
Sustainable Development and Motivation Opportunities from the Perspective of Women in the Polish Science Sector in the Light of Statistical Data and Surveys

Submitted 20/01/20, 1st revision 25/02/20, 2nd revision 29/03/20 accepted 10/04/20

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Abstract:

Purpose: The main aim of the article is to evaluate and analyze the role, participation and work motivation of women and men in the science sector in Poland.

Design/Approach/Methodology: Two research themes are presented during the research. The first one concerns determination of the share and role of women in the academic sector in Poland in 2008-2018 and it is a macro perspective. The second research theme includes motivation factors in research institutes in the light of the surveys' results.

Findings: According to the research results the place and role of women in obtaining higher degrees in academic career in Poland (post-doctoral degree and professor's title) was still significantly lower than the place and role of men. Additionally, there were still some inequalities in using motivating factors between men and women.

Practical Implications: Sustainable development will not be possible without gender equality and the recognition of women's work. It will also not be possible to achieve the full benefits of this development that serve present and future generations. Therefore, the elimination of diagnosed symptoms of discrimination may contribute to increasing the innovation of scientific research and, as a result, to improving the quality of life in modern world.

Originality/Value: Research in this area has not yet been more widely conducted and described in the literature on the subject, therefore its results are a valuable source of information on gender equality in the Polish academic sector.

Keywords: Motivation systems, sustainable development of human resources, science sector.

JEL codes: M10, M12, M14.

Paper type: Research article.

Acknowledgments:

This article was funded by statutory research of the Department of Organization and Management of the Silesian University of Technology (13/990/BK_19/0138).

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1. Introduction

Based on several studies (Cohen *et al.*, 2018; Khedr, 2017; Castagnetti and Rosti, 2009), it can be noticed that the problem of the so-called glass ceiling is observed in several different professions. It is being emphasized, that this phenomenon has an adverse impact on the available talent pool and can cause long-term problems for the profession, related, among other things, to prejudices against the promotion of women at the highest level, lack of opportunities for mentoring and networking and for expressing one's own opinion "out loud", or lack of adequate social support from male leaders in the organization. Moreover, the issue of differences in remunerations of women and men taking the same positions, having the same qualifications, education and work experience is often discussed.

Counteracting such practices is exposed in the 2030 Agenda for Sustainable Development adopted by the United Nations General Assembly on September 25, 2015, which recognizes the problem of gender inequality. One of the 17 goals of Sustainable Development is to achieve gender equality and empower women and girls. The implementation of this goal requires the abolition of not only legal barriers, but also social and economic barriers that hinder women's empowerment. Gender equality in every aspect of life will contribute to achieving sustainable development by using the potential of women and men in building common well-being. Unfortunately, at present, gender inequalities are still being noticed in various spheres of human life, including the professional one.

Meanwhile, increasing research indicates that gender inequality causes high economic costs and leads to social inequality and environmental degradation worldwide (Caliyurt, 2017). It is also known, that female directors are more likely to be assigned to and to accept roles on the board that are related to environmental and sustainable development, as these types of positions are more closely aligned with their roles in the society (Furlotti *et al.*, 2018). Additionally, Setó-Pamies (2015) supports the hypothesis that gender diversity has a positive influence on CSR. The research, using a sample of firms from different countries and sectors, demonstrates that female capacity can play a strategic role in allowing firms to manage their social responsibility and sustainable practices (Setó-Pamies, 2015; Fredman *et al.*, 2016). The involvement of women and the use of their natural abilities therefore obviously contributes to strengthening sustainable development. Therefore, it is in the interest of all of us to work to level out gender inequalities, including those in science, where the foundations of knowledge and functioning of societies are being created.

The situation is similar also in the academic research sector. Researchers (Savigny, 2014; Fitzgerald, 2018; O'Connor, 2015; Burkinshaw and White, 2017), dealing with gender inequalities across countries, draw attention to significant differences in the proportion of women and men employed in research institutes, the disproportions among those achieving the highest academic degrees and their remuneration levels. Additionally, they underline that, even if they have higher

positions, it is in a way perceived as “unnatural” or threatening to the stable order in the hierarchy. As a result, they are additionally subject to gender-related expectations regarding clothing, image or appearance. This prompts researchers (Shepherd, 2017; Morley, 2014) to seek the cause of such situation and create models that identify the sources of these disproportions, as well as to develop recommendations, the implementation of which will influence the decrease of the glass ceiling phenomenon.

As Siemieńska (2019) points out, there is no evidence of a greater presence of women in the research sector in countries where greater equality between women and men is suggested. Other authors (Blackburn, 2017; Kwak and Ramirez, 2018; Shepherd, 2017) also highlight that, despite many initiatives to promote equal treatment of women and men in this sector, barriers to women’s careers development still exist. On the other hand, as pointed out by O’Connor (2015), the pressure on gender equality is supported by transnational structures, which are concerned about economic growth and which consider the failure to address gender inequality a serious constraint on that growth. The question, therefore, arises as to why, despite multilateral activities and research, this problem still exists and is not effectively addressed, even in countries with a high level of civilizational and economic development?

Taking the above circumstances into account, based on research conducted in Polish research institutes, the questions of participation, place and role of women and men in the science sector is considered in this article. In the course of the research, reference was made to the employment structure and professional promotions of women scholars in Poland and the results of surveys carried out in Polish research institutes dealing with conducting academic research and preparing their results for implementation in practice were used. Research in this area has not yet been more widely conducted and described in the literature on the subject, therefore its results are a valuable source of information on gender equality in the Polish academic sector and can be used in practice in the process of protecting and supporting women in their academic and research careers.

In order to realize the above mentioned objectives, in the further part of the article, literature overview is presented, which constitutes a theoretical basis for the conducted deliberations and posed research problems. Next, the adopted research methodology and results of statistical analyses and surveys were presented. In conclusion, a discussion was held, final conclusions were formulated and directions for further research in this area were indicated.

2. Literature Review

2.1 Participation and Role of Women in Sciences

Savigny (2014) shows, that in Europe only 18% of full professors are women. For example, in Great Britain, in 2012 only 14.2% of Vice Chancellors were women, while among 18,465 professors only 20.5% are women. This research, as many others, suggests unequal participation of women in the academic research sector. In this context, Morley (2014) emphasizes, that the participation of women in academic environment and its promotion is a complex issue and its perception is often simplified. This is because, most often, in research on the differences and similarities between the situations of women and men, scientists wrongly assume that all women start families, that they all have children. On the other hand, it is not noted that they belong to different social classes, ethnic groups, nationalities, races, that without an inter-sectional approach it is impossible to determine the chances of women in a given society, in a given educational institution, at a given time. The author identifies actions (the so-called Manifesto for change), which should lead to improvement of such situation. Among them, she distinguishes:

1. Observance of the principle of equality as an indicator of the quality of a given institution, which would be measured by the proportion of women in different positions, with particular reference to professorships, the proportion of women among students and doctoral students.
2. Monitoring the proportion of women and men receiving grants, broadening the number of criteria, e.g., gender in their allocation, promotion of women as project managers.
3. Paying attention to the composition of the editorial boards of the magazines from the point of view of proportion of women and men.
4. Creating a global database, in which women employed in higher education and in managerial positions would be placed.
5. Earmarking more resources for programs that prepare women for high-level management functions and mentoring.
6. Deployment of mainstreaming principle, considering diversity in applied procedures.

Burkinshaw and White (2017) note, in turn, that today very often in discussions on the lack of women in higher education management positions, “fixing women” is promoted as a solution to help women break through the “glass ceiling”. However, regardless of the measures implemented by and for women, gender power relations in universities persistently maintain their rooted characteristics. The authors postulate the repair of universities, not women, and point out that the growing resistance of women reflects their dissatisfaction with regard to taking up managerial positions by men. A similar opinion is shared by Shepherd (2017), who claims that a significant gender imbalance persists among the management of higher education institutions despite several initiatives aiming at increasing the number of women on managerial positions and ensuring that they are better prepared to fulfill these roles.

As a result of her research, the author questions the reason for the under-representation of women in this environment, which is often put forward by other

researchers, namely the lack of self-confidence or ambition and the tendency to give up on applying for the best jobs. In turn, she emphasizes the importance of three-structural factors connected with the selection processes, mobility and external professional capital, conservatism and homo-socializing. Furthermore, she points out that development programs aimed exclusively at women are not sufficient to achieve gender equality. Instead, she proposes a combination of measures, including those aimed at “fixing” the organization in terms of system and procedural changes.

The emergence of Corporate Governance (CG) in Malta traces back to 2001, when the Working Group set up by the Malta Stock Exchange was asked to give advice on matters relating to CG. One of the main recommendations was to establish a code of CG practices in order to enrich the quality as well as the transparency of corporate management. In response, the MFSA drafted the 'Code of Good Corporate Governance' and this has since then formed part of the Listing Rules (2018).

2.2 Level of Women and Men Remunerations in Research

Apart from the share of women in employment and women with managerial positions in sciences, the problem of the gender pay gap and the so-called “glass ceilings” is also very often studied. The different researchers dealing with the gender pay gap are trying to identify the causes that influence the gender pay gap and identify recommendations to reduce it.

Research carried out in this area shows that pay differences can result from behaviors related to personal approach to competition and risk-taking (Booth, 2009; Migheli, 2015). Researchers point out, that financial incentives are more likely to make men work harder and signal their skills, while women tend to perform the assigned task as efficiently as they can, seemingly independently of the incentive scheme. This encourages the employer to get maximum commitment from women even without incentives in the form of rewards (Migheli, 2015; Thalassinou *et al.*, 2011). This attitude may be related to certain personality traits. Research conducted by Risse *et al.* (2018) show that men present higher level of personality traits that indicate stronger sense of confidence in their capabilities and a stronger focus on their own development agenda, as well as they have more hope for success, they also feel less fear of failure and are less agreeable. As the researchers point out, these traits have a positive link with earnings.

Women, in turn, have a higher level of diligence and this is actually the only feature that is positively related to compensation (Risse *et al.*, 2018). Women tend to focus more on demonstrating proficiency in their current professional role than to undertake other, more difficult roles, that usually allow them to achieve higher wages.

Another factor influencing the gender pay gap is the composition of the management. It turns out, that more diversity in corporate management is beneficial

for decreasing the gender pay gap (Ahamed *et al.*, 2019; Mostak, 2019; Rabovsky and Lee, 2018; Carter *et al.*, 2017; Hedija, 2017). Similar opinion is presented by Stojmenovska (2018), who, according to the research carried out, confirms that an increase in the percentage of female managers in the workplace is associated with decreasing the gender pay gap. This research is a guideline for decision-makers, who can tackle wage differences by making efforts to make management more diverse.

Gender pay gap is present also among senior management. After conducting a research (Hutchinson *et al.*, 2017), it turned out, that women with higher managerial positions receive on average 22.58% lower basic remuneration than men. The same applies to remuneration based on performance. According to this criterion, women receive on average 16.47% less cash bonus compared to men.

In the literature on the subject, it is also pointed out that gender pay gap varies from one economic sector to another and from one country to another (Hedija, 2017). The average unjustified gender pay gap is the lowest in public administration and defense and the highest in construction and agriculture, forestry and fishery. Moreover, it can be noted that in the public sector the gender pay gap is lower than in the private sector (Hedija, 2017; Jones *et al.*, 2018).

There are interesting research and insights concerning academic remunerations. As it turns out, also here there are unjustified gender pay gaps. In the case of academics, the pay gap concerns, in particular, the efficiency of research. Research carried out by Wiedman (2019) shows that women seem to receive much less remuneration for co-authorship articles they publish with men than for those they publish with other women. The results indicate that women are paid less for work, and this is due to the fact that women's productivity in research is on average lower than men's. This is due to the fact that women are much more involved in their work activities than men, who can focus on research during this time (Guarino and Borden, 2017). In addition, social pressure on childcare, home management and elderly care (Samble 2008; Bozzon *et al.*, 2015) does not allow women to engage in academic work as men do.

Punishing women with lower wages exacerbates the challenges women face in the academic world. Lower remunerations for women restrict their ability to purchase services that would give them time to work, especially for research (Wiedman, 2019). Women often underestimate their contribution (Haynes and Heiman, 2013), less often cite their own work than men (King *et al.*, 2017) and are generally reserved in promoting themselves.

In order to eliminate the gender pay gap, employers should and can take the leading role. Among the most frequent recommendations in this area are the following:

- The remuneration for work in a given position should be determined before recruitment, on the basis of the value of the work for the organization.

- Increasing diversity in management and senior positions is beneficial for reducing the gender pay gap.
- Collective labor agreements reduce the gender pay gap.

3. Research Methodology

Two research themes were presented during the research. The first one concerns determination of the share and role of women in the academic sector in Poland in 2008-2018. As part of this research theme, answers are sought to the following research problems:

1. How did the number of professional promotions in Polish science in 2008-2018 change, including the number of women promoted?
2. What was the share of women in the total number of academic promotions, including doctorate, post-doctorate and professor's degrees in 2008-2018?

Answers to the above questions were obtained with the use of Statistics Poland from 2008-2019 and using indicators of dynamics and structure of phenomena.

The second research theme concerned research institutes in Poland and institutes that conduct research and academic works. 20 out of 117 institutes functioning in Poland took part in the research. In 2018, the authors of the article carried out multidimensional surveys on incentive systems. One of the research aspect was evaluation of financial and non-financial incentives from the perspective of women and men. Its results are presented herein. Among 215 surveyed employees of the analyzed institutes there were 103 women and 112 men. Their task was to evaluate two dimensions of incentives. The first one concerns their presence in the analyzed institute and their use in relation to the total staff employed (Use of Incentives). The second referred to the experience of a given incentive by surveyed employees (Personal Experience of an Incentive). The list of assessed incentives with their division into financial and non-financial is presented in Table 1.

Table 1. *List of financial and non-financial incentives assessed by employees of analyzed institutes*

FINANCIAL INCENTIVES	
1.	basic salary, as a basic instrument of motivation (without an extensive system of allowances and bonuses),
2.	financial allowances (e.g. for overtime work, work in a foreign language, work in harmful conditions),
3.	discretionary bonuses (based on immediate superior's decision),
4.	bonuses based on performance results (obtained research funds, number of publications etc.),
5.	financial rewards linked to performance,
6.	social services: holidays, trips, festivals, cultural events etc.,

7. paying for additional (other than compulsory and social) personal insurance,
8. paying for additional (other than compulsory contributions) pension schemes,
9. paying (in addition to compulsory health contributions) for health care,
10. company car,
11. company mobile phone,
12. financing academic publications (fees, translations, technical editing etc.),
13. financing participation in domestic conferences / seminars,
14. financing participation in conferences / seminars abroad,
15. possibility of further vocational training (participation in post-graduate studies, courses, trainings, conferences),
16. possibility of academic development (obtaining the next academic degree / title; participation in academic events; possibility of publishing academic papers),
17. possibility of obtaining managerial position.

NON-FINANCIAL INCENTIVES

1. praise / recognition of the immediate superior,
2. flexible working hours,
3. employment security,
4. having an academic mentor involved in employee development,
5. the possibility of reconciling professional and personal life,
6. intra-organizational communication (information flow, meetings, intranet etc.),
7. good atmosphere at work (positive informal relations),
8. work for highly prestigious institution,
9. formal support from institute administration,
10. possibility of work in highly innovative conditions (modern equipment, access to new technologies),
11. respecting intellectual property rights / copyrights,
12. initiation of external relations by the institute authorities (contacts with businesses; cooperation between research and academic institutions; internationalization of activities etc.),
13. the possibility of freedom of opinion / views,
14. new challenges,
15. help and support from superiors,
16. no discrimination,
17. transparent rules for employee evaluation,
18. relations with the superior based on partnership,
19. formal, codified incentive system (taking into account most of the above mentioned incentives and the rules of their application).

Source: Own work.

Results in the group of men (X) and women (Y) were compared using Chi-squared test (χ^2), posing the following alternative hypotheses at significance level of $p=0,05$:

H₀: The variables X and Y are independent.

H₁: The variables X and Y are not independent.

If the *p*-value for a particular incentive was lower than the critical *p*-value mentioned above, differences in the use and experience of particular incentives by women and men were considered significant. Such approach allowed answering the three research problems.

1. Are there differences between men and women's recognition of incentives in the analyzed institutes?
2. Are there differences between men and women's experience of incentives in the analyzed institutes?
3. In light of potential differences in the use and experience of incentives, can women employed in research institutes feel discriminated against in relation to men working there?

In the further part of the article, the results of the research in both research themes characterized above are presented.

4. Findings and Discussion

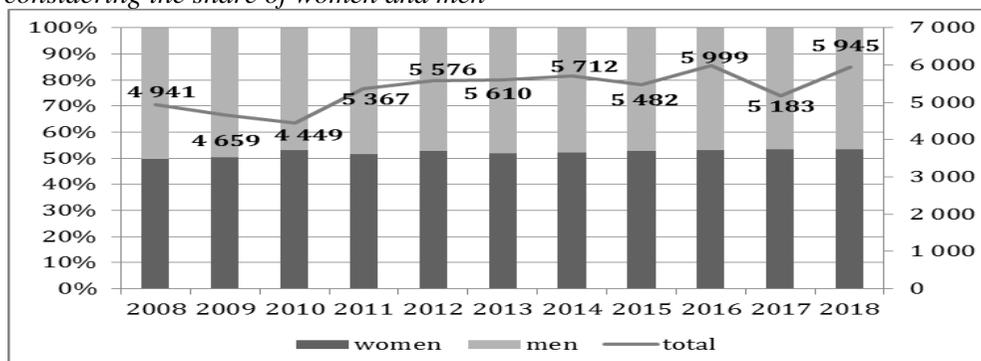
4.1 Level of Women and Men Remunerations in Research

In Poland, an academic career begins with doctoral studies, where one can obtain a doctoral degree in a given discipline and academic field. The next stage of professional development is to obtain the post-doctoral degree based on the original academic achievements (original research monograph or own innovative construction or technical solution) and significant research, didactic and organizational achievements. The development of such achievements makes it possible to obtain the title of professor conferred by the President of the Republic of Poland, which is the highest possible professional advancement. All the above stages of academic career development require complex professional advancement procedures and multi-faceted reviewer and collegial body evaluation at the level of the academic unit and central administration.

It is also worth mentioning that, until 2019, obtaining the post-doctoral degree was a condition for further employment in the academic sector. Until September 2013 (the first major legislative change), persons with doctoral degree had to obtain a post-doctoral degree within 15 years from obtaining a doctoral degree. From September 2013 to September 2019 this period was 7 years. Currently, obtaining post-doctoral degree is no longer mandatory, however, the position of academic staff without this degree is by law significantly weaker than that of post-doctorates and professors (restrictions in reviewers work, promoting doctors and taking managerial positions). The analysis of professional development of women and men was started from the lowest academic degree, which is a doctoral degree. Figure 1 presents the

number of doctoral degrees conferred in Poland in 2008-2018 in total and the structure of these nominations broken down into women and men.

Figure 1. Number of doctoral degrees conferred in Poland in 2008-2018 considering the share of women and men



Source: Own compilation based on data of the Statistics Poland.

According to Figure 1, the number of doctoral degrees since 2011 exceeded 5,000 a year. Since 2011, the share of women increased in the structure of conferred degrees in total, and until 2018 it slightly exceeded the share of men in the analyzed group of professional opportunities. It is also worth mentioning that in 2018 women were conferred a record number of doctoral degrees, which was 3,180. Such trend should certainly be considered as positive. It means that more and more young women start academic careers and have opportunity to write and defend doctoral dissertations.

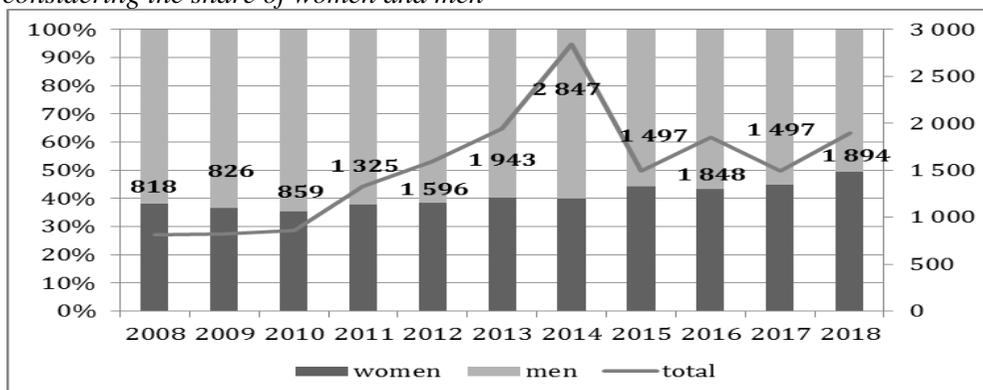
Nonetheless, in the case of post-doctoral degree, the above trend is getting weaker, which is presented in Figure 2. The post-doctoral degree in 2008-2018 was obtained on average by approximately 28% of doctors in total. Compared to 2008-2010, the number of these degrees systematically increased with time⁵. The share of women in the structure of conferred degrees was lower than in the case of doctoral degrees and throughout the analyzed period it did not exceed 50%, however, it increased with time, which indicates an improvement in the situation of gender equality in this group, as well as good and efficient women mobilization to further development.

Among the group of post-doctoral associates, on average approximately 37% of staff obtained a title of professor. The share of women in obtaining the title of professor was the lowest among the analyzed opportunities and it did not exceed 40%. However, compared to 2008, it increased by several percentage points, while the number of women conferred with the title of professor ultimately grew by over 63%,

⁵The record number of conferred degrees in 2014 results from the post-doctoral requirements implemented in 2013 and rapid increase of number of applications for the post-doctoral degree submitted that year.

which can be considered a significant change, if it was not for the still unbalanced shares of professional advancements in the analyzed group.

Figure 2. Number of post-doctoral degrees conferred in Poland in 2008-2018 considering the share of women and men



Source: Own compilation based on data of the Statistics Poland.

4.2 Incentive Opportunities from the Perspective of Women in the Light of Surveys

In the second research theme a reference was made to incentive instruments observed and experienced by women and men in the analyzed research institutes. This part of the article focuses on the differences identified in this respect, referring them to financial incentives and then to non-financial incentives.

Thus, in the case of financial incentives, the six incentives listed below were statistically significant:

- bonuses based on performance results,
- financial rewards linked to performance,
- social services: holidays, trips, festivals, cultural events etc.,
- financing academic publications (fees, translations, technical editing etc.),
- financing participation in domestic conferences/seminars,
- financing participation in conferences/seminars abroad.

The p values for Chi-squared test (χ^2) for the above incentives when comparing women and men are presented in Table 2. Table 2 shows that, in general, the differences between men and women in the recognition and experience of financial incentives concerned two groups of incentive tools. The first one referred to performance-related stimuli. In this case, women were less likely than men to recognize bonuses and receive cash rewards depending on their performance. The second referred directly to three incentives that are very important in the work of a researcher and scholar, which are financing participation in national and

international conferences and financing academic publications. Additionally, women less frequently recognized and used social services such as: holidays, trips, festivals, cultural events etc.

Table 2. *p* values for Chi-squared test (χ^2), broken down by gender – recognized and experienced financial incentives

No.	Incentive	Recognized	Experienced
1.	bonuses based on performance results (obtained research funds, number of publications etc.)	0.170	0.032
2.	financial rewards linked to performance	0.029	0.046
3.	social services: holidays, trips, festivals, cultural events etc.	0.023	0.030
4.	financing academic publications (fees, translations, technical editing etc.)	0.056	0.042
5.	financing participation in domestic conferences / seminars	0.022	0.716
6.	financing participation in conferences / seminars abroad	0.004	0.525

Note: Statistically significant differences, $p < 0.05$

Source: Own elaboration based on the results of questionnaire surveys.

Less frequent use of bonuses and performance-related rewards for women may result from two different circumstances. The first is undoubtedly linked to the organizational practices cited in the introduction, relating to the assignment of less responsible tasks to women and their own attitude to making additional efforts and, above all, to the underestimation of the need to promote their own achievements in the work environment. Lack of self-confidence in women can, therefore, result in both giving up on ambitious, above-average tasks and underestimating the results of one's own work and not claiming due bonuses and rewards. Nonetheless, it is worth adding, that less frequent bonuses and rewards for women may be a result of lack of remarkable achievements and worse work results due to the burden of additional family responsibilities, as was also mentioned in the introduction. This issue would require further investigation and comparison of academic and research achievement levels in both surveyed groups.

Very significant differences observed during the research were the discrepancies concerning possibilities of financing academic undertakings by women and men. These are the factors on which the final results of work in research institutes depend. Less frequent use of financing of publications may limit women's development and negatively influence their advancement opportunities. Thus, it can be the direct reason for smaller number of professional advancements in women than men, which was described in the previous research theme. The situation is similar in the case of recognition of financing participation in domestic and international conferences. The findings may indicate, that women are not informed about the opportunities

available in this area, which limits their use and restricts the recipients of this funding to more privileged men.

In the case of non-financial incentives, the statistically significant differences concerned four incentives listed in Table 3, together with their respective p values for Chi-squared test (χ^2).

Flexible working hours, formal support from institute administration, as well as help and support from superiors are the factors that directly shape the substantive and formal working conditions, and thus also influence the final academic results. The conducted research shows that women employed in the institutes experience these incentives less frequently than men who are employed there. If this was and is actually the case, and this is not only a subjective perspective of women, which is supported by the existence of characteristic differences in several units, then this is an evidence of serious discrimination against women. In the work of a researcher and scientist, flexible working hours are one of key success factors that influence not only the efficiency and effectiveness of the performed tasks, but also the work and life balance. Creating more favorable conditions for men in this respect generates frustration and dissatisfaction with both work and personal life.

Table 3. *p* values for Chi-squared test (χ^2), broken down by gender – recognized and experienced non-financial incentives

No.	Incentive	Recognized	Experienced
1.	flexible working hours	0.410	0.044
2.	formal support from institute administration	0.491	0.020
3.	possibility of work in highly innovative conditions (modern equipment, access to new technologies)	0.005	0.536
4.	help and support from superiors	0.670	0.049

Note: Statistically significant differences, $p < 0.05$.

Source: Own elaboration based on the results of questionnaire surveys.

A very important factor in the work of a researcher is also the formal support from the institute administration. The existence of this support allows full focus on academic and research work and relieves the burden of organizational responsibilities. It also allows efficient project management, concluding contracts or settling payments. The lack of such support, therefore, reduces the time spent on research work, on the one hand, and, on the other hand, can effectively discourage actions going beyond the obligations necessary to maintain employment. In the light of the above considerations, less frequent experience of such support by women can be a significant barrier to their professional development and a demotivating factor. It is also worth noting, that most often women are also employed in the administration of the institutes, and yet the cooperation of both sides is not

supportive and very often characterized by hostility or even envy – as pointed out in the introduction – which additionally worsens the situation of women at work.

The surveyed women were also less likely to experience support and assistance from their superiors, which, in turn, may result from greater male solidarity and their dominance in managerial positions in academic and research units. Both of these circumstances can have a discouraging effect and effectively block the professional development of women in the academic world.

In conclusion, it is also worth noting that women also have been less aware of the fact that working at the institute gives them the opportunity to work in highly innovative conditions (modern equipment, access to new technologies). Thus, they were more critical than men in assessing the working environment. Nonetheless, it should be pointed out, that during the research both groups reported several reservations as to the infrastructural development conditions in the analyzed research institutes, which largely results from underfunding of these institutions and their significant dependence on state budget funding.

5. Conclusion

Women in the Polish science sector benefited to a comparable extent from the possibility of obtaining a doctoral degree. Their share in the total advancement structure was systematically decreasing as the academic hierarchy grew. On one hand, this supports the previous findings of researchers (Shepherd, 2017; Carr *et al.*, 2019; Burgess *et al.*, 2012) on gender inequality in academic career development of women and men, resulting mainly from barriers encountered by women, including organizational culture and deeply rooted value systems, as well as social and cultural standards of these units, which hinder the diversity of leadership in the area. On the other hand, this can also result from objective circumstances related to women's resignation from academic life due to starting a family and different prioritization of life goals, which was also signaled by the authors of research in this area, described in the introduction.

Nevertheless, as in Europe, there are far fewer women in full professorships than men, which, in addition to the gender imbalance, results in a clear domination of men among the most privileged workers and can be a source of abuse of the professional position in relation to women. In such circumstances, it will be difficult to increase diversity in senior management, which, according to the research indicated in the introduction, influences a decrease in gender pay gap.

Similarly to other related research (Wiedman, 2019; Hutchinson *et al.*, 2017), the results of this research indicate that women recognized and experienced financial incentives (bonuses and cash rewards depending on the results of their work, possibilities of financing participation in conferences and academic publications) less frequently than men, which makes it possible to conclude that the standards of

remuneration of women and men in the examined institutes are different. Rewards and bonuses for work effects are more often given to men than women. Men also have better opportunities to finance development, which is confirmed by previous research results in the science sector. Thus, it can be assumed that better opportunities of financing development contribute to obtaining better research work results, and thus rewards and bonuses for effects of work. Barriers in research financing encountered by women are frustrating for them, on the one hand, and, on the other hand, they limit the opportunities for development and gaining further degrees.

What is more, the findings indicate that women were less able than men to take advantage of flexible working hours. As shown by previous research (Chung and Van der Horst, 2018; Fuller and Hirsh, 2018), flexible work can increase women's satisfaction from work and life balance, enabling them to maintain both, among others thanks to the possibility of work in flexible hours after childbirth or possibility to stay in human-capital-intensive jobs during high family demand period. In this sense, as pointed out by Chung and van der Lippe (2018), flexible work can become a useful tool to further enhance gender equality in our societies. Moreover, according to the research, women experienced a lack of sufficient formal support from the administration of the unit, as well as insufficient help and support from superiors in research units, which may additionally limit and discourage them from professional development in the world of science and cause dissatisfaction with both work and personal life.

In the light of the presented circumstances, it can be noticed that obtaining subsequent academic degrees by women in research institutes is more difficult and requires more determination than in the case of men.

Undoubtedly, the identified circumstances point to the worse position of women in the world of science, because gender inequality is clearly noticeable. And yet – as it was underlined in the introduction - creating equal opportunities contributes to improving the quality of life, which is consistent with the idea of sustainable development (Bozzon *et al.*, 2015; Guarino *et al.*, 2017; Haynes *et al.*, 2013; Samble, 2008).

The development of women in Polish and European science is certainly not sustainable, which not only demotivates women to take on scientific challenges and acquire further scientific degrees, but in the light of research it could also generate economic and social problems. It is surprising and worrying that European society, considers itself to be cavillation and economically very well developed. By definition, in such societies, inequality and unsustainable development should not occur, especially in an elite scientific community.

With regard to the research problems posed by the first research theme, the following should be noted:

- between 2008-2018, the number of women obtaining doctorate, post-doctorate and professor's degrees has been steadily increasing in Poland,
- the share of women in particular professional advancements also increased in the analyzed period,
- however, the place and role of women in obtaining higher degrees in academic career (post-doctoral degree and professor's title) was still significantly lower than the place and role of men,
- in particular, in the case of post-doctoral degree and professor's title.

Within the second research theme, some incentive conditions can be indicated, which certainly contribute to formation of the above characterized trends. The surveys show that women employed in the analyzed research institutes less frequently:

- recognize and experience performance-dependent incentives,
- have the possibility to benefit from financing academic publications,
- recognize opportunities for financing participation in domestic and international conferences,
- can count on formal support from the institute administration, as well as the support and assistance of their superiors,
- have the possibility to take advantage of flexible working hours.

Sustainable development will not be possible without gender equality and the recognition of women's work. It will also not be possible to achieve the full benefits of this development that serve present and future generations. Therefore, the elimination of diagnosed symptoms of discrimination may contribute to increasing the innovation of scientific research and, as a result, to improving the quality of life in modern world.

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