GENDER SEGREGATION IN TURKISH INSTITUTES OF HIGHER EDUCATION EMPLOYMENT

By SERAP PALAZ

Balıkesir University, Bandırma IIBF

Paper presented at The International Association for Feminist Economics 2000 Conference, Boðaziçi University, Istanbul, Turkey, August 15 -17, 2000.

ABSTRACT

In this paper the pattern of change in the vertical (position) occupational gender segregation in Turkish higher education employment over the year of 1988/9 to 1997/8 is measured using the Karmel and Maclachlan (KI) index of segregation. Also, each 40 academic disciplines within the higher education institutions are examined to show if there are any differences in segregation levels and changes in the trend of vertical occupational segregation for over the whole period. Moreover, the contribution of the academic disciplines to the overall level of segregation in the university sector, using modified KI, is investigated. The results shows that although aggregate measures of segregation indicate a slight increase in vertical segregation, the decomposition of the KI suggests that some gender integration have been observed within positions during the whole period. In addition, although in the past women were generally in the fields of natural sciences and engineering, recently Turkish academic women are choosing traditionally more feminine fields.

KEYWORDS

Gender discrimination, vertical occupational segregation, Higher Education employment in Turkey.

GENDER SEGREGATION IN TURKISH INSTITUTES OF HIGHER EDUCATION EMPLOYMENT

1. INTRODUCTION

As is argued by several authors (OECD, 1985; Gunderson, 1989; Reskin and Padavic, 1994; Koçak, 1999) that the most important explanation for the existence of sustained wage differences between men and women is continuing occupational segregation and women's concentration in low-paying occupations. This paper seeks to test the presence and extent of vertical (position) occupational segregation by gender in the Turkish institutes of higher education employment.

Occupational segregation refers to the unbalanced distribution of the genders across occupations in a manner inconsistent with their overall shares of employment, irrespective of the nature of job allocation (Jonung, 1984; 45). Hakim (1979) makes a very useful distinction between horizontal occupational segregation and vertical occupational segregation the former exists when men and women are disproportionately working in different occupational groups and the latter exists when men are working in higher level jobs within an occupation and women are working in the lower level jobs within an occupation. Horizontal occupational segregation has, in general, been studied using aggregate occupational data sets because this economy-wide employment data is usually readily available. These data sets are generally based on a classification of occupations by skill rather than hierarchy. In the Turkish case, except for institutions of higher education, it is not possible to obtain data on the hierarchical

gender distribution within occupations. Such data are required to investigate vertical occupational segregation. On the other hand, some researchers have analysed vertical occupational segregation within the organisational structure using data based on establishments in the US (Bielby and Baron,1984; Horan and Lyson, 1986).

Rich (1999) examined vertical occupational segregation in universities in Great Britain using the Karmel and Machlachlan index. In this study, we will investigate the size and character of vertical occupational segregation by gender within the Turkish Higher Education employment and the changes that have taken place over the last decade. To do this we use the Karmel and Maclachlan index (KI) and the fact that the total change in this index between two points in time can be decomposed into a certain number of underlying components which show the contribution of different factors to the observed total change.

Universities vary according to their academic discipline composition, or academic organisational unit, or cost centre, and the academic disciplines may vary according to their gender composition. Therefore it is not appropriate to analyse aggregate data by university. Academic disciplines are weighted differently within the university sector, and then would make the calculations unreliable. To avoid this problem, and to get more reliable results, we examine vertical occupational gender segregation in the 40 academic disciplines within the higher education institutes in Turkey. We will apply the KI index, over the academic years 1988/9 to 1997/8 using the available compatible data sets provided by Higher Education Statistics.

We also investigate occupational segregation for each academic discipline based on the gender share of that academic discipline's employment, using KI index during the 1988/9-

1997/8 academic years, to see if there were any differences among them in the form of unequal treatment, or any changes in the pattern of vertical occupational segregation by gender over the period. In addition, the contribution of the academic disciplines to the overall level of segregation in the university sector will be calculated for the same period.

The remainder of this paper is as follows; in section 2, the historical and sociological background of Turkish academic women's participation is explained. Section 3 looks at the evolution of total academic employment between 1984/5 and 1997/8 and at the changes that have taken place in the female representation in different professional positions and different academic disciplines. The KI index and its decomposition are outlined in Section 4. The estimated measures of vertical occupational segregation are analyzed in the next section. The final section draws conclusions.

2. THE HISTORICAL AND SOCIOLOGICAL BACKGROUND OF WOMENS' PARTICIPATION IN ACADEMIA

Before analyzing the situation of women in academia, the impact of some sociological and historical factors needs to be taken into account. After the First World War, the new Turkish Republic was established by Mustafa Kemal Ataturk, and many reforms were enacted to improve social and political conditions in the country. In particular, women received great priority during this modernising and Westernisation process. Acar (1991) points out that "the newly structured universities designed to reflect the image of modern Turkey emerged as particularly suitable media for operationalising the ideals of the Republic regarding women. Under these circumstances daughters of middle- and upper-class urban elite families who identified with Kemalist ideals benefited not only from the material advantages of their social

background – which made it possible for them to receive advantaged education and often facilitated their pursuit of a career by enabling them to hire household and childcare help but also from the supportive and legitimising values of the elite subculture in which they were raised" (p.150).

According to two different studies on women in higher education (Acar, 1983; Koker, 1988) academic women generally come from urban upper or middle class backgrounds and are very motivated in their career goals. This was ascribed to the influence of the family socialisation of women.

In the early years of the Turkish republic, the highest female share of academic employment was found in the natural sciences. For example, in 1947, 44 % of the academic staff of the Faculty of Natural Sciences were female, on the other hand only 22 % of the Humanities faculty were female, which is in marked contrast to the developed-western countries, such as the United States, and the United Kingdom (Koker, 1988).

The existence of Turkish women in natural sciences, which are generally male-dominated fields in developed countries, can be explained by several factors. Firstly, it may be due to the new Republican State's positivist ideology; it glorified 'hard'science vis-à-vis social sciences and humanities. Therefore women who were socialised in the elite subculture were consciously oriented towards natural sciences and mathematics, which were the dominant ideological discourse (Acar, 1991, p.151). Secondly, it may be the case that in developing countries the links between academic science and real power are weak contrary to developed countries (Ruivo, 1987). In the early years of the Republic, women may have been excluded from the real sources of power and supported and encouraged to choose natural sciences,

rather than law and political sciences, which were connected with the state and the commanding targets of political power in Turkey.

After the 1950s, when the Kemalist message and political ethos started to lose their effectiveness and, as a result of this, women's participation in the natural sciences decreased considerably. On the other hand female participation in social sciences began to increase. By 1998, 49 % of academics in the Humanities and 46 % in Fine and Applied Arts were females.

When the effectiveness of early republican policies somewhat diminished in society, the ideological activation of elite women in science lost its motivation (Oncu, 1981). In addition, after the 1950's the country experienced great social mobility, thus elite women came across more competition from men of lower socio-economic origins than before. Consequently women may have seen their preferred status of entry to academia diminished (Koker, 1988).

As well, Acar (1991) reveals that "most women coming into the system in the 1960's and 1970's were less ideologically motivated. Some were more influenced by the 'traditional values of society, many were more likely to choose a field that is associated with a well-paying profession, and all had to face tougher competition from men" (p.156). Recently, although more and more women are entering the academic sector (as well as men), due to the diffusion of educational facilities, women's choice of fields has changed from the natural sciences to the fields traditional in the west, such as the humanities, arts, vocational education. It will be shown in section 4.2 that these observations are consistent with our finding on occupational gender segregation in academic disciplines for the period 1988/9 to 1997/98.

It also needs to be mentioned that, according to the latest data, about 76.9 percent of all academic women are employed in the metropolitan universities namely Ankara, Istanbul and Izmir (OSYM, 1998). Acar's (1983) report interviewing women in academia indicates that the relationship between gender, hierarchical level within disciplines, and administrative power differs between those universities, which are new provincial or those, which are metropolitan. The women in new provincial universities are younger, junior and disadvantaged in competition with men of similar status, compared with women in the well-established universities in Ankara, Izmir and Istanbul. This may be due to the fact that, as would be expected, patriarchal values are more compelling in provincial (traditional) locations. In addition, women's lower geographical mobility affects their participation in provincial universities. As was pointed out in World Bank Report on Turkey in 1993, this outcome is consistent with their observation of the different situation of women in Turkey, where those from the major cities are highly educated and professional and face relatively fair equal treatment. On the other hand, in small provincial cities (rural areas), women's situation is more determined by culture, tradition and religion, which restrains their activities and situations (World Bank, 1993).

3. ACADEMIC EMPLOYMENT CHARACTERISTICS

In Turkey, the higher education institutions contain all the institutions under the jurisdiction of the Higher Education Council (HEC) namely: universities, academic disciplines (faculties), higher technology institutes, higher schools, vocational schools, evening universities, conservatories and research centres, which are subject to the Higher education Act of 1981. The data on Turkish Higher Education institutions do not record two distinct labour markets such as academic and non-academic employment. The data are available only for academic

employment, therefore, although there are non-academics employed in academia, in this study, we are only concerned with academic employment.

Turkey has a very young population and is a developing country, so educational expansion is required at every level. After a major reorganisation of the Turkish higher education system in 1981, many new universities were established; both state and private. For instance in 1992, 23 new state universities were founded in addition to 28 existing universities –one private, the rest state. Currently there are 67 universities both private and public in Turkey.

Total academic employment (56401 persons) represented 0.026 % of total employment in Turkey and women were 33 % of total academic employment in the 1997/98 academic year. Approximately 73 % of academics was employed in the academic disciplines, which are examined here (1998). Of the 41667 academics in Turkish universities, approximately 19000 (34 %) are female (ÖSYM, 1997-1998 Higher Education Statistics). However, academic women are highly underrepresented in senior administrative posts. For example, throughout the history of the universities, there has been only one elected and one appointed woman rector. Also, in the 1993/4 academic year, only 8.6 % of the 325 faculty deans in the 52 universities were women (DGSPW, 1994).

Table 1 shows the distribution of females and males in total academic employment. Women's proportion of total academic employment has slightly increased since 1985 (29.7 % in 1985 compared with 33.8 % in 1998). By 1998, female professors represented 2.96 percent of total academic employment compared with 10.47 percent for males. Although males, lecturer and above, represented approximately 35 percent of total academic employment in 1997/8 females at these levels only represented approximately 13 percent of total academic employment in the 1997/98 academic year. As is seen, women are generally employed in

support positions, which lack promotional opportunities, such as language instructor, or specialist.

Table 1 Distribution of Academic Employment (%)

Hierarchical Levels	1984/5		1997/8	
Within Disciplines	Male	Female	Male	Female
Total	70.23	29.77	66.61	33.8
Professor	7.26	1.13	10.47	2.96
Associate Professor	10.10	2.61	5.13	2.20
Assistant Professor	8.6	2.74	9.61	3.78
Lecturer	13.44	5.66	9.58	4.51
Language instructor	2.81	3.82	3.78	4.34
Specialist	1.65	1.21	2.25	1.51
Research Assistant	26.20	12.30	25.31	14.44
Other*	0.08	0.05	0.03	0.02

Source: OSYM, 1998, 1984/85–1997/98 Academic Years Higher Education Statistics.
* = Comprises Translator and Education and Training Planner

Acar (1991) explains the proportion of women in lower status positions as follows: "two factors may be thought to contribute to the present concentration of women in the lower echelons. One of them is the entry of more women into the academic world than men in the recent decades; this is readily observed in the increasing share of women throughout the past decades. An alternative explanation may be sought in the slower promotion rates of women" (Acar, 1991, p.153).

Koker (1988) and Acar (1983) report on the basis of interview data for the Turkish academic women, that a discrimination mechanism grounded on patriarchal values in society, and social and cultural pressures creates a role incompatibility between family and careers responsibilities. In addition psychological factors that influence women's own self-images reinforce social pressures to confine the development of women's careers. Women

interviewed in Acar's (1983) study recognized that they lowered the standards of performance in their careers because of the demands of their family roles.

Table 2 demonstrates that total female academic employment has grown 191 % over the period 1984/85 – 1997/98, compared with 142.2 % for male academic employment. The highest growth has been at the professional level for both genders. There has been a small increase in the female growth rate in translator and education and training planners level. On the other hand, there has been a fall in male growth rates at these levels. As can be seen, generally, the females show a higher growth rate than males in academic employment. This is a reflection of the general increase in participation of women in the Turkish Workforce. Ozbay (1995) points out that after the 1980s, some male professors resigned and sought jobs in the private sector because the salaries in the academic sector were so low (Ozbay, 1995, p.104). Therefore, with men less likely to apply for these jobs, females did not face such strong competition. Applications by women to new positions in the universities were greater than applications by men recently. It is significant that this result is consistent with the theory of queueing processes, which was suggested by Reskin and Roos (1990).

The queuing approach characterizes labour markets as comprising labour queues that rank groups of workers in terms of their attractiveness to employers and job queues that order jobs in terms of their attractiveness to workers. The occupational composition results from a matching process, in which the best jobs go to the most preferred workers and less attractive jobs go to the less preferred workers. Therefore the less preferred, bottom-ranked workers end up in jobs that others do not want to take. By identifying the structural properties of queues, the conditions that influence the occupational composition can be defined as follows;

"when (a) the relative distributions of elements –workers across labour queues, jobs across job queues- change, (b) employers rerank workers or workers rerank jobs, or (c) the intensity of workers' or employers' preferences for or against particular elements decline or grow" (Reskin and Roos, 1990, p.307).

The queuing perspective emphasizes the roles of power and of conflict between groups with contradictory interests in shaping occupational composition. The factors such as custom, stereotypes, prejudices, male workers' pressure and their aspiration to preserve their advantages influence employers'ranking decision of workers. In like manner, the working conditions, autonomy, career opportunities, and gender composition influence workers' assessments of jobs. In the Reskin and Roos studies, women's inroads into the male dominated occupations during 1970s in US conform to this queueing process. When the opportunities for mobility, earnings, and job autonomy declined in occupations such as clerical works, teacher, insurance sales, men sought better jobs elsewhere. When employers could not attract and hire enough qualified male workers, female workers entered these jobs. Although women made some progress in desegregating traditionally male occupations, when they finally achieved access to them, the occupations by then had lost most of their attraction to men. Consequently they became less advantageous for women as well. Accordingly, these factors contributed to occupational feminization. In addition, they found that, in these occupations, women were generally concentrated in the lower-paying, less desirable positions. Thus, gender desegregation in these occupations failed to diminish the wage gap between men and women.

In our case, when the earning of the university sector declined, men preferred to find better opportunities elsewhere and then women had opportunities to enter this sector. Despite

women's inroads into this sector recently, it has not changed their position in the academia, they are still concentrated in the lower status jobs such as specialist language instructor and translator.

Table 2 Growth Rates of Academic Employment for Total and Each Level by gender, 1984/5-1997/8 (%)

Hierarchical Levels Within Disciplines	Female	Male
Total	191.6	142.2
Professor	465.5	270.4
Associate Professor	116.1	30.7
Assistant Professor	254.3	185.2
Lecturer	105.0	83.3
Language instructor	191.6	245.7
Specialist	219.8	250.1
Research Assistant	201.7	148.2
Other*	7.6	-10.5

Source: See Table 1
* = Comprises Translator and Education and Training Planner.

Table 3 shows the percentage female employment shares across academic disciplines over the year 1988/9 and 1997/8. Generally women's shares increased in all academic disciplines, except engineering and marine sciences, and those higher education units without students, where centers for application and research take place. Recently women's highest shares were found in the vocational education, pharmacy, educational sciences and letters (90 %, 70 %, 55 % and 49 % in 1997/8 respectively). On the other hand, the lowest female shares were in theology (2 %), technical education (10%), aeronautics and space sciences (14 %) and engineering (15 %). They are fields where tradition acts to limit female involvement. The most noticeable increases in women's participation over the period 1988/9 – 1997/8 were in vocational education (from 71 % to 90 %), languages and history (from 36 % to 46 %) and communication (from 43 % to 50 %), which are considered more feminine fields.

As is noted earlier, although the highest share of academic women was in the engineering and natural sciences in the early years of republic, due to the sociological factors the distribution of women in these fields has decreased significantly after the 1950s. Recently women were found generally in more 'feminine' fields such as the vocational education, letters and educational sciences. In Turkey chemist is generally considered to be a female job therefore a large amount of academic women were found in the pharmacy (70 % in 1997/8).

The largest representation of academic women (90 % in 1997/8) was in the vocational education, which is intended to provide female students with the traditional 'female' occupational skills, such as the home economics. However, technical education, which has only 10 percent of women in its labour force is designed to provide male students with the conventional typical 'male' specific occupations such as electronics and carpentry. This shows how the male and female specific fields are separated in the society.

Table 3 Female Employment Shares of Academic Disciplines, (%)

	1988/9	1997/8
Aeronautics & Space Sciences	12.0	14.0
Agriculture	18.0	21.0
Architecture	44.0	52.0
Arts & Sciences	30.0	31.0
Chemistry & Metallurgy	30.0	39.0
Civil Engineering	23.0	23.0
Communication	43.0	50.0
Economics	31.0	34.0
Economics & Administrative Sciences	27.0	26.0
Education	30.0	31.0
Educational Sciences	50.0	55.0
Electrical & Electronic Engineering	20.0	23.0
Engineering	23.0	22.0
Engineering & Architecture	20.0	25.0
Fine Arts	36.0	38.0
Fish & Fisheries	22.0	29.0
Forestry	8.0	16.0
Higher Education Units without Students	50.0	47.0
Languages, History & Geography	36.0	46.0
Law	28.0	30.0
Letters	45.0	49.0
Management	26.0	35.0
Marine Sciences	28.0	16.0
Mechanical Engineering	6.0	14.0
Medicine	28.0	32.0
Dentistry	43.0	48.0
Mining Engineering	17.0	15.0
Music & Performing Arts	42.0	35.0
Open Education	29.0	45.0
Pharmacy	66.0	70.0
Political Sciences	23.0	37.0
Sciences	37.0	43.0
Shipbuilding & Marine Sciences	9.0	19.0
State Conservatory	46.0	48.0
Technical Education	8.0	10.0
Theology	2.0	2.0
Trade & Tourism Education	32.0	33.0
Veterinary	19.0	21.0
Vocational Diffuse Education	19.0	21.0
Vocational Education	71.0	90.0

Source: OSYM, Higher Education Statistics 1988/9 – 1997/8.

4 OCCUPATIONAL GENDER SEGREGATION IN INSTITUTES OF HIGHER EDUCATION BETWEEN 1988/9-1997/8

4.1 MEASURES OF OCCUPATIONAL SEGREGATION

There are many measures of occupational segregation indices in use. Their adequacy has been judged using the criteria established in the literature on inequality (James and Tauber, 1985; Blackburn, Siltanen and Jarman, 1995). A main conclusion from this literature is that an adequate measure of gender segregation should be decomposed to isolate a margin-free component (that is the composition effect), which is independent of the interrelated changes in the overall gender shares of employment and the occupational structure (Blackburn et al, 1995; Watts, 1997). The index of measurement developed by Karmel and Maclachlan (1988) and applied by Watts and Rich (1992;1993) and Barrientos (1994) to UK data satisfies this requirement for time series data.

The index of dissimilarity ID, which was originally defined by Duncan and Duncan (1955) in a study of residential segregation by race, is the most commonly used measure of segregation (e.g., Jonung 1984; Rubery and Tarling 1988;World Bank, 1993). Many studies have applied the index of dissimilarity in their analysis of occupational segregation without question, on the grounds that it has good explanatory power and is easy to compute.

This index is interpreted as measuring the percentage of the male (female) labour force required to shift between occupation or industry categories to make sure that the distribution of males (females) is the same as that of females (males) (OECD, 1985).

Although the index of dissimilarity is very popular, it has been criticised more recently. Cortese, Frank and Cohen (1976) explain that the Dissimilarity index measures the percentage of either males or females who must be shifted, without replacement, to achieve zero segregation (pp. 634-635). Watts (1998) points out that "all excess (fe)males in (fe)male dominated occupations are culled, so that the distribution of employment associated with gender integration, explicit in the ID measure, differs in its occupational structure from the actual employment distribution" (pp. 8-9). Therefore the interpretation of changes in the value of the ID index over time and the decomposition of these changes into different components such as gender composition effect, structural (occupational) effect is not clear.

4.1.1 The Karmel and Maclachlan Index

The index was first proposed by Duncan around 1965 in a letter to Taeuber and Taeuber, (1965) and developed and advocated by Karmel and Maclachlan in 1988 (Jones, 1992, p.106). The Karmel and Maclachlan index, KI, measures the fraction of total employment which must relocate, with replacement, to achieve zero gender segregation (Watts, 1994, p.424).

This index is defined as follows:

$$KI = (1 / N) \sum | F_i - a(M_i + F_i) |$$

$$= (1 / N) \sum | (1 - a)F_i - aM_i |$$

where:

N = total academic employment

a = the overall male share of total academic employment

F_i = number of academic females in occupation i

M_i = number of academic males in in occupation i

The maximum value of KI depends upon the proportion of females (males) in the total academic employment.

4.1.2 Decomposition of the Karmel and Maclachlan Index

Karmel and Maclachlan (1988) point out that the change in their index from time 1 to time 2 can be decomposed into Composition and Mix Effects, and also the latter can be divided into Occupation, Gender, and Interaction Effects (pp. 189-190). Hence, we can examine the changes in the pattern of vertical occupational segregation by gender.

Decomposition of KI identifies three inter-related indices, which are classified as follows:

$$KI(a) = (1 / N_2) \sum | (1 - a^*)M_{i1} - a^*F_{i1} | (N_{i2} / N_{i1})$$

where $a^* = \sum M_{i1} (N_{i2} / N_{i1}) / N_2$

The subscripts 1, 2 refer to time periods 1 and 2. The index KI(a) is computed by proportionately adjusting the number of males and females in each occupation by the change in the academic employment level in that occupation from period 1 to period 2, (N_{i2} / N_{i1}). The resulting male share of total academic employment is shown by a*. Therefore the initial gender composition of each occupation is maintained but the share of total academic employment in each occupation is adjusted to that prevailing in period 2.

$$KI (b) = (1 / N_2) \sum | (1 - a_2) (M^*_2 / M^*_1) M_{i1} - a_2 (F^*_2 / F^*_1)F_{i1} | = Z_{21} KI_1$$

where $Z_{21} = a_2 (1 - a_2) / a_1 (1-a_1)$.

The index KI(b) is calculated by adjusting the numbers of academic females (males) in each occupation by the rise in total female (male) employment between the two time periods. Hence the overall gender composition of employment corresponds to period 2, however, the size of occupations will be different from that of period 2.

KI(c) is obtained by successive transformations of the original distribution by the occupation and gender calculations detailed above. Therefore, after each iteration, total academic employment corresponding to period 2 is gained but, after the odd iterations, individual occupation totals are realized whereas, after the even iterations, the period 2 gender totals are attained.

When the proportional error is less than 0.025 %, the distribution is said to be converged to an employment distribution with gender total and occupational structure close to those of period 2. The full numerical example can be found in Karmel and Maclachlan (1988: 194).

The interaction of KI_1 which denotes the first year value of the index, and KI_2 which shows the second year value of the index, and KI(a), KI(b), and KI(c) allows us to decompose the change in the index as follows:

The Composition Effect measures the impact of changes in the gender structure of occupations retaining the overall gender and vertical occupational structures constant. In our formula, the composition effect is KI_2 - KI(c).

The Mix Effect determines the impact of changes in the vertical occupational structure and the overall gender distribution. As we mentioned above, this effect is subdivided into the occupation, gender and interaction effects. The mix effect is formulated as:
KI(c) – KI_1.

The Occupation Effect shows the impact of changes in the overall vertical occupational structure, and it is written as: KI(a) – KI_1.

The Gender Effect indicates the effects of changes in the overall gender composition of the total academic employment. It is formulated as follows: $KI(b) - KI_1$.

The Interaction Effect is the residual, and is measured as: $(KI(c) - KI_1) - (KI(a) - KI_1) - (KI(b) - KI_1)$. Changes in the occupational structure of employment and the growth rates of male and female employment are interrelated therefore, this effect is useful to define.

The percentages of these effects are computed by multiplying by 100 and dividing by the mean of the index values, such as $(KI_1 + KI_2) / 2$ (Barrientos, 1994, pp.54-55).

As was mentioned above, changes in gender and occupational shares of total academic employment and changes in the gender composition of individual occupations affect the movement of an index of segregation. Therefore an adequate decomposition of an index of vertical occupational gender segregation should purge the effect of the changes in gender shares of total academic employment and also, the effect of changes in the vertical occupational structure. The Karmel and Maclachlan (1988) index is an appropriate method to measure occupational gender segregation because it produces an adequate measure of the extent and trend of segregation over time. In addition, its decomposition procedure can identify the impact of the composition effect on these changes, picking up the effect of changes in the gender composition of individual occupations. As is known, the analysis of the pattern of vertical occupational gender segregation is not only measured by the composition effect but also by the occupation, gender, and interaction effects as well. Changes in vertical occupational and gender shares of academic employment affect the movements in the index as well. Therefore KI is superior to other index measures because its decomposition procedure

can also identify the Mix Effect which can be broken up into Occupation, Gender, and Interaction Effects.

4.1.3 Segregation within Occupational Groups

The Karmel and Maclachlan approach can be extended to analyse the contribution of the Academic Disciplines (AD) to the overall segregation index (Watts and Rich, 1992; 1993; Watts, 1995; 1998). Watts and Rich (1993, pp.166) show that these calculations are straightforward using the KI index, since it can be written as a weighted sum of the normalised contributions of the individual academic disciplines:

$$KI = \sum_{J}(N_J / N) \sum_{j \in J} (|(1-a)M_j - aF_j| / N_J) = \sum_{J}(N_J / N)KI_J \qquad (1)$$
$$= \sum_{J} KI^*_J$$

where KI_J shows the fraction of those female and male academics employed in each academic disciplines J who must relocate to achieve zero segregation, with respect to the overall gender shares, N_J is total academic employment in academic disciplines J and KI^*_J denotes the fraction of total academic employment who are employed in academic disciplines J and must relocate.

The calculations of the total change and the Mix Effect and its components by AD are sensitive as to whether KI^*_J or the index value normalized by the employment share of the AD (KI_J) is used (see Appendix 2). Therefore we only present the Composition Effects by AD whose magnitudes are relatively insensitive to the method of calculations.

4.2 ESTIMATION OF VERTICAL OCCUPATIONAL GENDER SEGREGATION IN TURKISH INSTITUTES OF HIGHER EDUCATION EMPLOYMENT BETWEEN 1988/9-1997/8

Tables 4 presents the results for Turkish higher education institutes in aggregate, using the 40 academic disciplines. In 1998 approximately 77 percent of total academic employment was represented by that academic discipline's employment. Around 70 percent of academic women were employed in the 40 academic disciplines by 1998.

Although aggregate measures of segregation indicate a slight increase in the level of vertical occupational segregation in academic employment (KI_1=0.098 %, KI_2=0.100 %) the decomposition of the change suggests that there has been a trend towards the integration of the genders in the vertical occupations as measured by the composition effect (–4.91 %) for the period of 1988/89-1997/98. Approximately 5 percent less academics would have had to change appointment level to achieve zero segregation by 1998.

Table 4 KI Index Decomposition for Total Academic Employment of Academic Disciplines by Gender 1988/9-1997/8

	KI_1 (%)	KI_2 (%)	TCH (%)	COMP (%)	MIX (%)	OCC (%)	GEN (%)	INT (%)
1988/7 – 1997/8	0.098	0.100	1.83	-4.91	6.74	1.89	2.70	2.14

Notes: Subscripts 1 and 2 denote the initial and final year of calculations. TCH denotes the total percentage change in the index over the two years. COMP and MIX denote the percentage Composition and Mix Effects respectively. MIX is subdivided into Occupation (OCC), Gender (GEN) and Interaction (INT) Effects.
Source: Higher Education Statistics 1988/9 – 1997/8.

The decomposition reveals that the increase in overall segregation was affected by changes in the structure of vertical occupations and in the gender composition of the total academic employment, as shown by the mix effect for the whole period . The effect of changes in the gender composition of the total academic employment, which is the largest effect in the mix effect, operated to increase occupational segregation by gender over the period 1988/9-1997/8.

The gender effect reflected the growth of female employment over the period (see Table 2), which was accompanied by lower grow in male employment and therefore an increase in the female employment share.

It is believed that net growth of employment is associated with the rate of job separation because the existence of growing employment opportunities would favour job mobility. Therefore when there is increasing net employment growth, it can be expected that the occupational integration of male and female workers would take place because the presence of growing employment opportunities would create more jobs and job mobility. In our case, employment growth might encourage job mobility and opportunities, and assist the rate of integration of the genders occurring during the whole period. Recently, because of the establishment of many new universities, which required new and more academic staff, academic employment has grown enormously in Turkey (see Table 2). In addition, as we mentioned earlier, according to the queueing theory, the relative distributions of workers or jobs changes in response to the structural features of the labour market and job queues (Reskin and Roos, 1990). Likewise Power (1975) claims that the feminisation of an occupation tends to be self-reinforcing, in the sense that the associated decrease in pay, or status and also conditions discourages male entry (Power, 1975, p.234). This is consistent

with this Turkish case. In our case, the demand for academic employees increased due to the growth of university sector, and at the same time the supply of men diminished because of lower salary, therefore all these factors contribute to decrease segregation in this sector.

Moreover, the industrial and occupational structure is subject to long-term forces, which should be uncovered by the occupation component of the mix effect. In our case, however, the evidence is not clear, as the interaction effect is larger than the occupation effect during the whole period. However, the positive occupation effect does indicate growth in the more segregated areas of academic employment.

Our results of better integration of female and male academic employment over the whole period are consistent with finding for occupational segregation for Turkey with respect to professional employment over the period of 1975-1990 (Koçak, 1999). The decline in segregation in the professional jobs (and academia) is more likely due to several factors. Women are able to compete more equally with men in these professional jobs, because the training for these jobs is generally taken on outside the labour market. Moreover, entry into institutions of higher education depends on examinations scores in Turkey, hence statistical discrimination (overt)[1] by employers might not be as prevalent as in other occupational groups. Also, women who have education and qualifications are more likely to be aware of

[1] Statistical Discrimination: employers are not able to obtain detailed information and statistics about the productivity of female applicants, therefore they make their hiring decisions on the basis of the alleged average performance of woman relative to man. Employers' belief that female workers in general are not as reliable as male workers, because of their domestic responsibilities, disadvantage particular women who are as committed to the labour force as men. This sort of employer discrimination is called statistical discrimination (Phelps, 1972).

legislative changes in favour of them and they may be more active in pursuit of their legislative rights.

4.3 RESULTS FOR INDIVIDUAL ACADEMIC DISCIPLINES OF ACADEMIC INSTITUTIONS

The estimation of the KI measure of vertical occupational gender segregation for each academic discipline is based on the gender share of that academic discipline's employment. Table 5 presents the level of segregation in 1988/9 and 1997/8 for academic disciplines, which are ranked from lowest to highest level of segregation according to the 1997/8 values.

The segregation level for academic disciplines in 1997/8 is ordered, from the Vocational Diffuse Education with a low of 0.0038, to the Political Sciences with a high of 0.14. The Law, Economics, Management, and Political Sciences are among the most segregated fields. As mentioned earlier, women's employment share of these fields was not very high. This indicates that women are generally poorly represented in areas that would give access to that employment where the real source of power lies, and which involve decision-making in political institutions, public and business administration. On the other hand, the less segregated fields are the education ones where traditionally women have been employed and where wages are low.

The total change in the level of segregation for academic employment for the natural sciences, namely, the Aeronautics and Space Sciences, Electrical & Electronic Engineering, Science,

Medicine etc. increased significantly (see Table 5). On the other hand the Music and Performing Arts, Economics and Administrative Sciences, Trade & Tourism Education, Educational Sciences recorded increases in the level of segregation.

These results support the contention that women's choose of field moved from the 'unconventional' to the more conventional, 'feminine' fields.

4.4 THE CONTRIBUTION OF EACH ACADEMIC DISCIPLINE TO THE OVERALL LEVEL OF SEGREGATION IN THE UNIVERSITY SECTOR (1988/9-1997/8)

In this section, we present the results calculated for each academic discipline using the modified KI (as is explained in Section 4.2). Table 6 presents the academic disciplines by level of the index values and employment shares in 1988/9 and 1997/8. The Table groups the faculties in ascending order for the index values in 1997/8.

The Vocational Education, Pharmacy and Theology make the largest contribution to the level of segregation in the academic sector, normalised by their corresponding employment shares, followed by Educational Sciences, Technical Education and Marine Sciences. These results are not surprising because women have their highest share both in Vocational Education and Pharmacy. However, they have their lowest share in Theology (2 % in 1997/8). On the other hand the Medicine, Music and Performing Arts, Languages and History and Education make relatively smaller contributions to the segregation index. This is, again, consistent with our claim that women have recently started to choose conventionally more "feminine" fields in the university sector.

5 CONCLUSION

The pattern of change in vertical occupational gender segregation within Turkish institutions of higher education employment has investigated over the year of 1988/9 to 1997/8, using the KI index. In addition each of the 40 academic disciplines were examined to see whether there were differences in segregation levels and changes in the trend of segregation over the whole period. Moreover the contribution of each academic discipline to the total level of segregation in the university sector was calculated.

The results reveal that there was a slight increase in the level of segregation of academic employment over the period 1988/9-1997/8. However, the decomposition of the KI index indicates that there has been a trend towards gender integration across academic levels (shown by composition effect over the whole period). Further, it indicates that changes in the structure of academic employment across the levels, and changes in the gender composition of the labour force as a whole contributed to boosting occupational segregation.

Turning to segregation for each academic discipline, in 1988/9 women were generally in the Natural Sciences and Engineering (as explained in section 2) however, recently there has been a shift towards concentration in the social sciences which are considered to be more 'suitable' for women. The composition effect shows that net segregation is increasing in the fields of Engineering and Sciences, Medicine, etc. where women are generally under-represented in the developed countries.

The results obtained for the contribution of each academic disipline to the overall level of segregation reveal that the academic disiplines, which have highest and lowest shares of female academic women (such as the Vocational Education, Pharmacy and Theology), are the

most segregated fields. The Social Science, such as Music and Performing Arts, Education and Fine Arts, which are traditionally feminine fields, make relatively smaller contributions to the total level of segregation. This is not surprising, because, unlike in the past, Turkish academic women are recently choosing traditionally more 'feminine' fields.

Acknowledgment

I am very grateful to Professor Peter Riach and Mrs Judith Rich for their very useful comments on an earlier draft of this paper.

Appendix 1: The Tables

Table 5 Academic Disciplines by Level of Segregation, in 1988/9 and 1997/8

Academic Disciplines	$KI_{88/89}$	$KI_{97/98}$
Vocational Diffuse Education	0.0069	0.0038
Technical Education	0.0024	0.0051
Music and Performing Arts	0.0498	0.0104
Theology	0.0065	0.0131
Vocational Education	0.0227	0.0138
Medicine	0.0215	0.0368
State Conservatory	0.0555	0.0392
Economics and Administrative Sciences	0.103	0.0393
Veterinary Sciences	0.0991	0.0418
Higher Education Units without Students	0.0314	0.0431

Dentistry	0.0838	0.0447
Trade and Tourism Education	0.117	0.0452
Chemistry and Metallurgy	0.0737	0.0453
Communication	0.0676	0.0455
Electrical and Electronic Engineering	0.0160	0.0458
Engineering	0.0735	0.0470
Education	0.0270	0.0471
Aeronautics and Space Sciences	0.0144	0.0492
Mechanical Engineering	0.0208	0.0504
Arts and Sciences	0.0526	0.0517
Fine Arts	0.0664	0.0520
Engineering and Architecture	0.0641	0.0526
Agriculture	0.0870	0.0615
Forestry	0.0491	0.0626
Letters	0.0552	0.0639
Marine Sciences	0.0544	0.0694
Fish and Fisheries	0.0682	0.0717
Educational Sciences	0.173	0.0740
Languages, History and Geography	0.0349	0.0758
Architecture	0.118	0.0781
Law	0.132	0.0892
Economics	0.129	0.0970
Mining Engineering	0.0975	0.100
Sciences	0.0579	0.101
Civil Engineering	0.146	0.101

Shipbuilding and Marine Sciences	0.0659	0.110
Pharmacy	0.112	0.112
Management	0.152	0.124
Open Education	0.112	0.126
Political Sciences	0.164	0.148

Source: Higher Education Statistics, 1988/9 –1997/8

Table 6 Academic Disciplines by Level of Normalised Index Values and Employment Shares in 1988/9 and 1997/8

Academic Disciplines	$Share_{88/89}$	$Share_{97/98}$	$KI_{j88/89}$	$KI_{j97/98}$
Music and Performing Arts	0.007	0.002	0.112	0.036
Medicine	0.242	0.212	0.022	0.036
Trade and Tourism Education	0.002	0.001	0.125	0.037
Languages, History and Geography	0.010	0.007	0.073	0.045
Education	0.062	0.064	0.023	0.045
Art and Sciences	0.091	0.104	0.051	0.049
Economics and Administrative Scien	0.046	0.053	0.103	0.062
Fish and Fisheries	0.003	0.006	0.080	0.063
Engineering and Architecture	0.040	0.034	0.107	0.072
Chemistry and Metallurgy	0.003	0.004	0.071	0.082
Fine Arts	0.013	0.012	0.087	0.082
Law	0.012	0.012	0.130	0.083
Electrical and Electronic Engineering	0.005	0.005	0.100	0.090
Engineering	0.096	0.070	0.078	0.094
Economics	0.005	0.005	0.128	0.102
Agriculture	0.041	0.039	0.121	0.106
Veterinary Sciences	0.016	0.016	0.112	0.109
Vocational Diffuse Education	0.014	0.062	0.119	0.111
Civil Engineering	0.007	0.007	0.145	0.113
Shipbuilding and Marine Sciences	0.001	0.001	0.215	0.127
Management	0.006	0.005	0.140	0.137
Sciences	0.025	0.022	0.072	0.139
Dentistry	0.023	0.019	0.137	0.159
State Conservatory	0.019	0.011	0.159	0.161
Forestry	0.005	0.005	0.221	0.163
Mining Engineering	0.003	0.002	0.132	0.165
Higher Education Units Without Studt	0.086	0.106	0.210	0.166
Letters	0.020	0.017	0.143	0.170
Political Sciences	0.004	0.003	0.181	0.172
Mechanical Engineering	0.005	0.005	0.246	0.181
Aeronautics and Space Sciences	0.001	0.001	0.180	0.183
Communication	0.004	0.006	0.148	0.184

Open Education	0.002	0.001	0.110	0.186
Marine Sciences	0.0008	0.0004	0.066	0.186
Architecture	0.018	0.013	0.179	0.199
Technical Education	0.010	0.013	0.222	0.221
Educational Sciences	0.002	0.001	0.239	0.231
Theology	0.017	0.018	0.278	0.297
Pharmacy	0.016	0.012	0.351	0.379
Vocational Education	0.007	0.003	0.407	0.576

Source: Higher Education Statistics, 1988/9 –1997/8

Appendix II

Watts and Rich (1993, pp.176-177) demonstrate that three intermediate indexes, KI_i (i =A, B, C) are computed by Karmel and Maclachlan (pp.190-191) in their decomposition of changes in the index over time. These indexes are also disaggregated by AD, i.e.

$$KI_i = \sum_J (N_{iJ} / N_i) KI_{iJ} \qquad (i =A, B, C) \qquad (2)$$

Where N_{iJ}, N_i are the number of employees in AD $_j$ and in total corresponding to the intermediate index i respectively, and KI_{iJ} is the value of the AD index, normalised by its corresponding employment share. The 'forward' percentage composition effect is as follows:

$$CE_J = 100*(KI_{2J} - KI_{CJ}) / ((KI_{1J} + KI_{2J}) / 2) \qquad (3)$$

Where the subscripts 1, 2 indicate the two time periods. The advantage of the normalisation procedure is that the 'forwards' and 'backwards' components of the composition effect are measured in comparable units, namely the shares of AD employment, which must relocate. The failure to normalise both the numerator and denominator of (3) by the corresponding employment shares could lead to one component of the computation being given greater weight, if the AD share of employment changes are significant over time.

However, this normalisation procedure suggests that the weights attached to the composition effects by AD which are required to calculate the overall composition effect are complicated, while in the absence of normalisation,

$KI = \sum KI^*_J$

$CE = \sum w^*_J CE^*_J$

Where $w^*_J = (KI^*_{1J} + KI^*_{2J}) / (KI_1 + KI_2)$

and CE^*_J is calculated from (3) but is based on raw values of the AD index (KI^*_J). Hence the overall composition effect can be related to the composition effects across ADs.

In addition, as Watts and Rich (1992, p.74) conclude, "the magnitude of the composition effect by AD is relatively insensitive to the way it is calculated, because the normalisation procedure in (3) affects the terms in the numerator equally. Calculations of the total change and the mix effect and its components by AD are highly sensitive to whether index values are normalised, because of the differential impact on the terms in the numerator by normalisation, due to their different AD employment shares". Therefore, in this study, we only present the composition effects by occupational group.

REFERENCES

Acar, F., (1983), "Turkish Women in Academia: Roles and Careers", **METU Studies in Development**, vol.10, No.3, pp.409-446.

Acar, F., (1991), “Women in Academic Science Careers in Turkey”, in Stolke-Heiskanen, V., (ed), **Women in Science: Token Women or Gender Equality**, Oxford & New york: Berg, pp.147-171.

Barrientos, A., (1994), "Did Occupational Sex Segregation in the British Full-Time Labour Force Decline in the 1970s”, **British Review of Economic Issues**, Vol. 16, No.40, pp. 51-67.

Bielby, W.T. and Baron, J.N., (1984), “A Woman’s Place is with Other Women: Sex Segregation within Organisations”, in Reskin, B.F. (ed.), **Sex Segregation in the Workplace**, Washington D.C: National Academy, pp. 27-99.

Blackburn, R.M., Siltanen, J. and Jarman, J., (1995), “The Measurement of Occupational Gender Segregation: Current Problems and a New Approach”, **Journal of the Royal statistical Society**, Vol. 158, No. 2, pp. 319-331.

Cortese, C.F., Frank R.F. and Cohen J. (1976), “Further Considerations on the Methodological Analysis of Segregation Indices”, **American Sociological Review**, Vol. 41, pp. 630-637.

DGSPW (Turkish Republic State Ministry For Women’s Affairs and Social Services Directorate General on the Status and Problems of Women), (1994), **The Status of Women in Turkey**, The Turkish National Report to the Fourth World Conference on Women, Dizgi &Baskı, Ankara.

Gunderson, M., (1989)**,** “Male-Female Wage Differentials and Policy Responses”, ***Journal of Economic Literature***, Vol.27, No.1, pp. 46-72.

Hakim, C., (1979), **Occupational Segregation: A Comparative Study of the Degree and Pattern of the Differentiation Between Men and Women's Work in Britain, the United States and Other Countries**, Research Paper, no.9, London: Department of Employment.

Horan P.M. and Lyson T.A., (1986), “Occupational Concentration in Establishments”, **Sociological Forum**, Vol.1, No.3, pp.428-449.

James, D.R. and Tauber K.E. (1985), “Measures of Segregation” in Tuma, N.B. (ed.), **Sociological Methodology**, San Francisco: Jossey-Bass, pp. 1-31.

Jones, F.L., (1992), “Segregation Indices: An Historical and Conceptual Note”, **Australian and New Zealand Journal of Sociology**, Vol. 28, No.1, pp.105-110.

Jonung, C. (1984), "Patterns of Occupational Segregation by Sex in the Labour Market", in Schmid, G. and Weitzel, R. (eds.), **Sex Discrimination and Equal Opportunity: The Labour Market and Employment Policy**, London: Gower Publishing Company, pp. 44-68.

Karmel, T. and Maclachlan, M., (1988), "Occupational Sex Segregation - Increasing or Decreasing", **Economic Record,** vol. 64, pp. 187-195.

Koçak, S., (1999), **Gender Discrimination in the Turkish Labour Market**, PhD Thesis in Economics, De Montfort University, England.

Koker, E., (1988), **Women, Education and Politics in Turkey: A Study of Women’s Condition in Institutions of Higher Education,** Unpublished PhD Dissertation, Ankara University.

OECD, (1985), **The Integration of Women into the Economy**, Paris.

Oncu, A., (1981), “Turkish Women in the Professions: Why so Many?” in Abadan-Unat, N., (ed.), **Women in Turkish Society,** Leiden E. J. Brill Press, pp.181-193.

OSYM (Student Selection and Placement Center), (1998), **The 1984/85 – 1997/98 Academics Years Higher Education Statistics**, OSYM Publications, Ankara, Turkey.

Özbay, F., (1995), “Changes in Women Activities Both Inside and Outside the Home”, Tekeli, Ş., **Women in Modern Turkish Society**, Zed Books Ltd, London, pp. 89-111.

Phelps, E., (1972), "The Statistical Theory of Racism and Sexism", **American Economic Review**, vol.62, no.3, pp.659-661.

Power, M., (1975), "Women's Work is Never Done by Men: A Socio-economic Model of Sex Typing in Occupations", **Journal of Industrial Relations,** Vol.17, pp. 225-239.

Reskin, B. and Roos, P., (1990), **Job Queues, Gender Queues: Explaining Women's Inroads into Male Occupations**, Temple University Press, Philadelphia.

Reskin, B., and Padavic, I., (1994), **Women and Men At Work**, Pine Forge Press, London.

Rich, J., (1999), "Gender Segregation in the Academic Staff of Universities in Great Britain, 1980/1 to 1993/4", **Economica**, Vol.66, No.264, November, pp. 509-531.

Rubery J. and Tarling R., (1988), "Women's Employment Declining in Britain", in Rubery, J., (ed.), **Women and Recession**, Routledge and Kegan Paul, London, pp. 100-132.

Ruivo, B., (1987), "The Intellectual Labour Market in Developed and Developing countries: Women's Representation in Scientic Research", **International Journal of Science Education**, Vol.9, No.3, pp.385-391.

Watts, M. J., (1994), "Notes and Issues: Debate- A Critique of Marginal Matching", **Work, *Employment and Society***, Vol. 8, No.3, pp. 421-431.

Watts, M. J., (1997), "Multidimensional Indexes of Occupational Segregation", **Evaluation Review**, Vol. 21, No. 4, pp. 461-482.

Watts, M. J., and Rich, J., (1992), "Occupational Sex Segregation in the UK 1979-89: the Role of Part-time Employment", **Internatinal Review of Applied Economics**,Vol. 6, No. 3, pp. 286-308.

Watts, M. J., and Rich, J., (1993), "Occupational Sex Segregation in Britain 1979-1989: the Persistence of Sexual Stereotyping", **Cambridge Journal of Economics**, Vol. 17, pp. 159-177.

Watts, M.J., (1995), "Divergent Trends in Gender Segregation by Occupation in the United States: 1970-1992", **Journal of Post Keynesian Economics**, Vol.17, No.3, pp. 357-379.

Watts, M.J., (1997), "The Measurement of Occupational Gender Segregation", **Journal of The Royal Statistical Society**, A, Vol.160, No.1, pp.141-145.

World Bank, (1993), **Turkey Women in Development**, A World Bank Country Study, Washinghton, D.C.