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Saglamer G.

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Women academics in science and technology with special reference to Turkey

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Abstract. Women face great difficulties in developing professional careers in equal opportunities to those of men in science-engineering-technology (SET), especially regarding their proportion and representation at the higher levels of hierarchical ladder. This multi-dimensional problem has been addressed by many researchers and remarkable outcomes have been disseminated by these researchers and research teams. In this presentation some of these outcomes and facts about women representation in SET will be outlined and discussed. Horizontal and vertical segregation for women academics is also widely analysed according to some important research projects' results such as ETAN. Comparative analysis on the representation of women in academia between OECD countries and some EU countries has been carried out under the umbrella of UNICAFE project which has been funded under the FP6 by EC. It has been demonstrated that Turkey is one of the leading countries among OECD and especially in EU countries in terms of women representation in academia in SET. Last section of the presentations has been devoted to the case study on Istanbul Technical University.

Keywords. Women Academics – Women representation in SET – European Commission – Education – Gender mainstreaming – Employment – European Union – Turkey.

Les femmes dans les milieux académiques des Sciences et de la Technologie, en particulier en Turquie

Résumé. Les femmes se trouvent confrontées à de grandes difficultés, par rapport aux hommes, dans les carrières professionnelles en Science, Ingénierie et Technologie (SET), surtout en ce qui concerne leur proportion et représentation aux niveaux les plus élevés de l'échelle hiérarchique. Ce problème multidimensionnel a été abordé par de nombreux chercheurs et des résultats importants ont été disséminés par différentes équipes de recherche. Dans ce travail, nous allons passer en revue quelques-unes de ces données sur la représentation des femmes dans la SET. La ségrégation horizontale et verticale des femmes académiciennes sera aussi analysée compte tenu des résultats de certains projets de recherche tels l'ETAN. Une analyse comparative de la représentation des femmes en milieu académique entre les pays de l'OCDE et certains pays de l'UE a été réalisée dans le cadre du projet UNICAFE, financé par la Commission Européenne au sein du PC6. Il a ainsi été démontré que la Turquie occupe l'une des premières places parmi les pays de l'OCDE, notamment ceux de l'UE, en termes de représentation dans la SET. En dernier lieu, sera présentée une étude de cas sur l'Université Technique d'Istanbul.

Mots-clés. Femmes Académiciennes – Représentation des femmes dans la SET – Commission Européenne – Education - Intégration du genre – Emploi – Union Européenne - Turquie

I – UNESCO

UNESCO's "Millennium Development Goals" are targeting to improve the living conditions all over the world and it addresses to 7 areas;

- eradicate extreme poverty and hunger;
- achieve universal primary education;
- promote gender equality and empower women;

- reduce child mortality;
- improve maternal health, combat HIV/AIDS, malaria and other diseases;
- ensure environmental sustainability.

II – World-wide acquisition of women's rights

The term Women's Rights encompasses all those rights that women achieve if they are to have equal opportunities with men in all segments of society.

This concept also includes those special statutes passed to protect the woman within the family, as a mother, and in the work place.

Concepts of gender equality and universal human rights have been defined by such fundamental documents as

- the United Nations Agreement of 1945;
- the Universal Declaration of Human Rights of 1948;
- the European Human Rights Agreement of 1950;
- the European Social Rights Agreement of 1961.

The right of women to vote in general elections was won by the women of

- Australia in 1902;
- Finland in 1906; and
- Norway in 1913.

The American suffragette movement was successful in getting the 19th Amendment ratified to their national constitution in 1920.

Among those 28 countries that granted women rights before the outbreak of the Second World War were;

- Soviet Union in 1917;
- Great Britain in 1918;
- United States in 1920;
- Turkey in 1934;
- France joined these countries in 1944, and followed by Italy, Romania, Yugoslavia and China;
- Women of Switzerland gained the right to vote in federal and most canton elections in 1971.

III – The acquisition of women's rights in Turkey

- Women first used their right to vote in parliamentary elections in the general election held on February 8, 1935. Eighteen women were elected to the parliament in this election;
- Fewer and fewer women were elected to the parliament in succeeding elections and women were never really able to assume a truly viable role in the political life of Turkey;
- Today, there are only 8% women MPs in the parliament out of 550.

IV – Women in higher education

Data for academic staff by gender show patterns of both vertical and horizontal segregation. Women first began to enter colleges and universities as both students and faculty around one hundred and fifty years ago. Not surprisingly, women have been struggling for equality within academia since at least the middle of the nineteenth century (The Association for Women Faculty, 2005) .

V – Women access to higher education

- On higher levels however, women are still heavily underrepresented and many obstacles remain for female students and researchers pursuing an academic career (Björklund and Olsson, 2004);
- The increase in women's enrolment in higher education in the 20th century has been characterized as a “dramatic progress” (Stolte-Heiskanen, 1991). However, women underrepresentation among academics and gender inequalities in academia appear to be persistent and a global phenomena.

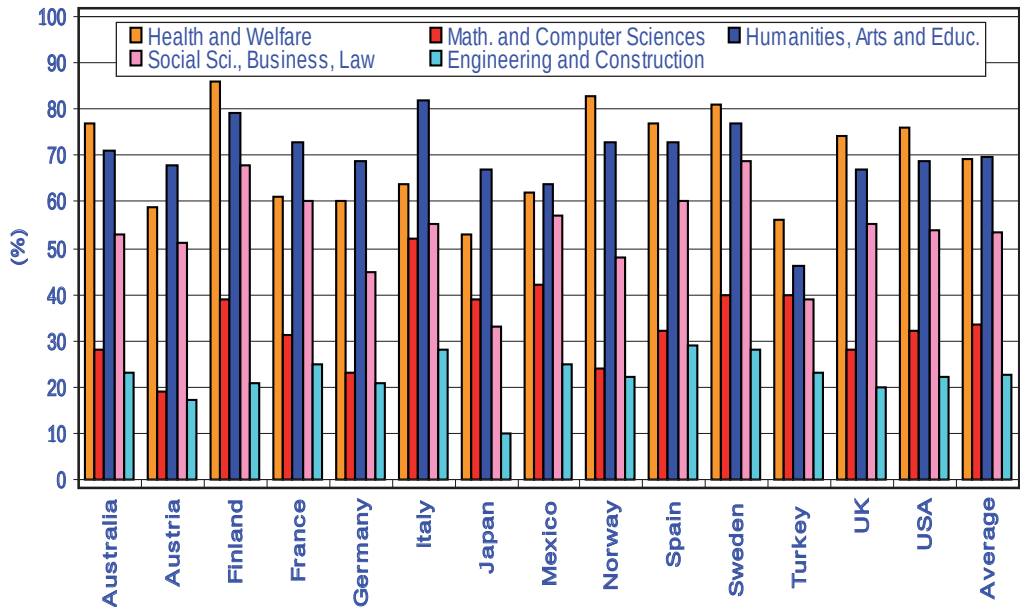


Figure 1. University degrees awarded to females in all fields(2002) OECD,2004

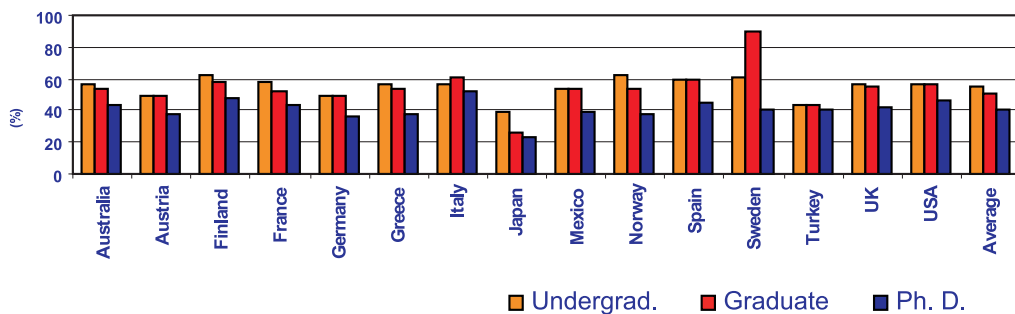


Figure 2. University degrees awarded to females in all fields (2002)

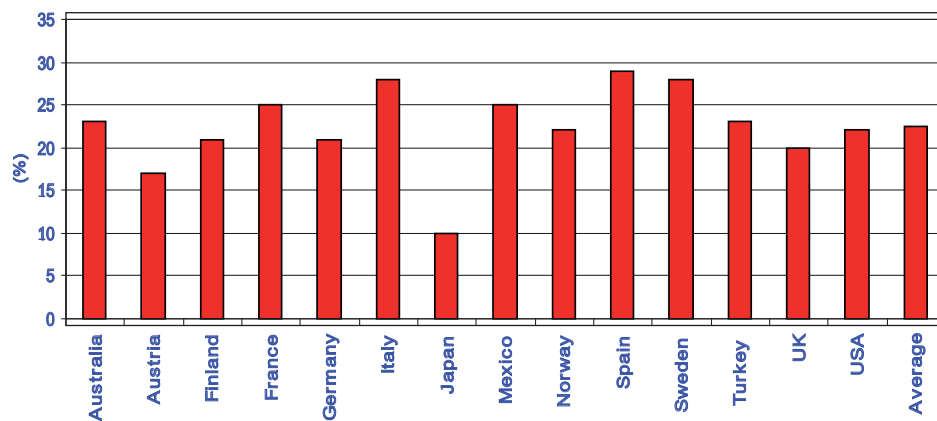


Figure 3. Female students ratio in HE (Engineering) - OECD 2002

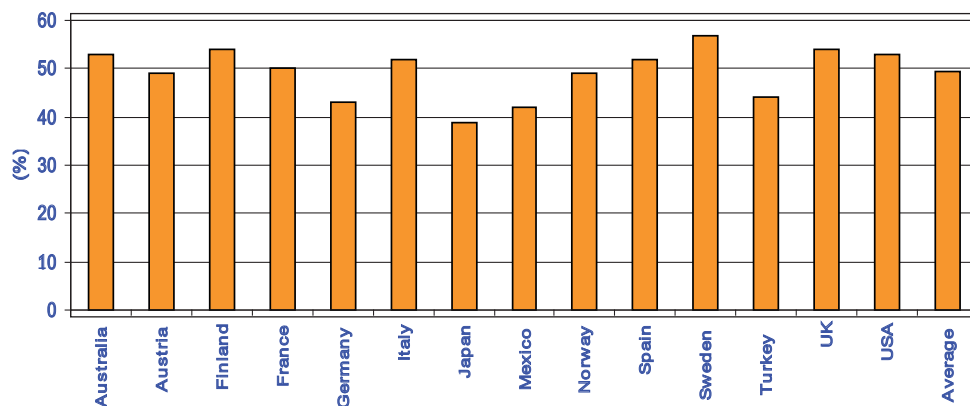


Figure 4. Female students ratio in HE (Life Sci. Phy.Sci.) - OECD 2002

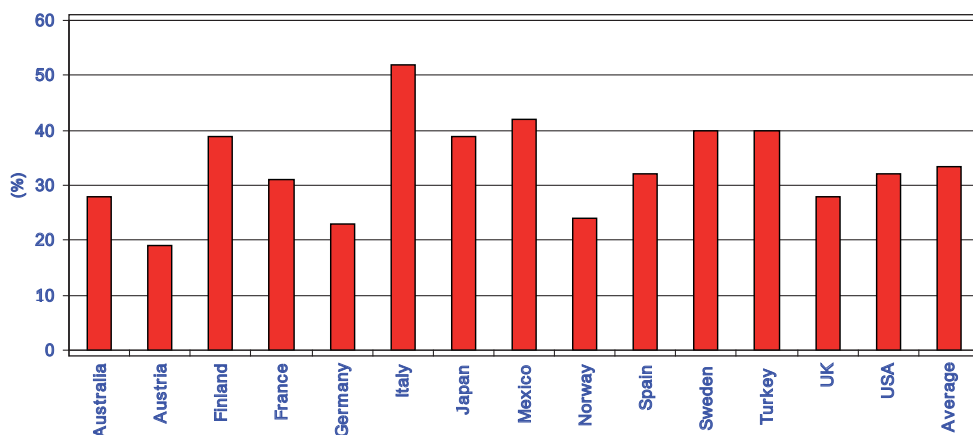


Figure 5. Female students ratio in HE (Math, Comp Sci) - OECD 2002

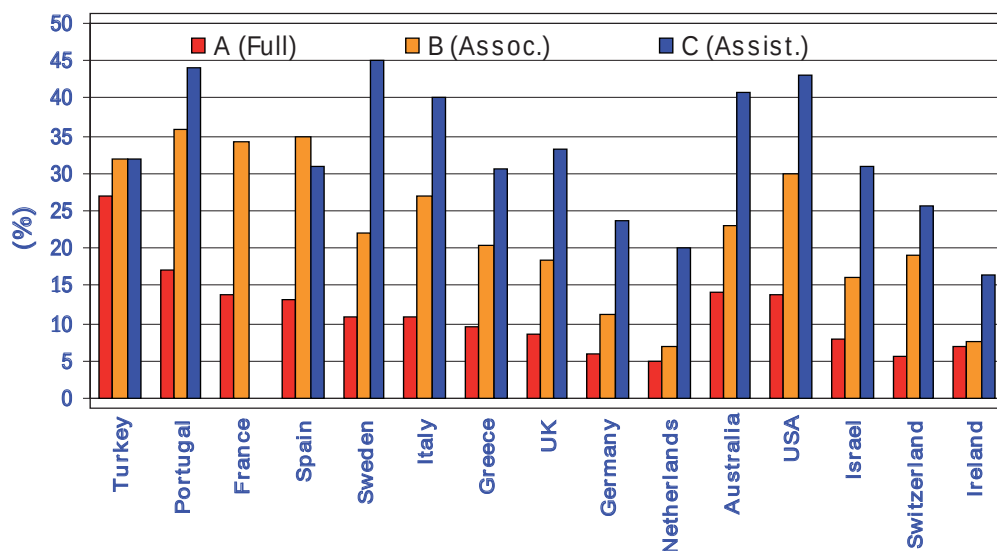


Figure 6. Women professors in all disciplines in the world (OECD, 2004)

While there are some statistics on student population, there are no coherent, publicly available statistics on the employment of scientists. Nevertheless, such statistics as do exist show the following (Rees 2001):

- Women now constitute about 50% of first degree students in many countries of the world;
- The percentage of full professors who are women is very low worldwide, for the most part, below 15%;
- There are considerable variations in the proportion of women students between disciplines.

VI – Metaphors

Some of the metaphors referring to women's predicament in academia are discussed by Husu (2001). Metaphors linked to universities such as :

“Ivory Tower” brought the new metaphor of “*Storming the Tower*”

Metaphors related to

- “Glass Ceiling” which defines limitation on academic promotions for women or;
- “Chilly Climate” which depicts the fuzzy academic processes for women reflects inconveniences in the academic environment;
- According to some members of the academic world, women are “*The Other Academics*”;
- Women academics are “outsiders in the sacred grove” or they are on “*The Outer Circle*” of the scientific community;
- “The Continuum of Otherness”, “Otherness” imply exclusion and marginalization of women in academia. In order to solve these problems, a bottom up model has been implemented in many countries to recruit more female students at undergraduate level;
- It is expected that this “Pipeline” model will create more women academics in the long run at upper levels. Unfortunately, vertical segregation do not let women academics going higher position as it is expected yet.

VII – Women in academia

There is a widely discussed picture of the academic system. Sometimes, it can be seen within a context where personal contacts and informal networks are essential to advance.

As an American professor put it: “*Getting a position on the faculty of an academic institution is much like getting membership in a country club – you get in if those that already are members want you in*” (Björklund and Olsson 2004).

VIII – Women access to science engineering and technology

Horizontal segregation is an important problem for women in higher education.

There is a widely shared image by the society that women are expected to study and work as professionals in certain areas which match with their roles in their families as mothers. This traditional pattern has a great impact on women contribution to science, engineering and technology.

Bebbington (Bebbington 2003) carried out a study on women in science, engineering and technology and draw the attention to different patterns of gender segregation in different disciplines.

She stated that “In considering disciplinary variations across European member states, a report by ETAN on women and science shows a trend replicated across Europe of a generally

- higher representation of women in the social and biological sciences; and
- a low presence in the natural sciences and engineering, even though the percentages may vary somewhat between countries.”

IX – ETAN report

European Technology Assessment Network (ETAN) has formed a group named “The ETAN Group on Women and Science”. The ETAN report focused on three areas (Rees, 2001);

- The underrepresentation of women in science, engineering and technology;
- The lack of attention paid to the gender dimension in science;
- The lack of gender balance in decision-making about scientific policy.

For gender equality three models are proposed:

- Equal Treatment; Equal treatment as an approach to gender equality is clearly rooted in the liberal feminist tradition. However, equal treatment does not lead to equal outcome;
- Positive Action; A series of positive action measures were co-funded to address the disadvantages experienced by women. These, measures principally training projects designed to improve women's skills and enhance their employability (Brine, 1999);
- Mainstreaming; is a process of conducting a gender-impact assessment of all proposed legislation and policies. It means a wholesale redesign of systems and structures (Rees,1998).

X – Women in SET in EU

- At European level the starting point was a common preoccupation about the fact that the number of women involved in Engineering in Europe is increasing very slow-too slow!
- The intention was to understand why it is so, and to try to identify and analyse efficient solutions (Beraud, 2003).

This project was initialised in 2001 and seven technology universities took part in this project. General conclusions and recommendations from this study has been summarized below.

Since interdisciplinary degrees appear to be more attractive to female students than single and or traditional and or classical degrees, it is recommended to (Beraud, 2003):

- Set up interdisciplinary degrees to increase the proportion of women taking up engineering;
- Include at least 25% of socio-economic contents;
- Interdisciplinary subjects should be introduced in the curriculum as early as possible;
- Ensure that information of interdisciplinary degrees and career opportunities reached school pupils at a key stages in order to make an informed career choice;
- Use professional services to prepare this information using appropriate language, images, context and examples, that school girls can relate to;
- Take measures to improve the image of science, engineering and technology (SET) among school girls;
- Promote multidisciplinary learning as a step to life-long learning.

It is expected that these changes will not only create impact on girls' decisions to go into engineering but also on boys' decisions as well where there is a serious problem exist in technology universities to attract good quality of students in EU.

XI – Female representation in science and technology

- An important fact has been outlined on the Male “Overrepresentation Factoring” in computer science (Kiderra, 2005);
- According to the research which has been conducted at the University of California, Turkey has the minimum;
- “Male Overrepresentation Factor” (1.79) among 21 countries (Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Korea, Netherlands, New Zealand, Norway, Slovakia, Spain, Switzerland, Turkey, United Kingdom, United States);
- According to OECD 2002 statistical data, the distribution of female representation in different fields favors Turkey’s situation;
- For mathematics and computer sciences female representation is over 40% in Turkey;
- whereas the average ratio is 33%. The countries which have female representation in mathematics and computer science higher than Turkey are;
 - Italy %52
 - Mexico %42
- The female representation within engineering students in Turkey is same as the average value, and higher than UK, Japan, Germany, Finland, and Austria.

XII – Women in education (ottoman period)

- Until the Law Regarding Public Education was passed 1869, there had been no official application for the formal education of women during the Ottoman Empire;
- During the Constitutional period in the early years of the twentieth century, an institution of higher education called İnas Darülfünun was established in 1915;
- The year of 1917 marked the first graduates of İnas Darülfünun, but in 1920 the school was attached to the institution later known as Istanbul University.

XIII – Women in education (republican period)

During the years of 1918-1923, which marked the transitional period from that of the Empire to Republic, Atatürk evaluated, one-by-one, all the issues that the new society would be forced to deal with.

- In 1924, primary school education became compulsory for all children;
- In 1924-1925 intermediate school opportunities were broadened for girls, but coeducation at lower levels had still not been achieved;
- In 1926, a decision was taken to establish a truly coeducational system.

XIV – Women professors worldwide

In terms of women professors in the world (OECD,2004), Turkey has the highest ratio in full professorships (27%) . Between 1993 and 2005 there is a noticeable increase in women teaching staff in Turkish universities.

XV – Women academics in Turkey

- Although, Women in Higher Education has no more than 100 years history in Turkey, at the moment 41% of students in higher education are female and 38% of all academic personnel in the universities are women;
- This is an impressive figure with respect to developed countries but it is even more impressive if we go into the details of the figures;
- 27% of Full Professors, 32% of Associate Professors, 31% of Assistant Professors are female in Turkey;
- Turkey is setting a unique example with a patriarchal Islamic cultural heritage and conspicuously high differences in literacy rates between men and women;
- Since 1990's, there has been significant increase in the number of female students in higher education and in academia in Turkey;
- The number of women academics vary in different disciplines such as in medical sciences and literature women have a share over 40% while it is 30% in engineering and architecture;
- We may talk about vertical segregation in Turkey. On the hand when we compare the ratio of the female students in science, engineering and technology we observe that Turkish universities have higher ratios of female students in SET programs;
- The most important finding of this study is that the close proportion of women academics at upper levels;
- Women doing Master or Ph.D as research assistant in the universities have 44% of the total research staff. Not all of them stay in the universities for further positions but still 31% of assistant professors and 32% associate professors, 27% full professors are female;
- It is clear that vertical segregation does not exist in Turkish universities when women with Ph.D decide to continue their research work in universities. This is an interesting fact that needs further research to find out the factors and mechanisms which creates these results in Turkish Academia;
- The conventional interpretation of the rise in women's education and professionalisation in Turkey often attributes it to secular ideology and Westernizing reforms of Kemal Atatürk;
- A series of reforms enacted by the state of the Turkish Republic following its founding by Atatürk in 1923, were aimed at giving women equal status with men. Having replaced the Islamic religious code (Shari'a) with secular code, republican reforms aimed to improve the social and political conditions of women in Turkish society by outlawing polygamy, establishing universal suffrage and guaranteeing equality of the sexes before the law;
- As a consequence of this policy, the state ideology and the elite subculture, strongly encouraged women's higher education and career-orientedness as part of their modernization mission;
- It is also claimed that the result of this sudden and unrestricted push to recruit women into the professions prevented the sex-typing of occupations in Turkish society (Kağıtçıbaşı, 1989).

Table 1. Number of female and male academic staff in different ranks in Turkey between 2003- 2007 (UNICAFE,2008.)

ACADEMIC STAFF										
Year	Total	Prof.	Assoc. Prof.	Asst. Prof.	Instructor	Language Inst.	Specialist	Research Assistant	Translator	Ed.& Tng Planner
2003-2004	78804	10864	5298	13555	12779	5537	2305	28430	12	39
F	29858	2785	1739	4094	4878	3123	981	12244	8	6
M	48946	8079	3559	9461	7901	2414	1324	16186	4	33
Female %	37.89	25.64	32.82	30.20	38.17	56.40	42.56	43.07	66.67	15.38
2004-2005	82096	11381	5456	14461	14064	5964	2444	28271	16	39
F	31434	3020	1728	4504	5262	3382	1013	12512	7	6
M	50662	8361	3728	9957	8802	2582	1431	15759	9	33
Female %	38.29	26.54	31.67	31.15	37.41	56.71	41.45	44.26	43.75	15.38
2005-2006	84785	11841	5769	15129	14353	6302	2595	28751	21	24
F	32858	3149	1813	4861	5396	3630	1075	12917	11	6
M	51927	8692	3956	10268	8957	2672	1520	15834	10	18
Female %	38.75	26.59	31.43	32.13	37.59	57.60	41.43	44.93	52.38	25.00
2006-2007	89329	12773	6150	15844	14628	6472	2901	30497	20	44
F	35087	3464	1906	5252	5536	3750	1196	13958	12	13
M	54242	9309	4244	10592	9092	2722	1705	16539	8	31
Female %	39.28	27.12	30.99	33.15	37.85	57.94	41.23	45.77	60.00	29.55

Table 2. Number of teaching staff by gender and rank in Turkey in 2004-2005 (UNICAFE,2008)

Title	Female	Male	Total	% Female
Professor	3020	8361	11381	27
Assoc. Professor	1728	3728	5456	32
Asst. Professor	4504	9957	14461	31
Instructor	5262	8802	14064	37
Language Instructor	3382	2582	5964	57
Specialist	1013	1431	2444	41
Research Assistant	12512	15759	28271	44
Total	31434	50662	82096	38

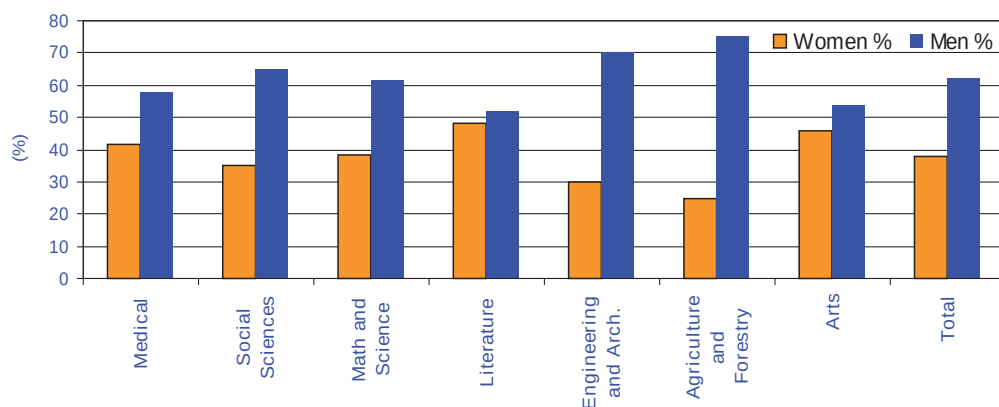


Figure 7. Distribution of teaching staff according to professions in Turkey (2004-2005)

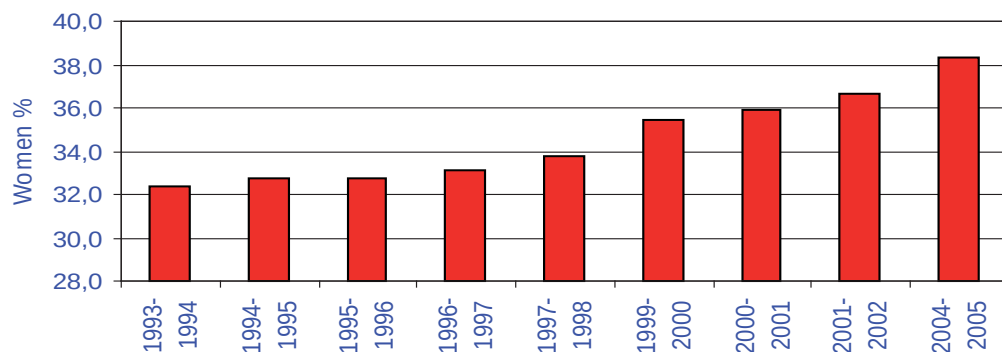


Figure 8. Variation of women teaching staff by years in Turkey (1993-2005)

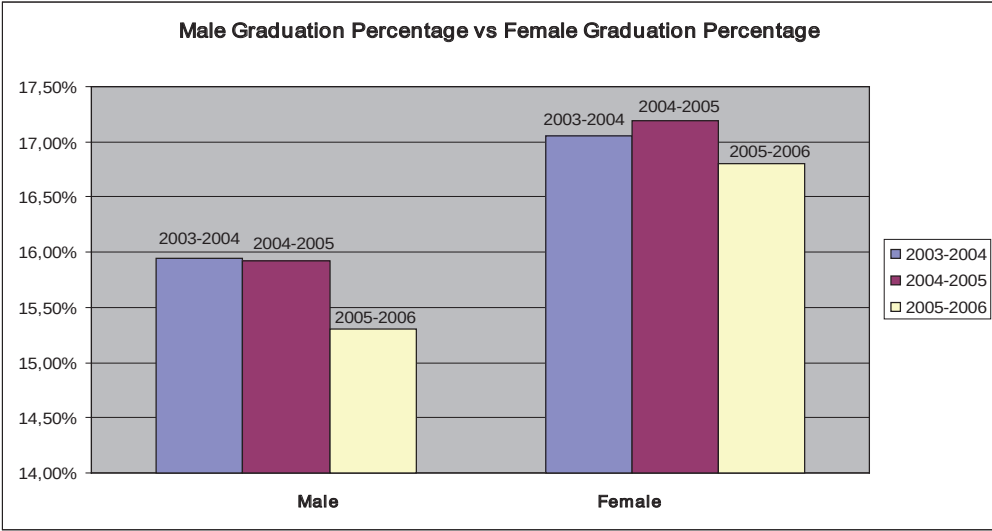


Figure 9. Male and female graduation percentages (UNICAFE,2008)

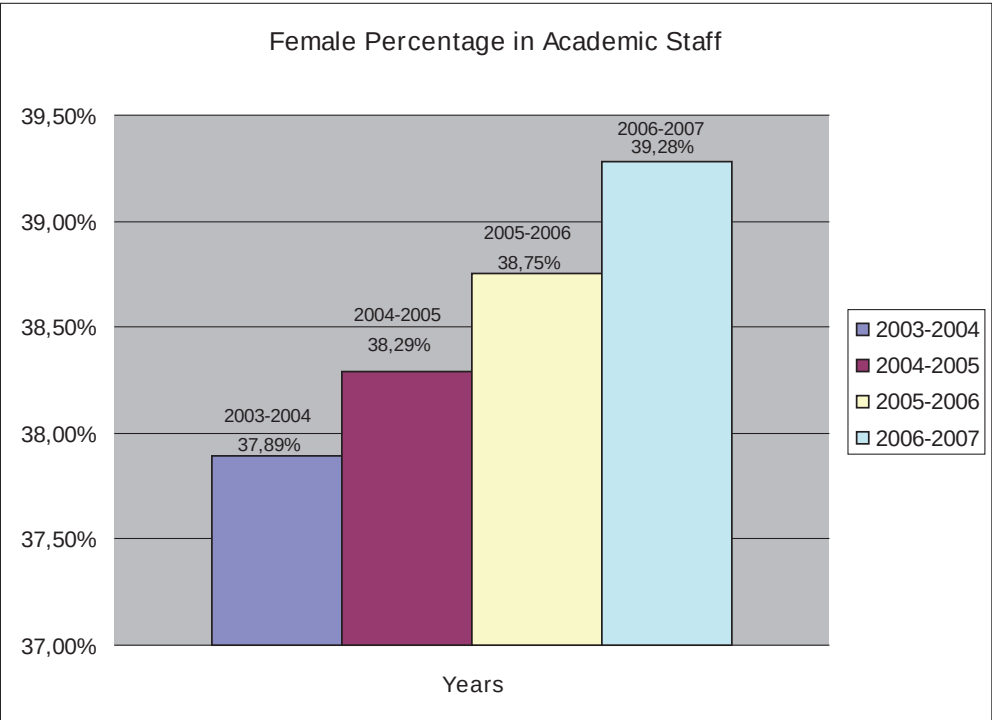


Figure 10. Female percentage in academic staff (UNICAFE,2008)

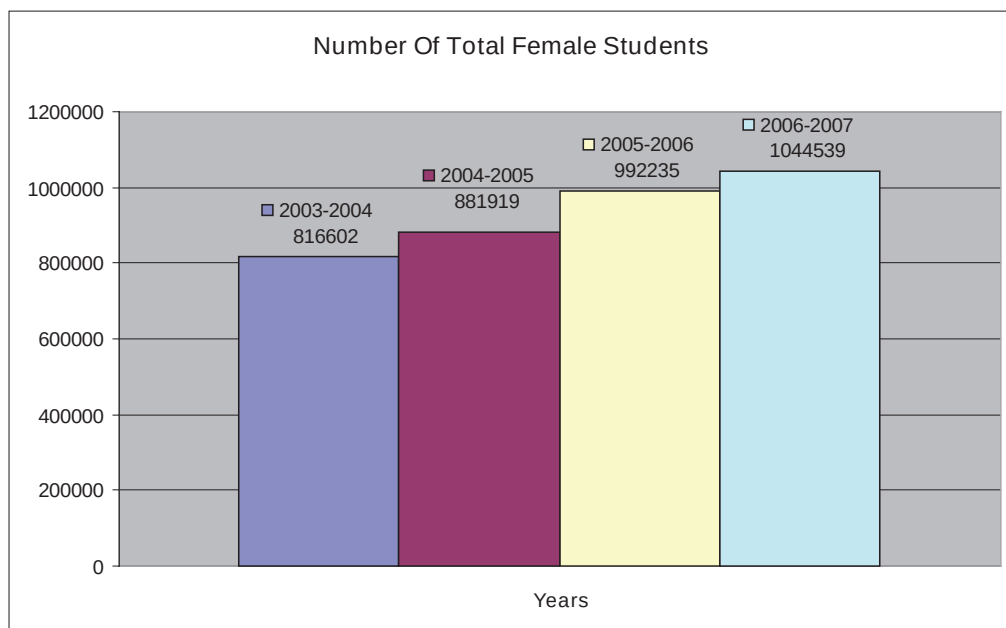


Figure 11. Number of female students in all disciplines (2003-2007) (UNICAFE,2008)

Table 3 Number of graduate students(Turkey) (UNICAFE,2008)

NUMBER OF GRADUATE STUDENTS			
Year	Total	Master	Doctorate
2003-2004	114892	90057	24835
F	47282	37635	9642
M	67610	52422	15193
Female %	41.15	41.79	38.82
2004-2005	119901	92566	27335
F	50607	39676	10931
M	69294	52890	16404
Female %	42.21	42.86	39.99
2005-2006	144317	111814	32503
F	59642	46835	12807
M	84675	64979	19696
Female %	41.33	41.89	39.40
2006-2007	142394	108683	33711
F	60138	46308	13830
M	82256	62375	19881
Female %	42.23	42.61	41.03

XVI – A case study: Istanbul Technical University

Istanbul Technical University (ITU) is a well-respected state university having a long history and sound reputation in engineering and architecture education in Turkey.

- ITU has been experiencing continuous change ever since its foundation in 1773 during the Ottoman era. This change has been multifaceted: from an imperial to a republican institution at the start of the 20th century; from an international to a global outlook; and from a deterministic to a quality-based system after 1996;
- Even in periods when ITU enjoyed unequivocal successes among its peers, it has always maintained a culture of change, and that is why the university motto is phrased as “Pioneer through the Ages”;
- The winds of change brought one of the major revisions in the history of ITU in the 1960's. Previously, ITU conferred a prestigious title of a “Diplomingeniuer” (translated to our system as “High Engineer”) degree upon its graduates, which was accepted as the equivalent of a Master's degree.

The administrators of the University understood future trends and thus they moved to three cycle system in 1969.

In 1988, ITU started to offer an English Supported Instruction program on a voluntary basis. This program did not meet the initial expectations of the University, it served as a foundation for the bilingual education started in 1997.

The most recent period of change has been realised in two consecutive projects: ITU Project 2001 and ITU Project 2005 was designed as the development plans of the university. The driving force behind this change was the wind of globalization and internationalization.

Table 4. Female academic staff by years (ITU) (UNICAFE,2008)

FACULTY	1994/ 1995				1999/2000				2004/2005			
	F	M	T	%F	F	M	T	%F	F	M	T	%F
Natural Sciences	78	103	181	43	95	112	207	46	123	120	243	51
Civil	74	249	323	23	79	202	281	28	69	180	249	28
Architecture	103	100	203	51	118	104	222	53	130	80	210	62
Mechanical	18	136	154	12	25	146	171	15	26	127	153	17
Electrical	29	94	123	24	46	128	174	26	49	118	167	29
Management and Industrial	20	61	81	25	28	55	83	34	34	58	92	37
Chemical and Metallurgical	39	69	108	36	49	76	125	39	59	67	126	47
Mining	15	98	113	13	22	112	134	16	27	94	121	22
Naval Arch. and Ocean	12	59	71	17	8	55	63	13	10	40	50	20
Maritime	30	41	71	42	16	31	47	34	12	31	43	28
Aeronautical and Astronautical	7	54	61	11	10	54	64	16	14	44	58	24
TOTAL (including Institutes)	434	1078	1512	29	507	1093	1600	32	590	1017	1607	37

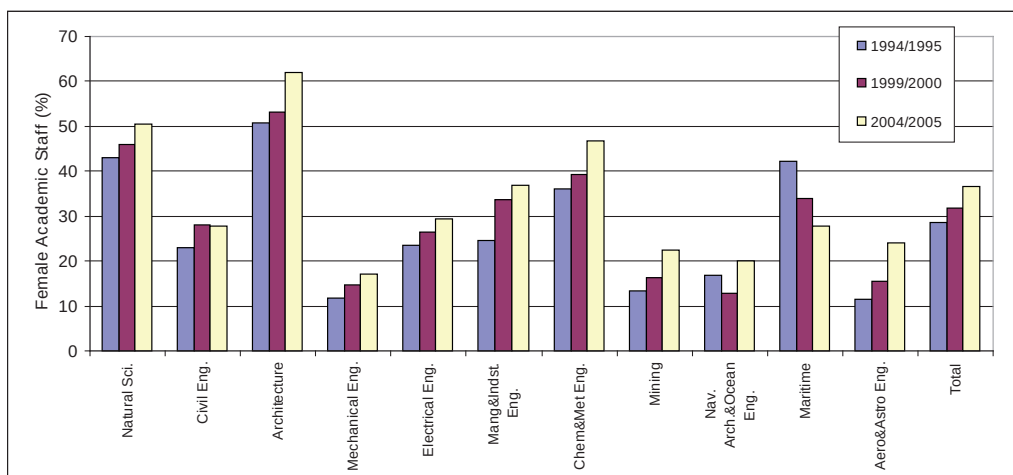


Figure 12. Female academic staff change at different faculties (ITU)(UNICAFE,2008)

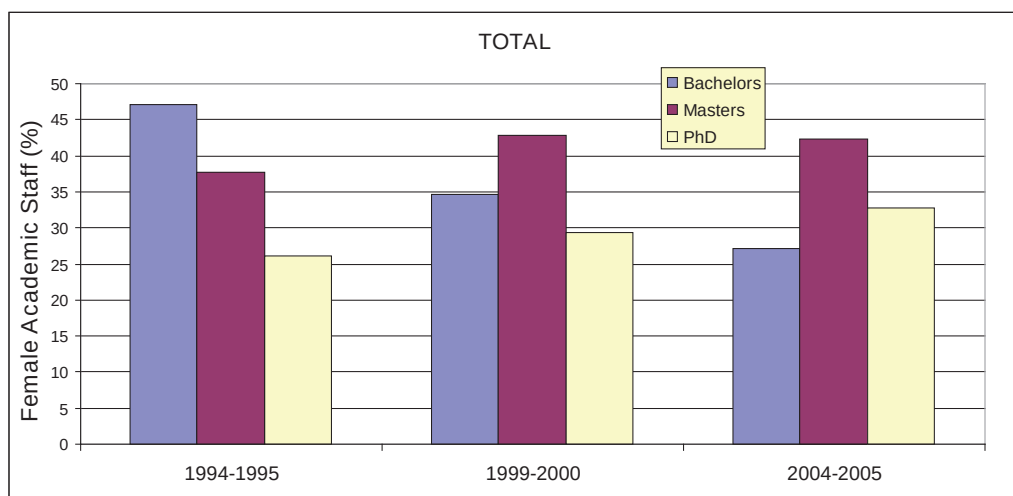


Figure 13. Female academic staff at different degree levels (ITU) (UNICAFE,2008)

First female graduates of ITU (Saglam G. 2003)

- Melek ERBUĞ 1933 Civil Engineering
- Sabiha ECEBİLGEN 1933 Civil Engineering
- Hürriyet SİRMAÇEK 1935 Civil Engineering
- Mülhime YAZAR 1938 Civil Engineering
- Nezihe ÖNYAY 1939 Electric-Mechanical Eng.
- Celile BERK 1942 Architecture

First female PhD graduates (Saglamer G. 2003)

• Cahide ARDOR	1949	Mechanical Engineering
• Mürüvet ŞENALP	1949	Mechanical Engineering
• Cazibe SAYAR	1954	Mining Engineering
• Asuman ÖNARAN	1959	Mining Engineering
• Münire ÖZKAN	1960	Mechanical Engineering
• Nazmiye SOYKUT	1963	Civil Engineering

Masters degree and PhD graduates

Master degree graduates (by 2006)

- Female: 3220 (28.9%)
- Total : 11136

PhD graduates (by 2006)

- Female: 578 (37.0%)
- Total : 1555

Discussions

There is a gender pyramid in all the professional areas with large number of women junior staff at the bottom and very small numbers of females at the top.

This is also true for higher education. As it has been stated before, statistics show that women are underrepresented in higher education and academia. Gender based segregation in higher education works in three different ways.

- vertical segregation;
- horizontal segregation;
- contractual segregation.

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