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GENDER WAGE GAP: EVIDENCE FROM THE HELLENIC MARITIME SECTOR 1995-2002

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Abstract: *The paper explores gender wage gap as well as educational level, work experience and age in the Hellenic maritime companies by utilizing the European Structure of Earnings Surveys of 1995 and 2002. The nonparametric statistical analysis used shows that even though the male-female wage distributions were not identical in 1995, so discrimination was present, though, we did not find evidence of this gap in 2002. Hourly wage rate which proved to be independent of educational level, while dependent on work experience and age, and for both latter characteristics, much more for females than for males, may explain the elimination of the gender pay gap at the end of the investigation period.*

Key words: *Gender pay gap, Male-Female wages, age, educational level, work experience, Nonparametric Statistics.*

1. Introduction

The wage gap between men and women amounts to 13% of the total Hellenic economy, during the period 1995-1998. This gap is noticeable amongst the 19 developed countries of the Organisation for Economic Cooperation and Development (OECD) and the sixth smallest among the European Union (EU) country members (OECD, 2002). Specifically, in the private (public) sector, the gender wage gap reached 21% (9%), according to evidence from the European Community Household Panel (ECHP, 1998), while it was computed at 23% for the private sector according to the European Structure of Earnings Survey (ESES, 1995) (Barry et al., 2002).

Over the period 1974 - 1999, the evolution of wage inequality between genders followed a path similar to that of the private return to education (Cholezas and Tsakloglou, 2004; Odink and Smits, 2001).

In Hellas, for the 1960s, Kanellopoulos (1982) estimated simple Mincer's models concentrated on human capital variables and concluded that discrimination constituted approximately 60% of the observed gap between men and women or it falls to 30% when additional independent variables are added to the model. For the late 1970s, Psacharopoulos (1982) estimated that women's wages barely reached 65% of those of men and

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that approximately 90% of this gap was generally due to discrimination, which was not the case only for the educated working women within occupational groups. For the 1980s, Patrinos and Lampropoulos (1993) concluded that almost the total wage differential by gender could be attributed to discrimination. Kanellopoulos and Mavromaras (2002) and Kanellopoulos, Mitrakos and Mavromaras (2003) estimated it at 27.5% in 1982 while it increased rapidly reaching 87.9% in 1999.

The wage gap in Hellas is also attributed to gender discrimination by recent studies using modern econometric techniques, e.g. quartile regression or decomposition techniques on Household Budget Surveys (HBS), Hellenic data (Papapetrou, 2004), or on private sector companies (Cholezas, 2004b). Especially in Papapetrou's (2004) paper, the gap was found larger in the tails of the wage distribution, and more specifically in the lower bound (60.7%).

Kioulafas et al. (1991) as well as Kanellopoulos and Psacharopoulos (1997) estimated the discrimination based on public or private attribute of the employer, finding evidence about the smaller gender pay gap, the return on education and experience for workers in the public sector.

Furthermore, in spite of the statistical significance of education in wage inequality in Hellas, for the last three decades its falling return has also been proved (Lazaridis et al., 1989; Tsakloglou, 1992, 1993; Mitrakos and Tsakloglou, 1997a, 1997b, 1998), as stated by the human capital theory especially in the lower bound of the distribution, either within the same working group or between workers and private professionals (Kanellopoulos, 1985; Tsakloglou and Cholezas, 2001). Here, as in all western European countries, these returns are consistent with excess supply of skilled labour or university graduates.

In the present paper, we test, for the first time, the hypothesis concerning human capital characteristics of Hellenic shipping companies. We provide new evidence on the relationship between wages and gender, educational level, work experience and age based on distribution-free methods. We differentiate on the previous studies by not considering the determinants of gender wage gap or wages of males and females. Instead, we are interested in investigating the homogeneity of our dataset and the correlation or dependence of the aforementioned variables.

The paper is organized as follows. In the next section we discuss some theoretical underpinnings. The third section contains a description of the data and the results of the nonparametric estimations. Concluding remarks are given in the final section.

2. Theoretical Underpinnings

Studies that explore gender wage gap usually refer to cross-sectional data national or international, aggregate or by sector, aiming at interpreting it with regard to a) the productivity differences between genders, and the discrimination against women, within sectors and/or occupations, b) the different evaluation of female against male occupations or even job positions, c) the different distributions of men and women between sectors and/or occupations.

These factors are suggested by the neoclassical human capital theory and the economic theory of labour market discrimination (Becker, 1993), where the gender pay gap is due to productivity differences, which, in turn, emerge from differences in human capital held by individuals. The latter are explained mainly by the different occupational or educational choices of men and women, made usually before their entrance in the labour market, a feature known as the pre-market discrimination. Moreover, they are

directly affected by the different social roles intended for each sex and hence by their social psychology. Nevertheless, economists are interested in market discrimination, which is the unfair treatment of women in the labour market, as regards their wage, given that they possess the same human capital as men. Therefore, according to neoclassical economists, women are paid less than men because, on the one hand, the latter have a lead on average in human capital and, on the other hand, because they are discriminated by employers partly due to their gender.

Furthermore, it has been proved empirically that phenomena of employment segregation based on gender exist. This is predicated on the assumption that men and women do not offer the same employment in a given job position, which proves to be a statistically significant factor of the gender wage gap. Employment segregation based on gender is expressed in a series of characteristics, such as occupation, sector, or employment contract, which may be full-time or part-time with a definite or indefinite time frame. Among different forms of employment, segregation by gender, occupational segregation, as a social phenomenon, has received interest in international literature (Rubbery, et al., 1996). Therefore, the undervaluation of women's employment, due to the non-recognition of their skills, expands the wage gap between men and women. Occupational segregation is directly connected to the wage gap, since the entrance barriers to privileged occupations force women to concentrate on fewer occupations than men (Bergmann, 1974).

The undervaluation of women employment compared to that of men, gives rise to a broader definition of wage discrimination per gender. Given equal employment, the unequal wage decomposition in two components refers to the quantity of goods and services produced by women and their value. In both cases, the low assessment of women's labour supply "justifies" their lower wage.

Relevant empirical literature (see for instance, Blau, 1998; Blau and Ferber, 1987; Blinder, 1973; Cain, 1986; Dolton and Makepeace, 1986; Dolton and Kidd, 1994; Greenhalgh, 1980; Gunderson, 1989; Kim and Polachek, 1994; Miller, 1987; Mincer, and Polachek, 1978; Mincer and Ofek, 1982; Neumark, 1987; Oaxaca, 1973; Willis, 1973) focuses on the identification of the appropriate econometric model to estimate the determinants of the wage gap, as well as its decomposition, improving, for that matter, the existing techniques.

3. Data and Estimation Results

We use raw data drawn from the most recently published reports by EUROSTAT European Structure of Earnings Surveys (ESES) sampled in 1995 and 2002, which was carried out in Hellas by the National Statistical Service of Greece-Hellas (NSSG) [1]. We concentrate on Hellenic maritime companies located in Piraeus and focus on charateristics such as gender, gross hourly wage rates, [2] [3] age, educational level and work experience of full time employees, with the exception of over time work.

Table 1 describes distribution patterns through summary statistics which can help us deduce some "stylized facts". The four observed frequency distributions, corresponding to age, level of education, work experience, and hourly wage rate, are positively skewed with diachronic declining kurtosis and increasing dispersion, more for male than for female. Their central tendency, measured by the median, has shifted to the right by 22% for male (from 6€/hour in 1995 to 7.3€/hour in 2002) and by 60% for female (from 4.3€/hour in 1995 to 6.9€/hour in 2002).

As a consequence, we observe a great reduction in the gender pay gap, 74% on average. By contrast, we observe (a) the significant difference in the upper end of the male-female wage distributions, even though it was reduced from nearly 3:1 in 1995 to 1.7:1 in 2002 as it can be seen from relevant ratios of maximum hourly wage rates; (b) the important increase in the range (9% for male and 94% for female) and the high relative variability (coeff. of variation – CV- more than 50% for male and slightly less for female); (c) the decline of the kurtosis degree, suggesting a great diachronic rise in the wage gap within sex. This evidence seems to occur much more for females than for males.

Table 1

Summury Statistics for the Hellenic Maritime Sector

		n	Min	Max	Med.	Mean	Stdev	CV	Skew	Kurt
Panel I: Total										
Age	**1995**	238	19,0	59,0	33,0	34,1	9,1	27%	0,6	-0,4
	2002	174	18,0	70,0	35,0	36,8	10,1	27%	0,5	-0,3
Level of Education	**1995**	238	1,0	7,0	3,0	3,5	1,7	50%	0,8	-0,2
	2002	174	1,0	7,0	3,0	4,5	1,9	41%	0,3	-1,6
Work Experience	**1995**	236	0,1	25,7	3,0	4,8	5,2	107%	1,8	3,7
	2002	174	0,0	30,0	3,0	5,2	6,1	116%	1,9	3,6
Hourly Wage Rate	**1995**	225	1,8	27,9	5,3	6,0	3,2	52%	2,3	10,6
	2002	174	2,9	31,3	6,9	8,1	3,9	49%	1,9	7,1
Panel II: Males										
Age	**1995**	156	19,0	59,0	35,0	35,6	9,5	27%	0,4	-0,5
	2002	91	18,0	70,0	36,0	38,3	10,4	27%	0,5	-0,1
Level of Education	**1995**	156	1,0	7,0	3,0	3,5	1,9	53%	0,7	-0,6
	2002	91	1,0	7,0	5,0	4,8	1,9	39%	0,0	-1,6
Work Experience	**1995**	154	0,1	25,7	2,5	4,9	5,4	109%	1,8	3,3
	2002	91	0,0	26,0	4,0	5,5	6,2	112%	1,7	2,3
Hourly Wage Rate	**1995**	144	1,8	27,9	6,0	6,8	3,5	51%	2,1	8,9
	2002	91	2,9	31,3	7,3	8,5	4,4	52%	2,2	7,9
Panel III: Females										
Age	**1995**	82	19,0	50,0	29,0	31,3	7,5	24%	0,7	-0,5
	2002	83	20,0	56,0	33,0	35,2	9,6	27%	0,5	-0,8
Level of Education	**1995**	82	1,0	7,0	3,0	3,5	1,5	44%	1,3	0,9
	2002	83	1,0	7,0	3,0	4,2	1,8	44%	0,7	-1,2
Work Experience	**1995**	82	0,1	25,3	3,3	4,7	4,9	104%	2,0	5,1
	2002	83	0,0	30,0	3,0	4,9	5,9	121%	2,2	5,6

Hourly Wage Rate	**1995**	81	1,8	9,9	4,3	4,6	1,7	37%	1,0	1,1
	2002	83	3,2	18,8	6,9	7,6	3,3	44%	0,9	0,4

Notes

n=sample size, Min (Max)=minimum (maximum) observation, Med.=Median, Mean=arithmetic average

Stdev.=standard deviation, CV=coeff.of variation, Skew=coeff.of Skweness, Kurt=coeff.of Kurtosis

Age and work experience are measured in years while hourly wage rate in euros.

The ordinal scale of the variable 'level of education' is

1 primary school, 2 secondary school, 3 lycee, 4 vocational training,

5 higher technological educational institute, 6 university, 7 post-graduate degrees.

Because of the unknown shape of the population distributions our random and independent samples come from, we choose to proceed with non-parametric methods. The properties of random and independent samples are verified because of the authoritative origin of our data (NSSG, EUROSTAT).

Table 2
Statistical inference for the Hellenic maritime sector, 1995 and 2002

		Mann-Whitney U test (1)	**Spearman's Rank Corr.coeff. Test (2)**	***X*2 test for Independece (3)**
Panel I: Gender Gap (Male-Female)				
Age	**1995**	3,40 [,0007]	-0,00 [,9938]	3,9 (6) [,6888]
	2002	-1,56 [,1196]	0,19 [,0834]	11,9 (9) [,2143]
Level of Education	**1995**	-1,17 [,2421]	0,00 [,9643]	12,8 (2) [,8873]
	2002	1,21 [,2260]	-0,05 [,6445]	19,7 (16) [,2356]
Work Experience	**1995**	-0,12 [,9083]	-0,05 [,6538]	12,5 (9) [,1847]
	2002	-2,42 [,0155]	0,06 [,5756]	6,4 (6) [,3804]
Hourly Wage Rate (HWR)	**1995**	5,78 [7,4E-09]	-0,00 [,9859]	16,8 (15) [,3288]
	2002	-2,03 [,0420]	0,14 [,2027]	13,0 (16) [,6699]
Panel II: Total				
HWR - Gender	**1995**	---	-0,32 [,0000]	38,1 (4) [,0000]
	2002	---	-0,04 [,6134]	1,82 (5) [,8739]
HWR - Age	**1995**	---	-0,34 [,0000]	77,7 (12) [,0000]
	2002	---	0,27 [,0003]	70,5 (15) [,0000]
HWR - Lev. of Educ.	**1995**	---	0,40 [,0000]	81,5 (20) [,0000]
	2002	---	0,17 [,0295]	41,3 (25) [,0218]
HWR - Work Exper.	**1995**	---	0,06 [,3479]	20,9 (12) [,0522]
	2002	---	0,34 [,0000]	64,5 (15) [,0000]

Panel III: Males				
HWR - Age	**1995**	---	-0,34 [,0000]	65,1 (15) [,0000]
	2002	---	0,006 [,9565]	11,2 (12) [,5086]
HWR - Lev. of Educ.	**1995**	---	0,33 [,0000]	62,3 (25) [,0000]
	2002	---	0,16 [,1346]	20,7 (16) [,1921]
HWR - Work Exper.	**1995**	---	0,09 [,2638]	25,4 (15) [,0444]
	2002	---	0,05 [,6049]	22,6 (12) [,0315]
Panel IV: Females				
HWR - Age	**1995**	---	-0,34 [,0018]	19,5 (6) [,0034]
	2002	---	0,19 [,0879]	32,5 (12) [,0012]
HWR - Lev. of Educ.	**1995**	---	0,34 [,0023]	26,1 (12) [,0105]
	2002	---	-0,14 [,2176]	10,3 (16) [,8529]
HWR - Work Exper.	**1995**	---	0,26 [,0173]	25,7 (9) [,0023]
	2002	---	-0,004 [,9696]	36,4 (8) [,0000]

Notes
Numbres in brackets indicate p-values, while before of them the numbers in parentheses give the degrees of freedom.
See also notes of table 1.

The gender pay gap hypothesis has been tested through (a) the Mann-Whitney U test or Wilcoxon rank sum test, which enables us to ask the null "the distributions of men and women wages' populations are identical", (b) the Spearman rank correlation coefficient (ρs) test, which provides a measure of the strength of linear correlation, if there is such, between ranks of men-women wages or wages–gender in the aggregate sample, (c) the chi-square test of independence, which lets us know whether two classifications are independent, e.g. men-women wages or wages-gender.

In panel I, line "Hourly Wage Rate-1995", column 1 of Table 2 it is shown that at the conventional significance level (α=5%) we reject the null that in 1995 the two samples of men and women hourly wage rate (HWR) have been drawn from the same population, i.e. we do not reject the hypothesis that at the beginning of the sampled period (1995) the gender pay gap is statistically significant in the Hellenic maritime sector. This evidence of gender wage discrimination is equally confirmed, first, by the acceptance of the null that men and women HWR are uncorrelated variables and independent as well (Table 2, panel I, line "Hourly Wage Rate-1995, columns 2, 3), and, second, by the rejection of the null that HWR and gender are also uncorrelated and independent (Table 2, panel II, line "HWR-Gender-1995, columns 2, 3).

In contrast, in 2002, the Mann-Whitney U test conducted us to not reject the null, though accepting the borderline p-value of 0.042, that men and women HWR samples are drawn from the same population (panel I, line "Hourly Wage Rate-2002", column 1 of Table 2), i.e., we have evidence that the gender pay gap, still existent in 1995 in the Hellenic shipping companies, has been eliminated in 2002. The above statistical

decision is confirmed, first, by the great reduction in the Spearman's rank correlation test's p-value (0.20) and the relevant increase in the corresponding independence test (Table 2, panel I, line "Hourly Wage Rate-2002, columns 2, 3), and, second, by the acceptance of the null that HWR and gender are uncorrelated and independent (Table 2, panel II, line "HWR-Gender-2002, columns 2, 3), translating that there is not gender pay gap any longer.

The elimination of the gender pay gap, in the Hellenic maritime sector, during the 1995 - 2002 examination period, apart from the socio-political maturation reasons, may be justified by:

A. The amelioration of the "education level": the central argument of the neoclassical theory of human capital about the lower women than men productivity may be present in 1995 but not in 2002, which contributes to a reduction in the pay gap. This can be verified, for both genders, even though much more for females, by the statistical significance of correlation and dependence between HWR and level of education in 1995 and the corresponding 2002 reversal (Table 2, panel II, III and IV, line "HWR- Lev. of Educ., columns 2, 3), when wages and level of education are now independent. In its turn, this may be attributed to the innovative, for Hellas, degrees in Maritime Studies from the University of Piraeus, from which the first class of graduates was in the 1994-95 academic year. The latter coincides with the beginning of our examination period. Eight classes since then could help staff local shipping companies and the scarcity in skilled employees reversed to the excess supply of demand.
B. The increasing relevance of "work experience" and its compatible "age": The obvious trend in the aggregate sample of increasing correlation and dependence between HWR and work experience (Table 2, panel II, line "HWR-Work Exper., columns 2, 3), over the investigation period 1995-2002, is much more in accordance with the female sub-sample than with the male one (Table 2, panel III & IV respectively, line "HWR-Work Exper., columns 2, 3). The gradual social insurance reforms of the '90s which cut down the early retirement of working mother employees, may be a well defined explanation of the increasing dependence between wages and work experience, i.e., because there are more women in Hellenic shipping occupations, their work experience accounting for better remuneration. The latter is also true for the qualification of age, which is not independent of the HWR for women henceforth (Table 2, panel IV, line "HWR-Age, columns 2, 3). Thus, two more human capital characteristics achieved by females contributes to the reduction in the gender pay gap.

The evidences of the gradual independence of HWR and educational level while dependence on work experience, seems to verify the predictions of endogenous growth (Romer, 1986; Lucas, 1988) about the human capital accumulation which is achieved more from learning by doing, than from the educational system.

4. Concluding Remarks

We investigated, for the first time, gender wage gap in the Hellenic shipping companies, located in Piraeus-Hellas, utilizing samples from the official European Structure of Earnings Surveys of 1995 and 2002. We used non-parametric statistical methods so as to estimate the heterogeneity and independence of male and female population distributions. From

several tests, we found evidence that the gender wage gap was present in 1995 but is eliminated in 2002. The evidence found that the education level in independent, much more for females than for males, and increasingly diachronic (1995-2002), may explain why the above gap has been eliminated. Work experience and age of women may be two more characteristics of the human capital neoclassical theory which seems also to explain the above pay gap elimination. The latter qualifications of the increased women participation in the Hellenic maritime labour market may be well justified by social insurance reforms of the 90s which reduced the early retirements of working mother employees.

The econometric examination, which is in our immediate priorities, is necessary in order to clarify the indications that emerge from the above statistical tests, so as to estimate the importance of the determinant factors of the gender wage gap in Hellenic shipping companies.

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Notes

1. In 1995 the survey included 3,584 companies and 52,975 employees, while 2,907 companies and 49,153 employees were included in 2002.
2. This includes ordinary gross wages and bonuses, the additional pay for employment that is not provided by the terms of the employment contract and which is not over-time work, and the wages for extracted work, beyond the normal employment, which was not considered as over-time.
3. The reference months are October 1995 and 2002 respectively.