



The Education of Gender The Gender of Education Sociological Research in Italy

Maddalena Colombo
Luca Salmieri

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***Reading Networks through
“Gender Lenses”
Scientific Collaborations at the
University of Naples, Federico II***

Ilaria Marotta

INTRODUCTION

Sandra Harding (1986: 31) argues that «women have been excluded from the practice of serious science more systematically than they have been excluded from the exercise of any other social activity, with the possible exception of the war on the front line». For example, considering the Nobel Prize, the highest level of academic distinction, from 1901 to 2020 a total of 874 men received the prize compared to only 58 women, accounting for 6% of all awards.

Moreover, according to the data presented in She Figures 2018, the number of women holding significant research and institutions roles in the European academic field is still very small. More specifically, there continues to be a gender imbalance among researchers given that, as of 2016, only one third of EU researchers were women. The further up the professional ladder we look in the academic sphere, the less women are represented. In the same year and again in Europe, women represented 48% of doctoral students and graduates, 46% of grade C academic positions (lecturer), 40% of grade B (associate professors) and 24% of grade A academic positions (full professor) (European Commission, 2018).

In the context of Italy as well, the data from a study by the Ministry of Education (2019) show that the Italian academic situation is characterized by low numbers of women, nationally. Women still constitute a minority, accounting for 40.2%; the proportion of female academics decreases when passing from the position of researcher (46.6%) to that of associate (37.5%) and full professor (23%) (MIUR, 2019).

According to the prevailing cliché, there are fewer women in science (mainly in positions of responsibility) because science is an extremely competitive environment. As such, it forces women to back out, either because they do not share men’s ways of working, because they are not

prone to disputes, or even because they are overwhelmed by a larger share of family-care tasks (Cherubini et al., 2011). However, the interpretative framework that might help explain this impasse is much more complex and multi-faceted, with multiple phenomena contributing to perpetuating this discrimination against women and defining the larger «gender order» (Connell, 2002). In fact, Le Feuvre (2015) notes that now more data are available (especially comparative data for the different European contexts) and there is widespread awareness of the factors determining gender inequalities and their embeddedness in institutional and cultural contexts.

Another issue to consider when considering women’s relative presence in the academy is the type of collaborations they engage in and their role in universities. According to Milojević (2010), collaborations are the basis of modern science. Indeed, most of the scientific areas are interconnected and these connections give rise to a complicated mega-science system. Sonnenwald (2007) argues that scientific collaboration can be defined as the interaction that develops in a social context between two or more scientists. Such interaction facilitates the sharing of ideas and helps scientists carry out tasks so as to achieve common objectives. Moreover, in recent years the study of scientific collaborations has attracted more and more interest, for the physical sciences as well as the social sciences (Batagelj, Mrvar, 2002; Newman, 2001; Tommasini, Luthi, 2007; Moody, 2004). The progressive growth in these studies shows that there is increasing interest in exploring the factors that lead two or more colleagues to collaborate in an academic setting (for example, in drafting a scientific article).

The increase in this type of study over the years reflects a greater awareness that collaborations bolster research results (Zhai, Li, Yan, et al., 2014). Furthermore, collaboration tends to reduce the arduousness of research, save resources, and reduce costs (Jiang, 2008). Collaborations are thus a fundamental variable for promoting scientific progress and development, so much so that the number of collaborations within the academy can be seen as a measure of a nation’s scientific progress.

In particular, numerous studies (Abbasi et al., 2012; Abbasi et al., 2010; Wuchty, 2007; Barabasi et al., 2002) have been proposed in the specialized scientific literature to study the structure of collaboration networks. On one hand, this research focuses on constructing models to represent and analyze the structure of links, identifying the dynamics of networking; on the other hand, such studies employ the social network analysis approach (Wasserman, Faust, 1994) to investigate the role actors play in the network and different forms of collaboration. Nevertheless, despite the increasingly collaborative nature of scientific research in the academy and growing scholarly interest in such interactions, gender as an aspect of collaboration between researchers has been treated quite marginally (Abramo et al. 2013) even though gender differences in scientific success have been investigated in depth (König et al. 2015). In light of these points, it is necessary to grant adequate importance to the collaborations carried out among researchers in the academy in order to identify systematic those in collaboration, especially differences linked to gender.

These dynamics of collaboration can be key to the construction of a scholar's social network, a web in which each node occupies a specific position that in turn allows the scholar in question to access specific opportunities in the academic world. The objective of this chapter is thus to carry out an exploratory analysis of the position women hold in two different case studies in an academic setting. The selected case studies are degree courses offered at the University of Naples Federico II - the first one is related to the Social Sciences Department and the second one to the Humanities. This chapter is mainly concerned with the level of feminization, the presence or absence of a glass ceiling, and the role of women in collaborative networks. Networks were reconstructed through an online survey involving all the professors and researchers associated with the selected degree courses. The methodological approach underlying this analysis is social network analysis (SNA) and the study seeks to map social reality from an examination of the totality of the social connections in which the actors are or are not included and the connections that have a determining effect on their behaviour. The social structure is understood as a social network which consists of the actors (representing the nodes of the network) and the relationships that connect the actors (representing the links of the network, these relationships have been precisely classified).

The chapter is organized as follows: the next section outlines the role of women in Italian academia while the following section describes the methodological aspects of research on networks of scientific collaboration. Finally, the last section is dedicated to a detailed description of the data and a presentation and analysis of the networks identified for the two case studies. Analysis is structured as follows: the starting point is the given by discussing the stratification of women in the University Federico II; the case study of the Department of Social Sciences will then be examined and lastly the case of Humanities Department.

2. THE POSITION OF WOMEN IN SCIENCE

Gender is certainly a significant variable for analysing the functioning of a group, and this variable acquires even more significance if we take this approach to the study of the labour market. Even today, in fact, women face disparity in employment due to stereotypes and disadvantages that are relatively easy to identify but difficult to break.

It is well known that, despite the various policies implemented by local, national and European governmental institutions and companies¹⁷, women still suffer from specific occupational disadvantages. They are the

¹⁷ In this context, we refer to the Diversity Management policies implemented to ensure equal employment rights and opportunities to a host of identities which, over the years, have had difficulties in accessing and retaining positions in the labor market. The variables in this case include gender, religion, age and, (in recent years) also sexual orientation and gender identity.

victims of segregation, essentially under-represented in sectors and positions that not only lack high remuneration but also offer better opportunities for career development. This under-representation manifests in the so-called “glass ceiling”, a barrier based on gender segregation that largely blocks women’s access to top-tier management roles.

In the academic field, the situation does not appear to be much different. On the contrary, gender represents an even more significant variable in this sector (Facchini, 1996) in influencing career trajectories, and one that is useful for showing the behaviour of a specific scientific community (Bianco, 2002). The university is a microcosm characterized by very complex social and cultural stratification and a specific level of development of gender relations (Giannini, De Feo, 2008). One widespread hypothesis is that there is a strong positive correlation between the feminization of different roles and the decrease in the prestige of these roles. Bourdieu argued as early as 1998 that the number of women decreases when approaching the highest positions, stating that «the rate of feminization is the best index of the relative position and value of the different professions» (Bourdieu, 1998: 108).

An analysis of official data from the Italian Ministry of Education, University and Research (MIUR, 2019) shows significant differences between women and men in the structuring of role models as well as recruitment and career development in Italy (Agodi, Picardi, 2016). Differences remain despite the multiple directives, recommendations and guidelines issued by European institutions aimed at reducing gender inequalities and promoting equal opportunities, efforts which are considered one of the cornerstones of the EU. More specifically, data show that the number of women in academia tends to decrease substantially the further up the career hierarchy we look: If we consider education alone, MIUR (2019) finds that women make up at least 50% of individuals in the academic field, of which more specifically 55.5% of those enrolled in degree courses; 57.6% of the total number of graduates; 50.0% of those enrolled in doctoral courses and 51.8% of the total number of PhDs. In 2017, women accounted for 40.2% of the 67,917 professors and researchers, with differences between the various academic career levels (MIUR, 2019). They represent just over half (50.3%) of the total number of post-docs, 45.9% of researchers and 34.6% of associate professors while they account for just 23.0% of all full professors (MIUR, 2019). This figure tends to worsen further if we consider women’s access to and duration in higher organizational roles (such as rectors, prorectors, directors, etc.). The CRUI - Conference of Rectors of Italian Universities - found that in 2019 only six female rectors had been elected to Italian universities as compared to 89 male rectors.

As mentioned above, women’s standing in the university can also be interpreted by studying their collaborations and the relative positions they hold in these networks. Numerous international studies have investigated the type of collaborations women carry out in the academic world, highlighting some problematic issues. Indeed, it seems that women in science have different and more limited (including in terms of extension) collaborative relationships than their male colleagues (McDowell et al. 2006; van Rijnsoever et al. 2008).

One of the differences researchers have noted is that women tend to develop collaborations that are more formal (Abramo et al., 2019) but extend beyond their own specific interests in some way (Leahey, 2006). This tendency also generates a greater propensity for interdisciplinary collaborations (Rhoten, Pfrman, 2007), although Araújo and colleagues (2017) argue that women are more likely than men to engage in interdisciplinary collaborations only in the natural sciences.

At the same time, however, women's collaborations are less international than those of male colleagues (Larivière et al., 2011) for a variety of reasons. There are economic reasons, that is, linked to the availability of research funding, which may be due to prejudicial peer review procedures in the evaluation of project proposals (Ledin et al., 2007). On the other hand, international collaborations also depend on a family variable: it has been suggested that family ties, specifically having children and a husband who works, could limit both the duration of collaborations and their geographic scope (Frehill et al., 2010). Men less burdened by family responsibilities, on the other hand, are freer to travel - since they can arrange for their spouses to come with them - and tend to travel abroad more frequently or commonly regardless of age (Zimmer et al., 2007).

Another important element in mapping women's collaborations in the university is that of social capital. Women have less social capital for two reasons. They are in the minority in many disciplines, which leads to their having fewer opportunities than their male colleagues (Rivellini et al., 2006). Furtherly, their social capital accumulation is limited by mechanisms of gender homophilia whereby values and methodological approaches are shared with colleagues of the same gender (Boschini, Sjögren 2007). This clearly reduces both the possibility of collaborating and the type of collaboration women can access. From this point of view, studying collaborations through the lens of gender enables us to understand the position that women hold in the academy. In fact, collaborations allow scholars to enrich their social capital and improve both their position and level of integration in the academy.

3. RESEARCH ON THE UNIVERSITY OF NAPLES FEDERICO II: METHODOLOGICAL NOTES

The data presented below are the result of empirical research conducted between 2019 and 2020 by two researchers at the Department of Social Sciences of the University of Naples Federico II, in collaboration with the LGBT Center.

As outlined above, the objective of the research was to conduct an in-depth analysis of two case studies to investigate the degree of feminization as well as the presence or absence of a glass ceiling and, finally, the position of women in science in collaboration networks in , which grants case studies. First one at the Department of Social Sciences where a Bachelor's degree in Sociology and a Master's degree in Public, Social and

Political communication are provided and the Department of Humanities where a Bachelor’s degree in Psychological Science and a Master’s in Cultural Heritage Management are taught. The choice of departments to be included in the analysis is mainly guided by convenience, as these departments hosted mediators who helped in the phase of presenting the research and disseminating the questionnaires. The aim was to use a mainly female lens to read and interpret the available data. The choice of departments to be included in the analysis is mainly guided by convenience, as these departments hosted mediators who helped in the phase of presenting the research and disseminating the questionnaires.

We carried out a document analysis to assess the relative presence of women, primarily in the university as a whole and in the selected cases. The aim was to understand how the selected cases reflect or differ from the trend characterizing the Italian university as a whole.

To reconstruct collaborations, a structured online questionnaire was administered to the academic staff of the selected degree programs. The areas covered by the questionnaire are listed below: personal information (each respondent was asked to indicate his/her position and disciplinary sector¹⁸) and the relational aspects of the collaborations. In this case, each professor and lecturer were asked to indicate the level of collaboration he or she engaged in with the rest of the academic staff during the last 3 years, 2016-2019. The collaborations were carried out at two different levels: *i*) Research products (writing of scientific articles, books, attending conferences, etc.); *ii*) Research projects (PRIN - Projects of national interest, Horizon2020, Marie Curie, etc.)

To analyse this data, social network analyses was chosen as the methodological approach. The objective is to study the relationship models connecting social actors within social systems (in this case, academia), the way in which these models affect the actor’s behaviour, and the flow of resources conveyed by the connections. However, another key parameter of investigation is the way in which the social actors contribute to changing the social structure through these same interconnections.

Networks are also important for the study of scientific communities: relationships can facilitate or prevent cognitive exchanges and the achievement of certain objectives. The sum of the relationships in which cultural exchanges occur give rise to a reticular structure and these exchanges derive both from the specific structure of the networks, and from the position occupied by the actors.

The initial idea that led to this research design is that professors have a particularly high cultural and educational background to begin with, but the ability to translate this background into career development tools depends on the structure of the academic field in which they operate and the way social relationships are configured. The aim, therefore, was to

¹⁸ The disciplinary affiliation of Italian university teachers or scientific position that each teacher assumes in the university system is divided into disciplinary groupings. Pursuant to Article 15 of Law 240 of 2010, each of these groups is divided into three levels from the general to the more particular, represented respectively by: Competition Macro Sectors (to date, there are 86 of these); Competition sectors (190); and the scientific disciplinary sectors (383)

examine how the structuring of these relationships can constitute a visible manifestation of women's status in the selected cases. Such structuring can be interpreted as a detectable external symptom of the potentially gendered structure of the academic context.

Our hypothesis overturns the idea that women occupy a position of lesser visibility in the case studies considered, suggesting that they may instead be central actors in the networks.

Thanks to the methodological structure of SNA, our analysis was able to consider some auxiliary variables that can be linked both to the nodes, in this case the professors, and to the links, in this case the level of collaboration. These variables are generally called attributes. In this context, the variable attribute of "gender" linked to the node takes on significance. We have also reconstructed the interpretative framework of the analysis of relational connections by employing additional attribute variables concerning node characteristics, such as academic roles and their respective scientific- disciplinary fields. The response rate was 60% for the social sciences degree programs and 30% for the humanities programs. The networks presented below, summarized in the tables and illustrated in the graphs, were constructed using all of the responses received. It may be assumed that even those who did respond but were "referenced" by other degree course teachers are an active part of the network of collaboration. However, respondents who were not referenced are considered isolated nodes since no information has been provided regarding their collaborations.

Some descriptive measures of the networks (typical of SNA) have been used, as useful tools for framing the research object. The global index of the network (like range and number of ties) provides the overall description, while the local description (in-degree and betweenness) identifies the groups and actors whose centrality makes them particularly influential in these networks. The main results of the research are described in the following sections.

4. WOMEN IN SCIENCE AT THE UNIVERSITY OF NAPLES FEDERICO II

Before starting, it is appropriate to outline the gender segregation in the specific case of the University of Naples Federico II so as to indicate the contours and extent of this phenomenon.

The First Gender Review¹⁹ conducted by the University of Naples (2016) emphasizes the university's composition, political choices and economic-financial commitments from a gender perspective with the aim of moving toward a more efficient, transparent, fair and intentional

¹⁹ This review was carried out as part of GENOVATE: Transforming Organizational Culture for Gender Equality in Research and Innovation, an FP7 research-action project funded by the European Commission in the context of the 7th Framework Program with the aim of ensuring equal opportunities for women and men in research and innovation.

management of resources. It analyses students, teaching staff and technical administrative staff, outlining the overall structure of the workforce and the gender gap that continues to characterize these populations. The data collected and analysed show that the number of women who enrol in university courses at the university has increased substantially in recent decades. Another finding is that, on average, graduated female students have even better grades than male students and the proportion of women is still higher in more advanced academic training programs (PhDs, specialization schools). Despite the increase in the share of female graduates (58%) and of those engaged in post-graduate training courses (56%), women still constitute a minority in the academic field, with the number of women gradually decreasing further up (only 20% of associate professors are women).

Women's difficulty in achieving career advancement can be measured through the glass ceiling index, defined as the ratio between the number of women in an academic role and those in the immediately preceding role (associate professors/researchers; full professors/associate professors). While the male glass ceiling index remains approximately in all the transitions from one position to the next, signalling that there is an equal number of men in the different roles, for women the thickness of the glass ceiling is greater, the more prestigious the target role. In particular, the value of the female glass ceiling index in the transition from the role of associate professor to that of full professor is 2.5, which means that the number of female professors is less than half the number of associate professors (40%). The data on the university's teaching and research staff show that some fields remain exclusively male domains (e.g. engineering, physics, medical sciences).

The data confirm that there are cultural and structural obstacles that, on the one hand, lead women to reject scientific careers and, on the other hand, reproduce mechanisms of horizontal and vertical segregation, with some areas and positions reserved exclusively for men. The existence of a glass ceiling is demonstrated by analysing institutional positions and governance among the teaching staff: only 15% of institutional positions are held by women. In particular, the data regarding the coordinators of specialization schools is remarkable: out of 53 coordinators, only 7 are women. Furthermore, the distribution of institutional positions among the various government roles shows that only 21% of institutional positions are held by associate professors, while the remaining 79% of positions are granted to full professors.

4.1. Social Sciences

The first case study comprises two degree courses in the Department of Social Sciences (DSS). It includes 54 professors and lecturers, 59% men and 41% women (a figure quite in line with the general breakdown of the University Federico II as whole, which employs 63% of men and 37% women as professors and researchers).

Table 1 shows the distribution of roles (full professor, associate professor, permanent lecturer, temporary lecturer) in relation to the gender variable. In this case, the number of women is lower than that of men; with reference to the role held in the university system, the position of full

professor and temporary lecturer are less covered by women. The positions of associate professor and permanent lecturer feature more encouraging data, in contrast, with the number of women almost equivalent to that of men.

TABLE 1 - *Distribution of roles in relation to gender (DSS)*

	Male	Female
Full professor	7	4
Associate professor	9	8
Permanent lecturer	10	7
Temporary lecturer	6	3
Total	32	22

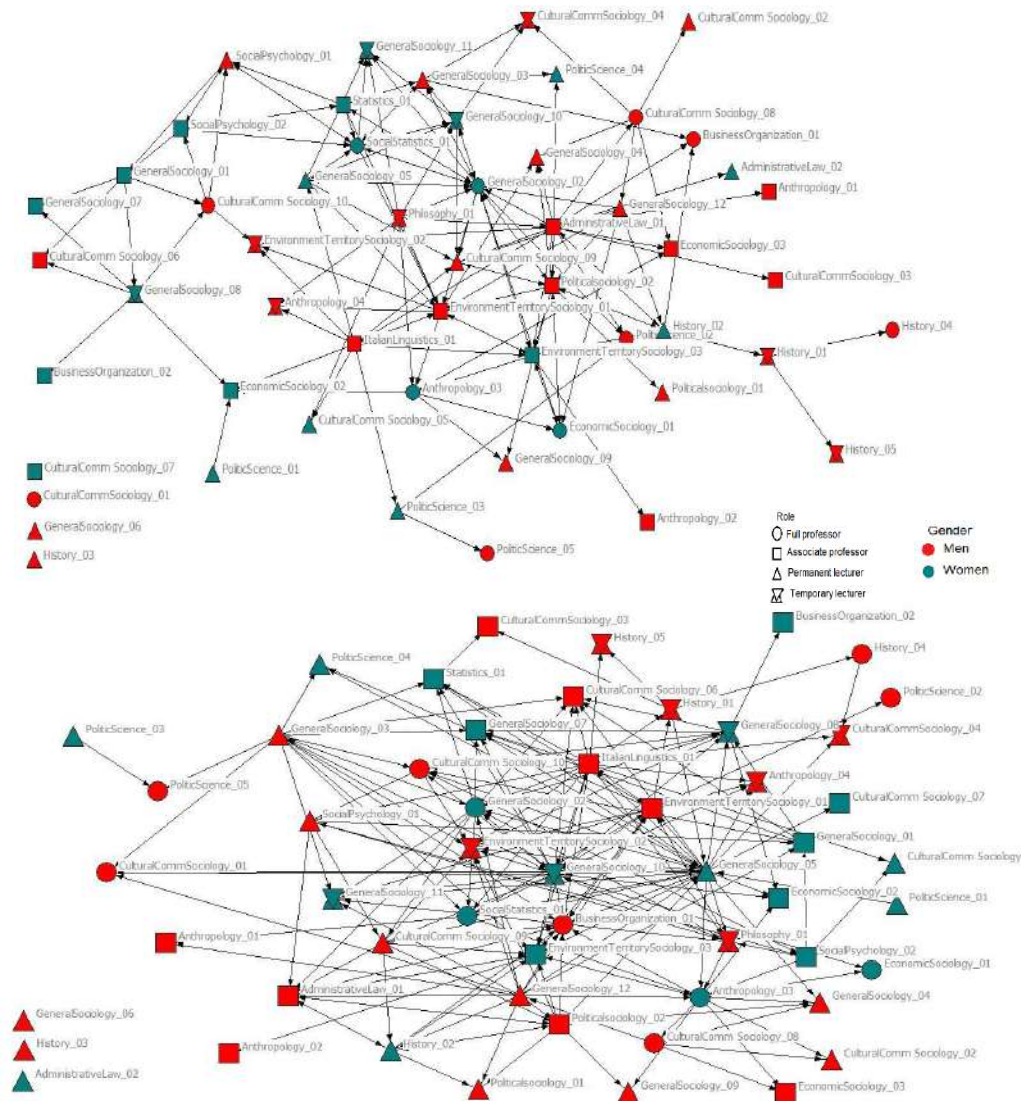
Considering instead the index of the glass ceiling, the transition from researcher to associate professor is 1.25 for woman (the equivalent value for the entire university is 1.4). In the case of the step up from associated professors to ordinary professors, the data show a ratio of 2 for woman (the equivalent value for the entire university is 2.5). In the first case, the value of the index is approximately 1, suggesting that in the role transition from researchers and associate professors, the number of professors is only slightly higher. In the second case, however, that of the role advancement to the highest position, only half of associate professors achieve the position of full professor. In fact, the number of full professors is half that of associate professors. Moreover, comparing the data of the DSS courses with those of the university overall shows that there is a glass ceiling in the case under examination, but to a slightly lesser extent than the general trend of Federico II.

Let us now consider the structure of collaboration networks mapped to ascertain the position of women. These networks refer to collaboration in the drafting of research products (such as scientific articles and books), conference participation and research projects over the last three years.

The network in Figures 1 and 2 comprises 54 nodes, and the graphic representation shows that there are 4 isolated nodes in the first case and 3 in the second. The isolated nodes represent individuals who have not been involved in any collaboration of this type. At the global level of the network, we consider the number of arcs in order to understand the relational volume. For the network of research products, there are 178 arcs; on the other hand, for research projects there are 232 arcs. This finding shows that there is a greater tendency to collaborate in research projects. Locally, however, a knot can be read as follows: the colour represents the gender, with red for men and green for women, while the shape refers to the position/role of each network participant. More specifically, a circle refers to full professors, a square to associate professors, a triangle to permanent lecturers and a double triangle to temporary lecturers. Furthermore, all the nodes in the network have been codified to indicate their respective disciplinary area by progressive numbering. As far as the distribution of the scientific fields is concerned, there are 14 different fields²⁰ (being a department of social sciences), of which only 4 are sociological.

²⁰ Anthropology; Philosophy; History; Political science; Sociology of culture and communication; Business organization; Sociology of the Environment and Territory;

FIGURE 1 - 2- Network of research products and projects



In order to identify the position of women in science within these networks, we take into account the centrality indices at the local level of the nodes. The references in this case are: *i*) in-degree, measuring the prestige of the actors (this is the number of incoming connections for each node). For the network of research products, the most central nodes for DSS are²¹: general Sociology_02 (full professor, woman), social Statistics_01(full professor, woman) and Sociology of the environment and territory_03 (associate professor, man). In the second case, the networks around research projects, the most central actors are²²: business organization (full professor, man), general Sociology_02 (full professor, woman), sociology of the environment and territory_01 (associate professor, man), and general Sociology _05 (full professor, woman). ii)

Law; Social psychology; Statistics; Italian linguistics; Economic sociology; Political sociology and General Sociology.

²¹ In order, the In-degree values are 13, 10 and 10.

²² In order, the In-degree values are 12, 11, 10, and 10.

Betweenness refers to the intermediation capacity of the network nodes. This is an indicator of a node's ability to control information exchange and resource flows within a network. The most central nodes for the first network are²³: general Sociology _02 (full professor, woman) and political Sociology_02 (associate professor, man). For project network collaborations, the results show a single node with a high index occupying a central position²⁴: general Sociology _02 (full professor, women). All the other nodes have values below 6.

The calculation of these two centrality indices tells us something interesting about the central actors in the department. As we can see, in fact, it is mainly women who play a role of prestige and intermediation. Indeed, it is even more interesting that these women also hold the position of full professors.

These data tell us that, despite the greater number of men in the degree courses under examination and despite the greater number of full and associate professors, in reality it is women who play central roles in terms of both prestige (in-degree) and the mediation they carry out within the networks (betweenness).

The results of this case study with regard to the three dimensions investigated provide a specific picture of the role of women in science in the Department of Social Sciences. The degree of feminization in this case is not particularly high, due to the fact that the academic staff features more men. The glass ceiling is still present, in this case in favour of female researchers (as compared to associate professors) and associate professors to the detriment of full professors.

The SNA results, on the other hand, contrast with the claims outlined above. Indeed, the actors who effectively move information and resources within these collaboration networks are women, both associate and full professors. This situation might be due in some way to a generational factor in which some women in science have become the soul of the department over the years. For instance, it should be noted that one woman held the position of Department Director from 2013 to 2018 and she was also the first female headmaster of the University Federico II.

4.2. Humanities

The second case study under investigation comprises two courses in the Department of Humanities (HD), where there are 44 lecturers and professors of whom 68% are women. Table 2 indicates the distribution of roles (full professor, associate professor, permanent lecturer, temporary lecturer) in relation to the gender variable.

In this case, the majority of the academic staff is female. This figure depends largely on the study courses selected, which, as mentioned above, are psychology and the management of cultural heritage and are predominantly female. However, this data seems interesting to us because it demonstrates that women maintain a greater presence in specific areas. Despite this prevalence, however, the role of full professor is mostly held

²³ In order, the values of Betweenness (normalized index to compare the position of nodes in different networks) are 12.962 and 10.560.

²⁴ The value here is 12.068

by men while the position mainly maintained by women is that of associate professor.

TABLE 2. *Distribution of roles in relation to gender (HD)*

	Male	Female
Full professor	5	4
Associate professor	7	14
Permanent lecturer	2	9
Temporary lecturer	-	3
Total	14	30

If we consider the glass ceiling index for women in moving from researcher to associate professor, the data show an index of 1.16, while the index for the upgrade from associate to full professor is 3.5. While the former figure (concerning the researcher-associate professor transition) appears largely in line with the university trend as a whole, the relationship between full and associate professors, suggests that there is still a substantial barrier in accessing the most prestigious position. In fact, the number of female associate professors is more than three times that of full professors. In this case as well, we examine the networks of collaborations formed around research products (Figure 3) and research projects (Figure 4) to investigate which individuals have greater prestige and centrality.

Both networks are made up of 44 nodes. More specifically, the first network has 68 ties and 16 isolated nodes (professors and lecturers without any collaborative relationships), while the second one has 72 links and 19 isolated nodes. This finding might depend more significantly on the high number of non-responses to the questionnaire, although responses by even a part of the professors should be significant for understanding the level of collaboration. As for the disciplinary sectors of the academic staff, 10 fields have been identified²⁵. The two indexes of centrality have been used in this case as well as a reference to identify the most central actors of these networks. In terms of In-degree²⁶ for the network of research products, the greatest degree of prestige has been found for the following nodes: psychology_07 (associate professor, woman), psychology_16 (full professor, woman), psychology_20 (lecturer, man). In the network of research project collaborations²⁷, the most prestigious node was psychology_07 (associate professor, woman). As for the betweenness index, however, in the first case the most central one is economy_03 [full professor, man]²⁸, while in the second it is psychology_06 (associate professor, woman)²⁹.

²⁵ Psychology; Economy; Art history; Classical archaeology; Sociology; Pedagogy; Philosophy; and Geography and Law.

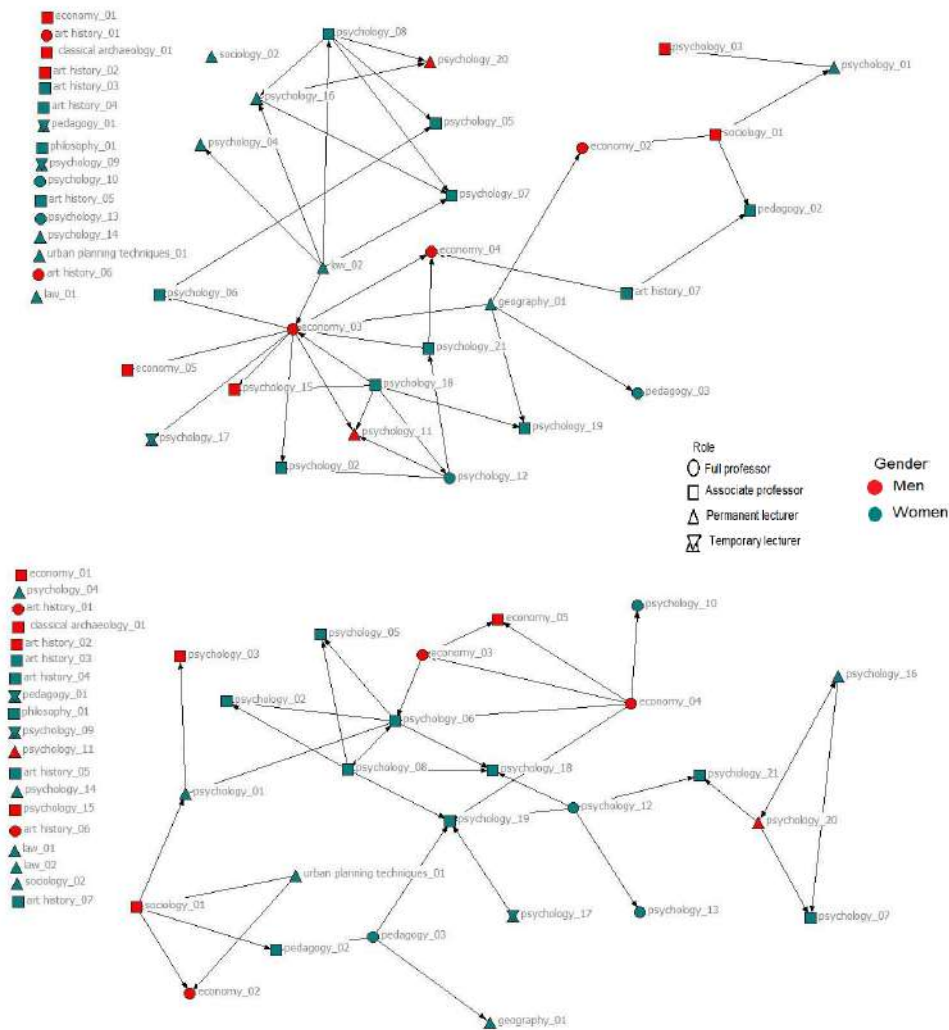
²⁶ The values assumed by the In-degree are in order: 21, 12,12.

²⁷ The values assumed by the In-degree are in order: 7.

²⁸ The values assumed by the nBetweenness is1.8.

²⁹The values assumed by the nBetweenness is 1.3.

FIGURE 3 - 4. Networks of research products and research projects



We can conclude that, for women in science, the staff is predominantly female (with a high degree of feminization) but this numerical prevalence does not correspond to an equivalent share of women in the higher position, that of associate professor. Women still seem to have trouble accessing the higher rung of the career ladder, suggesting that the glass ceiling remains in effect at this level.

The network analysis yields interesting results for our selected humanities department as well. First, the relational volume is low on average (if we consider the number of isolated nodes and links for each network) but, as in the previous case, there are slightly more collaborations for research projects than for research products.

Based on the relational analysis of the individual nodes, therefore, the most central nodes in terms of prestige and ability to mediate information are populated by women in these courses as well, in particular women in the position of associate professor.

4. FINDINGS

We can conclude that there continue to be significant differences between the numbers of men and women holding academic positions in Italy, considering the most prestigious career positions. Indeed, although female students stand out in both numerical prevalence and performance during the university years, in general these women scholars do not pursue leadership positions later on, that is, during their post-degree careers. If this finding sounds strange, it should be recalled that the environment in question is characterized by a high degree of cultural capital acquired during a lengthy trajectory of training, education, and apprenticeship.

The fact that this capital and the subjects who bear it are not adequately valued and utilized represents a very challenging issue, one that concerns both the university itself, conceived as a microcosm, and society as a whole.

In this article we have tried to answer the following questions: what is the level of feminization in the two departments considered? Is there a glass ceiling? What is the role of women in science examined via collaborative networks?

Our first observation is that, in both cases under consideration, the fact that the departments in question are human sciences means that there is a relatively high percentage of women in the teaching staff. This is especially true with regard to the two Department of Humanities degree courses, where the level of feminization is certainly much higher than the national and university averages. As regards the presence of a glass ceiling, however, it must be noted that this barrier does continue to operate in these departments, especially in the transition from the role of associated professor to full professor. The results of the analysis of collaboration networks contrast with this finding, however. Let us take a closer look at the networks. First, actors in the SSD degree courses establish considerably more collaborations than the ones in HD. This can be explained in part by the fact that one of the degree courses considered for HD, namely Management, was established more recently. This data could be interpreted in the light of the hypothesis that collaborations are established and strengthened over time: the fact that the degree course in management was established more recently, therefore, has meant that it hosts fewer collaborations between teachers and researchers, so far in this initial phase of its development.

Very generally speaking, academics usually establish more relationships in research projects than they do in co-authoring research publications. The difference is due to a number of variables, including the fact that research projects (in particular European ones) require multidisciplinary collaboration. At the same time, research publications (such as papers) tend to restrict collaboration. For instance, consider that papers in this area of research tend to have no more than three co-authors and that the disciplinary sector plays a much more substantial and binding role. On the other hand, however both networks clearly show the multidisciplinary nature of the collaborations. Actors tend not to limit relationships to other scholars within their own disciplinary field, but rather

enrich their scientific collaborations by also expanding partnerships in fields far from their own.

As for the lens of gender, however, both the graphic representations of the networks and our calculation of the different indices of centrality highlight that the networks are predominantly populated by women. Women in power (considering the In-degree index) and women with central roles are able to control the exchange of information and resources in the network. This is even more evident in the case of disciplinary fields where female researchers and professors do not make up the majority of the teaching staff. It should be noted that role segregation depends to a large extent on the degree of compactness of the networks, according to Bott (1995). The less compact the network (as in our case), the lower is the degree of segregation between men and women. We can also define these networks as loose-knit. These types of networks exert a less pressing degree of social and regulatory control, allowing greater variation in ideology, obligations, and norms of behaviour. In these types of networks, women in science are the central actors.

In order to ascertain the situation in other departments, the survey would need to be administered there as well, including the so-called hard sciences degree courses and verifying whether women are able to take on roles of centrality and prestige despite their under-representation in these male-dominated fields.

SNA could therefore represent an appropriate theoretical-methodological perspective for the study of gender dynamics in the academic framework. Indeed, it offers the opportunity to study the complexity of our social system by exploring roles among individuals as well as within groups, and to effectively map structures and collaboration models in scientific fields with an eye to gender.

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