

#### *Research approaches*

Studies which investigate the gender composition of women in universities are mainly qualitative with a focus on individual interviews with staff members, focus groups and workshops to gain rich data on individual's experiences. Studies also contain quantitative approaches such as online staff surveys which are then analysed to present basic descriptive statistics and thematically analysed to present themes of interest.

Research approaches include:

- Comparative studies exploring data from across Europe- comparing statistics from Ireland with other countries in terms of numbers of women in SET at different occupational levels e.g. professors in SET
- Case study approaches containing in-depth interviews with women to explore individual experiences in SET
- Quantitative approaches e.g. comparison of performance data for medical students by gender

- Self-assessment studies evaluating the effectiveness of support systems in place in universities to support/promote women in SET (including literature reviews, surveys, interviews and focus groups).

### **Findings**

Most studies have produced findings which provide a capsule report on one institution e.g. a university. This has been due to funding being provided by SFI (Science Foundation Ireland) aimed at individual organisations carrying out gender and SET self-assessment studies. However, some research has taken a broader perspective regarding gender and SET across institutions in Ireland e.g. the review funded by FORFAS (Ireland's national policy advisory body for enterprise and science).

Some specific findings by research in this area include:

- The number of women entering Higher Education is high and they achieve success at undergraduate level but their career advancement slows as they try and progress up to higher levels within academia- women's progress is slowed by organisational and career barriers e.g. long hours culture in science research
- Legislative changes introduced in Ireland have had an impact in improving gender balance in SET but career progression is still hindered and recruitment/promotion policies are seen as biased towards the male career model
- The causes of women's underrepresentation in SET are a complex blend of interdependent structural, ideological and cultural factors
- There are a number of practical interventions which could be introduced to affect change for women in SET in academia e.g. mentoring/coaching, support with funding/grant applications
- Women do apply for promotion in SET but are only half as likely to succeed (Dublin City University study)
- Many male nurses occupy the female gender role which may account for their suitability for nursing careers (study of 250 male nurses in Ireland)
- Countries (including Ireland) with higher levels of educational segregation by gender have higher levels of occupational segregation as a result
- Gendered choices in education channel men and women towards gender-typical careers
- Females perform better than male counterparts on final year medical examinations and yet their success is not yet reflected at senior registrar and consultant level (University College Dublin study of 577 medical students).

### **Gaps**

The analysis lacks breadth and depth in the number of studies carried out in Ireland in this area (although this research topic was the most prevalent found). In particular, there is a gap of longitudinal studies and comprehensive evaluations and critical reviews of available research. The analysis centres on academia. There are no studies about research in the private sector, with the exception of medicine/healthcare. A large part of the research effort is aimed at the compilation of data and interviewing individuals, providing valuable ideographic data but an absence of a nomothetic approach. Analytical and empirically based research, as will be shown in the subsequent topics, remains scarce.

## **2.2. Pay and funding**

### **Research questions**

There is an absence of empirical studies/research published focused on the gender pay gap and funding for in the field of gender and SET in Ireland. Studies carried out focus on gender equality and access and awarding of science funding applications. One informal study carried out by WITS (Women in Technology and Science) in 2004 contained an element of review of

funding available for female researchers and scientists in Ireland compared to male colleagues. In addition, SFI have reviewed their funding distributions by gender and field within SET and also feature in-depth case studies of each of their funding grants held by women in SET. A paper by Chormaic, McLoughlin and Gunning (2005) has also explored the numbers of women applying and being awarded fellowships/Awards in SET (focused on women in Physics).

These reviews have focused on the following questions:

- What is the distribution of research funding between male and female researchers in Science in Ireland?
- What is the proportion of pre-proposals accepted into full proposals by gender within SFI applications?
- What are the individual profiles of women who have been successfully awarded funding grants from SFI?
- What is the gender composition of fellowships and prestigious awards in SET?

### ***Research approaches***

The informal review by WITS (2004) focused on a quantitative review examining the total number of grants applied for by male and female researchers, the funding amount applied for by gender and then examining the number (and amount awarded) of grants awarded by gender as a result. SFI reviews focus on a quantitative approach analysing data by gender (number of applications submitted and selected by gender).

### ***Findings***

In the three years 2001-2003, Science Foundation Ireland (SFI, the agency overseeing Irish science and engineering research funding) handed out a massive EUR316 million to researchers. But only EUR30 million went to women researchers, that is less than 10% of the funds. Analysing figures published by SFI (all grants approved to January 2004, see:www.sfi.ie), WITS (2004) calculated that the women scientists also received considerably less on average than their male counterparts: EUR1.78 million per research grant, compared to EUR2.04 million.

SFI data (2007) illustrates that of a total of 704 pre-proposals, 134 were from women. They thus represented only 19% of the total proposals presented in SET. Of these 704 pre-proposals, 168 awards were made, 26 to women (15.5%). In most fields, the numbers of applications by women were found to be very low. Applications were highest in biomedicine, followed by biochemistry, chemistry and genetics. Women were found to be slightly less successful in funding applications than men overall, however in many field the numbers of women applicants were extremely low, which may explain wide variations in success rates. In biomedicine, the main field in which women submit applications, they had a similar success rate to men. In most other areas, there were wide differences.

Chormaic, McLoughlin and Gunning (2005) analysed the Institute of Physics findings based on SFI data. They noted that women represent 11% of all grant applications to SFI but only 9% of successful applicants. In 2005, the female success rate across all disciplines was found to be 15%, similar to that of their male colleagues. No funding was awarded to women in physics in 2005, despite six applications being submitted. The study also explored prestigious fellowships awarded in SET. No woman has yet won the prestigious Research Professor Grant, though 17 have been awarded to date. Women were found to be under-represented, particularly in the larger and more prestigious awards in Ireland.

### ***Gaps***

This is a recent topic of research which has a paucity of research studies conducted to date. There are no recent empirical studies about the gender pay gap for SET fields. The studies exploring gender equality in regards to accessing and being awarded funding are recent and there is a lack of objective analysis of the different awarding bodies in Ireland.

## 2.3. Stereotypes and identity

### *Research questions*

Again, a lack of empirical analyses and studies in this topic has been found in Ireland.

Studies that have been found have explored the following research questions:

- What are the implicit stereotypes of adolescent girls regarding a typical scientist and what is the impact of the expectations of an administrator on girls drawing a scientist?
- What are the stereotypes regarding gendered career choices across Europe and how does Ireland compare?
- What are the stereotypes associated with male and female gender roles in relation to traditionally female careers such as nursing?

### *Research approaches*

The few research papers found focused on quantitative analysis (e.g. quantitative non-experimental study of 250 male nurses using the Bern sex role inventory) and more novel research approaches such as analysing drawings made by adolescent girls when asked to draw a 'scientist'.

### *Findings*

- The incidence of drawing female scientists by girls in Irish samples was noted to be in excess of that recorded by studies in North America in 1970s
- Through making it explicit to adolescent girls the acceptability of drawing either male or female images as scientists it was possible to redress the balance so that the proportions of sexes drawn did not differ significantly
- Male nurses sampled identified more with female gender norms than with male gender role norms. This study supports the notion that many male nurses occupy the female gender role with respect to the caring role. Recruiting more men to caring careers may reduce the stigma for the minority of men in nursing currently.

### *Gaps*

This is an area which would appear to require a large focus for Ireland as there are large gaps in the Irish empirical research produced in this area in the areas of cognitive ability, social construction of science and social construction of identity. Reviews of any data or informal studies in this area are also missing.

## 2.4. Science as a labour activity

### *Research questions*

Again, research is scarce on this topic. Studies found focus on the following research questions:

- What is the impact on women's work/life balance of the organisational culture experienced in the legal profession?
- What changes to the structure of the legal profession are required to address the gender imbalance and associated work/life balance imbalance?
- How can the profile of distinguished female scientists from history who have made important contributions in Ireland be raised?
- How do educational experiences impact on career choice and progression?
- What is the perception of gender discrimination within Higher Education Institutions?

### **Research approaches**

Individual reviews of universities within Ireland have explored gender discrimination within the institutions via individual interviews, focus groups and surveys. Other studies have focused more on a theoretical approach and anecdotal reports. A case study approach of individuals has also taken place (raising profile of distinguished Irish female scientists).

### **Findings**

- Women progress to HE lecturer grade and are well represented at undergraduate and PhD level in SET but their participation stalls once higher levels are analysed. Processes for promotion appear to be male biased and women appear less likely to apply for promotion in some cases due to not wanting to subscribe to cultural restraints such as long hours culture in science
- Educational attainment – women tend to perform better in final exams than male colleagues at undergraduate level but this is not reflected in occupations represented at higher levels (study of medical students from University College Dublin)
- Women lawyers have great difficulty in achieving work/life balance due to long hours culture, ingrained resistance within organisations to flexible work arrangements and the fact that women still retain a disproportionate caring burden in the private sphere
- Women's participation in the public sphere remains limited by the ongoing need to do two jobs (working both in the private sphere at home and in the labour market- 'the double day')
- Distinguished women scientists from the 18<sup>th</sup> century onwards in Ireland have made significant impact on the understanding of the world around us and their stories inform us of their contributions despite immense cultural, social and behavioural barriers.

### **Gaps**

There is a lack of empirical studies looking into the organization of scientific work and the uses of time as factors of scientific knowledge-making and evaluation of performance. There is also a lack of empirical studies exploring work/life balance and gender and SET.

## **2.5. Scientific excellence**

### **Research questions**

There is a lack of studies which explicitly analyze gender bias in scientific excellence and a lack of bibliometric studies produced which compare the scientific productivity of male and female researchers. The only comparison studies which have been found relate to the application for funding grants and awards by male and female researchers, which could be seen as one way of assessing scientific productivity between the two sexes.

The focus of research found in this area is that of focussing on scientific excellence achieved by women to act as role models for women in SET e.g. historical female scientists who made important contributions to science in Ireland through their pursuit of excellence in science. In addition, one study has researched the gendered nature of curriculum and examination content in history, making links between gendered curriculum content and gender discrimination/stereotypes and potential impact on gender equality as taught to junior school children.

Research questions focus on:

- How are men and women represented in the junior cycle history syllabus?
- What is the gendered nature of examination questions?
- What are teachers' beliefs in relation to gender equality in the classroom?
- What is the availability of teaching materials with content illustrating gender balance?

### ***Research approaches***

The study exploring teaching materials and teachers' views of the gendered nature of the curriculum in history conducted a survey of views and reviews of curriculum content. A case study approach was used by the study presenting life stories and achievements of significant women scientists from Ireland.

### ***Findings***

- The study exploring the gendered nature of teaching materials in history found that there was a significant under-representation of females in both historical narrative and in the examinations questions/papers. In addition, a significant number of teachers (both trainees and practicing teachers) reveal frustration in the lack of gender balance in teaching materials available to them.
- The case studies of distinguished women scientists found that there is a wealth of information from history to act as role models to inspire women in SET today to pursue careers of scientific excellence.

### ***Gaps***

There are large gaps in this research topic. There is a lack of empirical comparisons of scientific productivity of men and women and a lack of bibliometric studies. There are no studies about scientific excellence in the research that takes place in the private sector. There is a lack of empirical research examining the barriers for women and their career progression in SET.

## **2.6 Gender in research contents**

### ***Research questions***

The gender perspective is looked at from a historical perspective in terms of highlighting scientific contributions made by women scientists and also studies have focused on the participation of women in research institutions and how this involvement shapes the research within institutions.

Research questions focus on:

- What are the levels of women's involvement in SET research activities?
- What are the historical contributions by distinguished women scientists?
- What is the impact of development within the field of Women's Studies on research and development of equal opportunities practices within universities?
- What are the policies and initiatives introduced in education and work to help with promotion women researchers in science?
- What are the initiatives which could help to plug the 'leaky pipeline' of women researchers in SET?
- Use of feminist methodologies to research the integration of technology into the domestic space and how is public knowledge produced from private lives?

### ***Research approaches***

The issue of gender and how it shapes research processes and outcomes has been largely overlooked. Investigations on gender in research content tended to be in the medical/healthcare field and not from social sciences e.g. clinical differences in presenting certain illnesses/symptoms and gender. Approaches used in assessing historical contributions included a case study approach with evaluative approaches used to review policies and initiatives in education and work to promote women in research careers.

### ***Findings***

- Women's research careers when achieving a significant impact on our understanding of the world around us can act as important historical biographical data linked with removing stereotypes and building role models
- Initiatives such as gender-proofing of publication criteria, mentoring schemes and updating courses for female scientists could help to improve the gender balance of women in SET and highlight attention on the gendered nature of research when researchers tend to be male
- The public and private spheres are interwoven in our everyday lives and thus also in the research process

### ***Gaps***

The whole area of how gender influences science knowledge-making is lacking. More studies are needed to review how the gender of a researcher and the choices of topics researched may influence the shaping of policy and practice in the research process and in the formulation of scientific knowledge.

## **2.7 Policies towards gender equality in science**

### ***Research questions***

There is a lack of empirical analyses on policies introduced to promote gender equality in science. Research questions focus on:

- Exploring initiatives and policies to promote gender equality through promoting the role of women in science
- What are the policy implications of gender mainstreaming for healthcare research?
- What are the short and medium prospects and ethical and socio-economic implications of developments in gender-based healthcare research?
- Comparisons of policies in gender equality around Europe and what are the lessons to learn from these and best practice models to apply?

### ***Research approaches***

The National Development Plan Gender Equality Unit was set up in 2000 to provide a support and advisory service on gender mainstreaming in Ireland. Gender mainstreaming is a requirement for all policies and programmes funded under the Irish National Development Plan 2000 to 2006 (the NDP). The NDP Gender Equality Unit was reconfigured as a Central Gender Mainstreaming Unit, within the Gender Equality Division of the Department of Justice, Equality and Law Reform in 2008. The new Unit supports some of the key objectives of the National Women's Strategy 2007 -2016, an 'all of Government' Strategy to support and advance the role of women in all facets of Irish life and society.

The main equality of employment legislation in Ireland is covered by the Employment Equality Acts of 1998 and 2004 and the Equal Status Act 2000. The Government is committed in the Programme for Government to achieving a minimum of 40% representation of women on State boards, although this target has not yet been reached.

Research approaches focus on non-empirical comparisons and general reviews of initiatives and policies. Gender equality policies relating to employment have had a strong governmental focus and have been strongly promoted since the Equality Acts came into being. However there is no research evidence about the impact of these policies in the fields of SET or in how to transfer policies into effective practices.

### **Findings**

- Gender equality policies in science have helped the situation for women in SET in Ireland, but only slightly
- There are various best practice interventions which have aimed to transfer policy into practice within universities to promote and support women in SET
- There are gaps in transferring policy to practice and tangible outcomes in the gender equality for women in SET

### **Gaps**

The research in this topic is a new area for Ireland and under-developed. There is a lack of empirical analysis of the impact of policies towards gender equality in science and studies of the impact of educational policies on science education are also missing.

## **3. Conclusions**

Empirical studies are extremely limited in Ireland regarding gender and SET and to date have been concentrated on the compilation of sex-disaggregated data and providing descriptive evidence about the persistence of inequalities across different areas of SET, strongly focused on Higher Education Institutions. The majority of studies are evaluative and focus on individual institutions and the presence/absence of women in SET at varying levels, looking at career progression from undergraduate to professor level. There is more of an empirical focus on the impact of gender on career-choices and the impact of gender on educational performance within the medical/healthcare field. Again, this could be linked with research funding priorities in Ireland on a historical basis. Informal research plays an important role in gender and SET within Ireland and has been greatly contributed to by national women SET networks such as WITS (Women in Technology and Science).

Critical reviews and analyses on any accumulated evidence are absent, particularly with regards to the impact and outcomes of diversity/gender equality policies and this introduces risk into the designing of new policies in the field as there is a lack of evidence-based practice in policy and decision making within this area. However, the Science Foundation Ireland has recently undertaken statistical reviews of gender and the number of funding applications for research funding which plays an important role to highlight applications and the gender disparity in funding applications in certain areas within SET. Longitudinal reviews in this area would provide useful data to see any changes in this process.

As highlighted in the introduction, Ireland has tended to lag behind leading countries in terms of research and science funding, which has had an obvious impact on research output. However, in recent years the government and science bodies such as the Science Foundation Ireland have been instrumental in investing larger amounts in research funding in order to redress this imbalance compared to other European countries. It is still recognized however acknowledges that whilst public investment in Research and Development has increased substantially (more than doubling between 2000 and 2005), it is not yet on a level with the leading countries, which contributes to the scientific production of research in the field of gender and SET within Ireland. Additional factors influencing the relative scarcity of research studies in this field could also be linked to social/political influences in Ireland which have resulted in a large number of Irish researchers working outside of Ireland.

The relatively recent development of centres within Ireland such as Trinity College's Centre for Women in Science and Engineering Research will hopefully focus more attention on the development of empirical studies in the field of gender and SET. However, at the moment centres such as these focus on practical interventions for women in SET e.g. introducing mentoring schemes for women scientists, and are not funded to conduct empirical research in these areas. A priority focus from science funding bodies on building the empirical evidence/findings will be required in order to stimulate research activity in this area.

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