
Gender Wage Gap: Evidence from the Hellenic Maritime Sector 1995-2002*

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Abstract:

Problem Statement: Gender wage gap has already been researched in the Hellenic (Greek) economy or within its public and private aggregate sectors, but, this was the first study ever done, especially for the maritime sector. Traditionally in Hellas, maritime industry income is the biggest one after tourism, while both industries covered approximately 30% of GDP or financed more than 35% of the trade balance deficit, during the last decade. We also investigated the correlation and dependence of wages (total, males, females) on attributes of the human capital theory, such as age, educational level and work experience. **Approach:** The data for the characteristics in question of the Hellenic maritime companies have been drawn from the European Structure of Earnings Surveys of 1995 and 2002 (Eurostat and National Statistical Service of Hellas). The statistical analysis comprised two steps; first, using summary statistics we described the relevant frequency distributions; second, the implemented non-parametric test-statistics (Mann-Whitney's, Spearman's rank correlation and χ^2 -test of independence), answered the aforementioned questions, like, "is there any difference in the two populations?, e.g. male-hourly wage rate (HWR) against female-HWR, which is equivalent to "is there any gender pay gap?" or "what is the direction and the degree of linear relationship between, for instance, total HWR and the level of education?" or "are they independent of each other, e.g. males HWR and work experience?". **Results:** The male-female wage distributions were not identical in 1995, so

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*the discrimination was present, though, we did not find evidence of this gap in 2002. Hourly wage rate 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. **Conclusions/recommendations:** The last results may explain the elimination of the gender pay gap at the end of the investigation period. Further research is needed so as to determine causal relationships.*

Key Words: *Gender Pay Gap, Male-Female Wages, Age, Educational Level, Work Experience, Inferential Non-parametric Statistics*

JEL Classification: *J16, J31*

1. Introduction

The wage gap between men and women amounts to 13% for the total Hellenic economy, during the period 1995-1998. This gap is noticeable amongst the 19 developed countries of the Organization 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 (1998), while it was computed at 23% for the private sector according to the European Structure of Earnings Survey (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 1960's, Kanellopoulos (1982) estimated simple Mincer's models concentrated on human capital variables and concluded that discrimination constitutes 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 reach 65% of those of men and that approximately 90% of this gap is generally due to discrimination, which was not the case only for the educated working women within occupational groups. For the 1980s, Patrinos and Lambropoulos (1993) concluded that almost the total wage differential by gender can be attributed to discrimination. Kanellopoulos and Mavromaras (2002) and Kanellopoulos et al. (2003) estimated it at 27.5% in 1982 while it was 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, 2004). Especially in

Papapetrou's (2004) study, 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; Tsakoglou, 1992, 1993; Mitrakos and Tsakoglou, 1997; 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; Tsakoglou and Cholezas, 2001). Here, as in all western European countries, these returns are consistent with excess supply of skilled labor or university graduates.

In the present study, we test, for the first time, 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.

2. Materials and Methods

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 labor 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 labor 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 labor market, as regards to their wage, given that they possess the same human capital as men. Therefore, according to the 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 against 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 labor supply "justifies" their lower wage.

Relevant empirical literature (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.

Data used: We used raw data drawn from the most recently published by EUROSTAT European Structure of Earnings Surveys (ESES) sampled in 1995 and 2002, which in Hellas was carried out by the National Statistical Service (NSSG) [In 1995 the survey included 3,584 companies and 52,975 employees, while 2,907 companies and 49,153 employees were included in 2002]. We concentrate on Hellenic maritime companies located in Piraeus and focus on characteristics such as gender, gross hourly wage rates (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. The reference months are October 1995 and 2002 respectively), age, educational level and work experience of full time employees, with the exception of over time work.

3. Results

Table 1. Summary statistics for the Hellenic maritime sector

	n	Min	Max	Med.	Mean	SD	CV (%)	Skew	Kurt
Panel I: Total									
Age	1995	238	19.0	59.0	33.0	34.1	9.1	27	0.6
	2002	174	18.0	70.0	35.0	36.8	10.1	27	0.5
Level of education	1995	238	1.0	7.0	3.0	3.5	1.7	50	0.8
	2002	174	1.0	7.0	3.0	4.5	1.9	41	0.3
Work experience	1995	236	0.1	25.7	3.0	4.8	5.2	107	1.8
	2002	174	0.0	30.0	3.0	5.2	6.1	116	1.9
Hourly wage rate	1995	225	1.8	27.9	5.3	6.0	3.2	52	2.3
	2002	174	2.9	31.3	6.9	8.1	3.9	49	1.9
Panel II: Males									
Age	1995	156	19.0	59.0	35.0	35.6	9.5	27	0.4
	2002	91	18.0	70.0	36.0	38.3	10.4	27	0.5
Level of education	1995	156	1.0	7.0	3.0	3.5	1.9	53	0.7
	2002	91	1.0	7.0	5.0	4.8	1.9	39	0.0
Work experience	1995	154	0.1	25.7	2.5	4.9	5.4	109	1.8
	2002	91	0.0	26.0	4.0	5.5	6.2	112	1.7
Hourly wage rate	1995	144	1.8	27.9	6.0	6.8	3.5	51	2.1
	2002	91	2.9	31.3	7.3	8.5	4.4	52	2.2
Panel III: Females									
Age	1995	82	19.0	50.0	29.0	31.3	7.5	24	0.7
	2002	83	20.0	56.0	33.0	35.2	9.6	27	0.5
Level of education	1995	82	1.0	7.0	3.0	3.5	1.5	44	1.3
	2002	83	1.0	7.0	3.0	4.2	1.8	44	0.7
Work experience	1995	82	0.1	25.3	3.3	4.7	4.9	104	2.0
	2002	83	0.0	30.0	3.0	4.9	5.9	121	2.2
Hourly wage rate	1995	81	1.8	9.9	4.3	4.6	1.7	37	1.0
	2002	83	3.2	18.8	6.9	7.6	3.3	44	0.9

Notes: n: Sample size; Min (Max): Minimum (maximum) observation; Med: Median; Mean: Arithmetic average; SD: Standard Deviation; CV: Coefficient of Variation; Skew: Coefficient of Skewness; Kurt: Coefficient 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

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

		Mann-Whitney U-Test (1)	Spearman's rank correlation coefficient test (2)	X2 test for independence (3)
Panel I: Gender gap (male-female)				
Age	1995	3.40 [0.0007]	-0.00 [0.9938]	3.9 (6) [0.6888]
	2002	-1.56 [0.1196]	0.19 [0.0834]	11.9 (9) [0.2143]
Level of education	1995	-1.17 [0.2421]	0.00 [0.9643]	12.8 (2) [0.8873]
	2002	1.21 [0.2260]	-0.05 [0.6445]	19.7 (16) [0.2356]
Work experience	1995	-0.12 [0.9083]	-0.05 [0.6538]	12.5 (9) [0.1847]
	2002	-2.42 [0.0155]	0.06 [0.5756]	6.4 (6) [0.3804]
Hourly Wage Rate (HWR)	1995	5.78 [7.4E-09]	-0.00 [0.9859]	16.8 (15) [0.3288]
	2002	-2.03 [0.0420]	0.14 [0.2027]	13.0 (16) [0.6699]
Panel II: Total				
HWR-Gender	1995	---	-0.32 [0.0000]	38.1 (4) [0.0000]
	2002	---	-0.04 [0.6134]	1.82 (5) [0.8739]
HWR-Age	1995	---	-0.34 [0.0000]	77.7 (12) [0.0000]
	2002	---	0.27 [0.0003]	70.5 (15) [0.0000]
HWR-Level of education	1995	---	0.40 [0.0000]	81.5 (20) [0.0000]
	2002	---	0.17 [0.0295]	41.3 (25) [0.0218]
HWR-Work experience	1995	---	0.06 [0.3479]	20.9 (12) [0.0522]
	2002	---	0.34 [0.0000]	64.5 (15) [0.0000]
Panel III: Males				
HWR-Age	1995	---	-0.34 [0.0000]	65.1 (15) [0.0000]
	2002	---	0.006 [0.9565]	11.2 (12) [0.5086]
HWR-Level of education	1995	---	0.33 [0.0000]	62.3 (25) [0.0000]
	2002	---	0.16 [0.1346]	20.7 (16) [0.1921]
HWR- Work experience	1995	---	0.09 [0.2638]	25.4 (15) [0.0444]
	2002	---	0.05 [0.6049]	22.6 (12) [0.0315]
Panel IV: Females				
HWR-Age	1995	---	-0.34 [0.0018]	19.5 (6) [0.0034]
	2002	---	0.19 [0.0879]	32.5 (12) [0.0012]
HWR- Level of education	1995	---	0.34 [0.0023]	26.1 (12) [0.0105]
	2002	---	-0.14 [0.2176]	10.3 (16) [0.8529]
HWR- Work experience	1995	---	0.26 [0.0173]	25.7 (9) [0.0023]
	2002	---	-0.004 [0.9696]	36.4 (8) [0.0000]

Notes: Numbers in brackets indicate p-values, while before of them the numbers in parentheses give the degrees of freedom; notes of Table 1

Table 1 describes distributions' 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 (HWR), 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 € per hour in 1995 to 7.3 € per hour in 2002) and by 60% for female (from 4.3 € per hour in 1995 to 6.9 € per 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 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 (Coefficient 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 female than for male.

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).

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 (ρ_s) test, which provides a measure of direction and 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 is shown that at the conventional significance level ($\alpha = 5\%$) we reject the null that in 1995 the two samples of men and women Hourly Wage Rates (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 conduct us to not reject the null, though accepting the borderline p-value of 0.042, that men and women HWR samples have the same distribution (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 reduce in the Spearman’s rank correlation test’s p-value (0.20) and the relevant increase of 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 no gender pay gap any longer.

4. Discussion

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:

- 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 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 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.
- 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 experience, 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 and IV respectively, line “HWR-Work experience, 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 accounts 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 gradual independence of HWR and educational level while dependence on work experience, seems to verified 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.

5. Conclusions

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 educational level is independent, much more for female than for male 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 also seems to explain the above pay gap elimination. The latter qualifications of the increased women participation in the Hellenic maritime labor 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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