

Effects of Gender Images and Stereotypes on Female E&T Research Careers in Higher Education in Chile

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(1) Introduction

Chilean women are joining the workforce in growing numbers and the number of their active years in the workforce is also increasing. As a result, traditional gender roles are being placed under new strains. Women from across all social, economic, educational, and age backgrounds see paid work as crucial to financial independence and self-fulfillment. Professional women, in particular, value their work as crucial to personal growth. Yet, the more numerous, permanent presence of women in the workforce has not removed enduring, covert forms of gender discrimination that hinder their chances of advancing their careers on an equal footing with male counterparts. (Abramo and Valenzuela 2006; Díaz, Godoy and Stecher 2005; Todaro, Mauro and Yáñez 2000; Guzmán, Mauro and Araujo 1999).

These patterns are especially marked when it comes to highly-trained women in demanding, male-dominated fields. The growing presence of women in challenging, prestigious, high-recognition fields does reflect new personal and professional growth opportunities. However, many women in this segment of the workforce have moved from exclusion to segregation, especially in certain sectors, professions, activities, and positions. As a result, their presence in leadership positions, especially at more senior levels, remains rare. (Hola and Todaro 1992; Todaro, Godoy and Abramo 2001).

The PROMETEA research project funded by the European Union from 2005 to 2007 under the 6th Framework Programme was designed to analyze the reasons for the unequal status of women engineers involved in E&T research. In Chile, PROMETEA project work had to contend with the fact that gender inequality in science has become an issue of concern only within the past two years. The 10-15 year lag vis-à-vis European countries helps explain the paucity of qualitative and quantitative data on the issue. Indeed, one of the key issues faced by research into women in E&T research in Chile was the lack of official, accessible statistical data and indicators by sex, sector, discipline, or level.

Nevertheless, we did manage to form a clear idea: while Chile does not have enough engineering researchers (see Final Report 2006 of the National Council for Innovation and Competitiveness), women going into science, especially engineering and technology, remain few and far between, and fewer still hold senior leadership positions. Compared with other disciplines, technology and engineering -as elsewhere around the world- are the most male-dominated fields in science. (See Figures 2003). This results in a serious under- utilisation of highly skilled members of the technology innovation workforce -a field deemed strategic to Chile's social and economic development- and in the unequal social and individual leveraging of these skills.

As a result of the lack of quantitative data on the status of Chilean women in E&T research, the qualitative data collected through our fieldwork constitutes, without doubt, the most significant achievement of the PROMETEA project in Chile. Our fieldwork is nevertheless an initial approach to the issues, a clearly exploratory study on a segment of women's employment and on questions -gender issues in E&T research- that most gender research conducted over the past two decades in Chile had neglected.

In all, we conducted individual interviews with eight female researchers and group interviews with ten female and seven male researchers (in two female and two male focus groups) involved in Materials Science and Biotechnology research. Of eighteen women interviewed, fourteen were engineers (72 percent) and eleven (61 percent) held a Ph.D. degree. Eleven female interviewees (61 percent) were 45 and older, thirteen (72 percent) were married, and most had children (an average of three). Only three were unmarried and had no children, while two were divorced and had three children each. Male respondents were younger on average, with six aged 30 to 45. Three were married and four had children (an average of two). Interestingly, younger researchers were better disposed to joining gender issues focus groups than their more senior colleagues aged 45 and up.

PROMETEA results in Chile confirm earlier studies by Hola and Todaro (1992) which found that, as a consequence of societal transformation over the past few decades, the most relevant phenomenon is continuity and rupture of the gender domination system –continuity of the values, gender images, and stereotypes which sustain the unequal status of women, and discontinuity of concrete practices that create and reinforce inequality.

As our fieldwork shows, discrimination and inequality in science and technology do not stem from an explicit discourse claiming women's inferiority. On the contrary, the legitimacy ascribed to women's demands has increased, at least in discourse, along with a growing recognition of the convenience and fairness of their involvement in the workforce and in science and technology decision-making. Gender discrimination as a reflection of power-based relations is not a formally institutionalised mechanism in E&T research in higher education. The hurdles and hindrances women engineers face as they seek to advance their research careers in academe are strongly related to traditional gender stereotyping. More subtle than direct, more persuasive than repressive, this is what largely accounts for the persistently unequal status of women in this highly male-dominated field.

This paper seeks to provide some insight into the effects of the gender images and stereotyping found in the PROMETEA case studies in Chile. Rather than systematically analyse all forms such images and stereotyping can take, it is intended to illustrate some of them as well as the mechanisms through which they can hinder women's careers in E&T research, thus contributing to their low numbers at senior levels.

(2) Psychological Barriers in E&T Research

The challenges and issues noted by both male and female respondents make it clear that career conditions in E&T research are not equal, with women who wish to rise to the top paying a particularly high personal price. Many such hurdles arise from preconceived notions about desirable behaviour and traits, i.e., from the gender roles and stereotypes shown by social psychology research as leading to prejudice about female performance and to psychological barriers (Schein 2001) to career advancement.

These barriers are especially evident in male-dominated fields, where notions about the need for stereotypically male traits can be exacerbated and lead to regarding female gender roles as incongruous or out of place (Heilman, 2001). This discrepancy can negatively permeate perceptions and judgements about female competence in the workplace.

The stereotypes and gender roles providing a foundation for such barriers -and for a range of perceptions about female fitness for various workplace duties- are no mere social interplay or

discourse as to the behaviour and traits expected or demanded of individuals. They are also gender standards adopted as personal standards by individuals who use them to guide and judge their own behaviour. In other words, gender roles and stereotypes exist both on a social level, as an ideology shared by and transmitted amongst members of society, and on an individual level, as part of the concept of self, as ingrained guidelines that give direction and meaning to individual action. (Eagly, Wood and Johannesen-Schmidt 2004)

Psychological barriers are based on entrenched gender roles and stereotypes often perceived as natural, almost common-sense, and adopted as ingrained guidelines. This helps explain why few men or women see them as mechanisms for discrimination. Indeed, a strong “discourse of denial” was evident among female interviewees and focus group members, especially those most successful. These respondents believed that gender discrimination was a thing of the past that had affected them at the outset but not now, adding that they owed their careers to merit and hard work. They almost unanimously felt little need for affirmative action, which they felt would minimize their merit. Their success, they held, stemmed from personal excellence, skills development and self-confidence. In their universities, overt discrimination is generally frowned upon. Efficient individuals rise to the top regardless of sex, and getting there hinges on personal ability, effort, and sacrifice. They felt that women who hold certain positions got there based on an objective evaluation of their performance. Informants were proud of having made it to the top and of their achievements in male-dominated disciplines.

Yet, as shown below, psychological barriers render the role of merit relative, giving rise to factors that in persuasive, indirect, informal, often invisible ways, help maintain and reproduce gender inequality in this male-dominated field.

(3) Having to Perform Better

Until recently, some doubted whether women could be as intelligent or perform as successfully in science, especially so-called “hard” science. Nowadays, social and cultural change and the wide-ranging achievements of female scientists have put doubters to shame. Participants in one male focus group pointed out that the thin numbers of women in engineering “is not a function of their intelligence. Chilean women engineers are highly distinguished and enjoy much recognition, both at home and abroad” (Male Researcher, Case 1: Materials Science, traditional engineering setting).

However, this significant transformation coexists with enduring prejudice about female labour skills, forcing them to prove their mettle on a permanent basis. Many women reported having to constantly prove themselves and their competence: “Our challenge was proving that we were as good as or better than men” (Female Researcher, Case 1, Materials Science, traditional engineering setting). Some men added: “Had I been a woman, I would have had to constantly prove myself to other people, show that I’m up to the task.” (Male Researcher, Case 2: Biotechnology, non-traditional engineering setting).

Hidden behind is a discriminatory mechanism whereby women receive tougher professional evaluations than men (Hola and Todaro 1992, p.112). Career advancement in E&T research is based on a series of goals (number of publications, for example) to be achieved within set timelines. It is a highly demanding, competitive process that purports to be gender-neutral and based solely on merit. Yet, the accounts of many female respondents show that women have to run faster and work harder just to keep up. To women, having to constantly prove themselves means making a greater effort and expending more time and energy on study and work than men, so that no one will question their worth. This was reported especially often by women in more senior positions. Indeed, participants in a female focus group said that had they been male, they would not have had to constantly prove their worth and

would have been able to commit less time to studying and more to their private and social lives (Case 1: Materials Science, traditional engineering setting).

This, in addition to family duties falling mostly on the shoulders of women, helps explain why most respondents felt that, had they been male, their careers would have been easier: “Sometimes I feel that if I were a man I’d have an easier time getting places. I would have accomplished more, sooner” (Female Researcher, Top Women 1, Ph.D in Chemistry, 45 and older, divorced, three children aged 40, 36, and 30).

According to male respondents, male domination in engineering is reflected in the expectation that women adopt male behaviour. Highly masculinized activities lead to perceptions of a “lack of fit” (Heilman 2001) between stereotypically female traits and the requirements and characteristics associated with jobs traditionally held by men, which are often noted for power, prestige, and status. These discrepancies lead to a negative predisposition that permeates perception and judgement of female competence, and explains the additional effort women must make to prove their professional abilities, including adoption of stereotypically masculine traits deemed appropriate in male-dominated fields such as E&T research.

Heilman’s “lack of fit” model is particularly appropriate for women in leadership positions. As shown by the replies of both male and female respondents, as well by the consistent evidence collected in various countries at various periods (Schein, 2001), the attributes associated with leadership roles are predominantly related to male or agentic rather than female or communal traits.¹ As a result, female traits are perceived as being incongruent with the typical expectations of individuals in leadership positions, since leaders are often generically ascribed predominantly male attributes (Eagly and Karau 2002). In other words, “*think manager, think male*” (Schein 2001).

Several female interviewees noted that when heading research teams, especially if staffed by men, being heard and respected required significant effort. Said one: “Men prefer to be led by men and have trouble taking orders from women” (Female Researcher, Top Women 1, Ph.D in Chemistry, 45 and older, divorced, three children aged 40, 36, 30). Participants in a male focus group (Case 2: Biotechnology, non-traditional engineering setting) agreed that women project heads have a harder time getting respect and prevailing over team members, especially in “hard” engineering areas: “Women who head projects have a tougher time getting respect and deference to their role from male subordinates.” Respondents also pointed out that, as result of often not being listened to, when women lead they tend to make sure everyone understands who is boss. “To exercise leadership, women somehow need to show people who’s boss”. This stands in stark contrast with men in leadership positions: “Men are more matter-of-fact bosses, said male respondents. Women have to prove that they’re up to the task”.

In other words, in addition to constantly having to prove their worth as science researchers, women must develop certain traits stereotypically associated with men, such as a strong character, aggressiveness, and authority. As noted by female respondents, to be accepted as leaders (lead researchers, team heads, etc.), they had to “steel” themselves and become “tougher individuals”. (Female Researchers, Case 1: Materials Science, traditional engineering setting). This involves an additional effort, since women, as opposed to men, are not socialized to develop such traits: “I didn’t have such a strong personality at the outset. Had I been a man, perhaps I wouldn’t have had to work so hard at it” (Female Researcher, Case 1: Materials Science, traditional engineering setting).

¹ Agentic traits include assertiveness, autonomy, activity, and strength. Communal traits include interest in the well-being of others, interpersonal sensitivity, warmth, caring, and empathy. While communal traits are stereotypically ascribed to women and agentic traits to men, both genders can exhibit either on different levels (Eagly 1987). As such, agentic and communal should not be equated with male and female, respectively.

Men agreed that “women who do well as bosses or leaders do so by becoming more masculine (i.e., aggressive, forceful). Women who are great managers are often stereotypes of women who act like men”. (Male Researcher, Case 1: Materials Science, traditional engineering setting).

Yet, this behaviour can have consequences. Heilman (2001) holds that while women can be well-evaluated professionally if perceived to be attuned to requirements, they can also be devalued as individuals. For example, women who exert strong (i.e., agentic) leaderships can be seen as competent but less adjusted to female roles and stereotypes. In fact, they are often perceived as running afoul of such roles. As a result, they may be seen as less pleasant socially or less skilled on an interpersonal level. As powerfully noted by a woman in a senior position, “I’m a bossy old hag, according to my colleagues. Were I a man, they’d probably say I was a strong leader.” (Female Researcher, Top Women 1, 45 and older, divorced, three children). Another (Metallurgical Process Engineer, under 45, single, no children) adds that when she does discuss gender issues with male colleagues, she asks how they see her as a woman and solicits their views about how they interpret what she says or the way she says things. These exchanges focus on her concern that her demeanor as a woman of strong character could be regarded as “unfeminine”. In other words, the competence men are praised for may be seen as unattractive in women, thus leading to a personal penalty (Heilman, 2001).

(4) Different Attributes, Different Expectations

As noted earlier, the gender stereotypes and roles upon which psychological barriers are built exist on both social and individual levels as ingrained guidelines that give direction and meaning to individual action. A review of the narratives expounded by female respondents shows that perceptions of a misalignment between female traits, on the one hand, and “men’s work”, on the other, are associated with how women define themselves and guide their careers and with related expectations and interests.

This review also shows that, to the extent that women internalise gender roles and stereotypes, psychological barriers act not just as obstacles imposed from the outside, but also as self-imposed limitations that become evident in various ways. Below is an account of barriers noted by some female respondents. These include a willingness to accept an excess of duties not in direct connection with their research careers, and lack of clarity in defining career goals and steps.

On the first issue, respondents said that women are more likely to take on administrative, outreach, report-writing and other such duties and to devote more time to teaching than male counterparts. Most agreed that women tend to take on the tedious work males turn down or avoid. Men, for example, “hate filling out forms and worksheets, administrative work in general. They delegate it on secretaries or female colleagues” (Female Researcher, Case 1, traditional engineering setting).

A female interviewee says that “while in the Faculty, and in this school in particular, men outnumber women by far, in the faculty committee which handles administrative matters -a tedious job- the balance has always been reversed: most members are women. Although one male joined recently, for long periods of time the committee has been a women’s-only affair. Us women have a tendency to take on the jobs nobody else wants”. (Female Researcher, Case 1, Materials Science, traditional engineering setting).

Some interviewees said that to steer clear from the male tendency to dump boring tasks on them, they prefer to work either alone or with other women. “In mixed teams, men tend to delegate most administrative work, such as report preparation, on women. They (men) hate writing reports. They like other types of activities, I’d say.” (Female Researcher, Case 2: Biotechnology, non-traditional setting).

These tasks require certain skills and competencies that are more congruent with the traits stereotypically ascribed to women, including thoroughness, tidiness, interpersonal sensitivity, warmth, and empathy. Such greater coherence may partly explain why women are often expected to undertake certain tasks.

Yet, this is not just a matter of others' expectations, it is also a question of how women see themselves. Some interviewees said spending additional time on administrative tasks was due to "a sense of responsibility and specific skills, including thoroughness and a sense of aesthetics" (Female Researcher, Case 1: Materials Science, traditional engineering setting). Likewise in teaching: "Women tend to take on significantly heavier duties than men due to a stronger sense of commitment to teaching and students" (Female Researcher, Case 2: Biotechnology, non-traditional engineering setting). Per this, it is often women themselves who prefer to take on these tasks because "they feel they can do better than men" (Female Researcher, Case 1: Materials Science, traditional engineering setting).

The most significant consequence of the additional time and energy spent on administrative and teaching duties is a reduction of the time available for obtaining funding, conducting research, and publishing. In a focus group, women said that "men write more and therefore publish more. Male dedication to students is "minimal", which gives them much more time to do research and write for publication. They have more time to work undisturbed". (Female Researchers, Case 2: Biotechnology, traditional engineering setting).

Having less time for research frustrated many female respondents, as research is key to career advancement at a time when academic life imposes significantly greater demands: "Ten years ago, one publication in a peer-reviewed journal was enough to get you a grant. One good idea sufficed. Nowadays you can have a very good idea and present it very well, but if you have only had three or four publications over the past five years, you're not going to get funding. (Female Researcher, Case 2: Biotechnology, traditional engineering setting).

On the issue of career goals and steps, interviews reveal that men and women approach career development differently. Said one respondent: "Men don't improvise as much, they are much more clear as to what they want and how to get it...men are clear as to where they want to go, and act accordingly...I think women aren't as clear about career development. Things did happen, but it's not as if I'd said I'm at point A and want to get to point B" (Female Researcher, Chemical Engineer, single, no children, 45 and older).

In addition, women believe that men are more self-centered and have more ambition and a greater craving for power and recognition than women, who do not mind as much being second in command. "Women's egos are not as big as men's", said a respondent (Female Researcher, Seismic Engineer, 45 and older, married, three children).

The different traits and interests of men and women dovetail with social and family expectations: "Men are expected to lead distinguished careers, and even become university presidents. This is not expected of women. No one ever expected me to become dean. Had I worked very hard at it, say if I hadn't had a family, perhaps I would have made it big. But it was not part of what interested me" (Female Researcher, Case 2: Biotechnology, non-traditional engineering setting).

By impacting the way men and women define their professional interests and steer their careers, different attributes and expectations may contribute to men being able to get ahead faster and go farther.

(5) Conclusions

As shown by our analysis of accounts collected from male and female respondents, despite growing recognition of the convenience and fairness of women's involvement in the workforce and in science and technology decision-making, they continue to face hurdles arising from gender images that seriously hamper career advancement.

This paper was intended to review some of the mechanisms through which such gender images act in E&T research in Chile.

We found that, in highly masculinized contexts such as this, gender images, roles, and stereotypes lead to prejudice about female performance and act as psychological barriers to advancement. As a result, career conditions in E&T research are not equal, which forces women to work harder in order to get ahead.

One such barrier is the need women face to constantly prove their abilities and competence. As a predominantly "male field", E&T research is permeated by behavioural patterns leading to perceptions of a "lack of fit" between stereotypically female traits and the requirements and characteristics associated with jobs traditionally held by men. This discrepancy, especially when women hold senior positions, leads to a negative predisposition that permeates perceptions and judgement of female competence. It may also explain the additional effort women must make to prove their professional mettle, including adoption of the stereotypically masculine traits deemed most appropriate for male-dominated fields.

In addition, as women internalise gender roles and stereotypes, psychological barriers can also act as self-imposed limitations. Accounts by female respondents show a certain willingness to accept an excess of administrative and teaching duties to the detriment of research work, as well as lack of clarity in defining career goals and steps

Psychological barriers, as mechanisms for discrimination, do not always act as enforced restrictions women reluctantly accept. At times, they also act as a set of apparently shared reciprocal expectations which provide guidelines for career action by men and women.

Barriers are based on entrenched gender roles and stereotypes often perceived as natural, almost common-sense, and thus easily adopted as ingrained guidelines. This helps explain why barriers act in persuasive, indirect, informal, often invisible ways, and why few men or women see them as mechanisms for discrimination. This is compounded by a discourse which legitimizes merit and personal effort as the sole criteria for career advancement.

Yet, these informal, implicit discrimination mechanisms render the role of merit relative and must be recognized when attempting to understand the paucity of women going into engineering and technology research, as well as the hurdles and challenges facing new entrants.