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THE MARKET FOR Ph.D. HOLDERS IN GREECE: PROBIT AND MULTINOMIAL LOGIT ANALYSIS OF THEIR EMPLOYMENT STATUS

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Abstract
The objective of this paper is to investigate the factors influencing the probability that a Ph.D. holder in Greece will work in the academic sector, as well as the probability of his or her choosing employment in various sectors of industry and occupational categories. Probit/multinomial logit models are employed using the 2001 Census data. The empirical results indicate that being young, married, having a Ph.D. in Natural Sciences and/or in Engineering, granted by a Greek university, increases the probability of being employed in the academic sector. Fields of study and the wage rate are the variables that exercise the strongest impact on the predicted probability of choosing employment in various sectors of industry and occupational categories.

JEL Classification: J24, J31
Key words: Ph.D. holder, academic labor market, industry, occupation

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1. Introduction

The number of Ph.D. graduates in Greece has been growing continuously over the last thirty years. Since 1996 the number of Ph.D. graduates has increased by almost 5.5 times, reaching the 1892 mark in 2010, while 58% of them are men and 42% women. Most of the Ph.D. graduates are found in Health Sciences and the Sciences of Engineering, reaching in 2007 almost 70% of the total number of graduates. Regarding their employment status, 31% of Ph.D. holders in 2001 work in academia. With respect to the sectors of industry, most men and women Ph.D. holders are employed in Education, (42.3% and 47%, respectively) and Healthcare (22.4% and 26.2% respectively).

The basic objective of this paper is to analyze the labor market of Ph.D. holders in Greece and to identify the factors that affect the probability of employment in academic and non-academic sectors, as well as the probability of choosing employment in various sectors of economic activity and occupational categories.

Previous research is mostly concentrated on the U.K. and U.S. academic markets and the areas under investigation concern mainly issues regarding earnings differentials among male and female Ph.D. holders and issues of promotion and/or discrimination within the academic sector (Meyer 2005). In Greece, the system of higher education is public, highly concentrated, and the number of the available positions at each university is determined and allocated by the Ministry of Education, Lifelong Learning and Religious Affairs. Each opening of a new employment position is published in the press and the interested individuals submit applications. Furthermore, university salaries are determined by a formal institutional framework, where salaries are mainly related to the tenure status of each position. Consequently, salaries are the same for both males and females and across disciplines, and discrimination in salaries determined by the state is negligible. In addition, the promotion process is also determined by the legal institutional framework depending upon teaching and research requirements and years in a position. No data on these processes are available in order to examine the issues of discrimination in the promotion process among men and women and across disciplines. Given the above institutional framework, our analysis will focus on the factors affecting the probability of employment in the academic and non-academic sector. In other words, the research question concerns factors affecting the "getting in" decision (Meyer 2005), as well as factors affecting the probability of choosing employment in various sectors of industry and occupational categories. As far as we are aware, there is no previous research on the market for Ph.D. holders in

Greece. This paper uses mainly 2001 Census data for Ph.D. holders, data from the Labor Force Survey 2001, as well as the Greek Statistics of Education (1980-2010).

The paper is structured as follows. Section 2 briefly reviews the literature on the academic labor market of Ph.D. holders. Section 3 presents the data and descriptive statistics of the variables used in our analysis. Section 4 presents the results of the econometric analysis. Major findings and conclusions are summarized in Section 5.

2. Review of literature

Research on the market for Ph.D. holders concerns mainly U.K. and U.S. academic markets and focuses on issues regarding earning differentials, promotions and discrimination among male and female Ph.D. holders within the academic sector. Most studies use survey data and control for factors such as the number of published articles, their quality and academic rank. In general, in the U.S., women in academia earn less than their male colleagues, even though the salary gap was closing from the 70's to the 90's (Barbezat 1987; Barbezat 1991; Toutkousian 1998). In particular, in the field of economics, McDowell *et al*., (2001) and McDowell and Smith (1992) find that women have been disadvantaged in promotions, although the effect seems to be diminishing over time. Ginther and Hayes (2003) and Ginther (2001) examine salaries in the U.S. academic labor market and especially in the field of humanities and find a gender pay gap, although they conclude that this is explained by rank rather than within-rank differentials. Furthermore, McDowell *et al*., (2001), Long *et al*., (1993), Kahn (1993, 1995) and Ginther and Kahn (2004) argue that women in academia are less likely to get promoted.

In the U.K. academic sector, salaries are determined within an institutional framework and salary differences are expected to be small, but several studies find a wage gap that is declining over time, as in the U.S. (Dolton and Makepeace 1987; Dolton *et al*., 1989; McNabb and Wass 1997; Ward 1999). In addition, it seems that women face more promotion difficulties (McDowell *et al*., 2001; Long *et al*., 1993; Kahn 1993) and difficulties with editors and referees and thus they are less likely than men to remain in academia after having obtained a doctoral degree (Preston 2004; McDowell *et al*., 2001; Kahn 1993). In the UK and in the field of economics, Blackaby *et al*., (2005), find that there is a significant gender promotions gap. In contrast to Ginder and Hayes (2003) and Ward (1999), they also find that there is a significant within-rank pay gap. They also suggest that for given productivity, individual and workplace characteristics, men receive more outside offers than women

and those offers are associated with higher earnings. Furthermore, their results are consistent with the "loyal servant" hypothesis, i.e., that women are less likely to leave their current employment, perhaps due to family commitments. Ward (1999) reports an average salary differential of 15-26% for British academics, while Blackaby *et al*., (2005), find an average gender pay gap of 18% for academic economists working in the UK.

In Sweden, Amilon *et al*., (2008) designed cross-sectional logit models explaining the probability of being employed in academia, as well as earnings regressions, and found that women Ph.D. holders are less likely to work in the academic labor market in the fields of natural sciences and medicine, while there are no important differences between men and women in the fields of social sciences and humanities. They also found that Ph.D. holders working in academia are paid less by 24% than those working in the non-academic sector. For both sectors, the gender wage gap is 15%. The gender wage gap varies within the academic and non-academic labor markets, as well as within the fields of study, although women's earnings are always less than men's.

3. Data analysis

3.1 Size and composition of Ph.D. graduates, 1980-2010

This section examines the size and the composition of Ph.D. graduates by gender and field of study. In Greece, during the last 30 years, a continuous increase in the number of Ph.D. graduates has been observed. From 1980 to 2010 the number of Ph.D. graduates has increased by almost six times. During this period the percentage of women Ph.D. graduates has increased and reached the 42% mark. The highest increase was observed in the years 1988-89, 2004-05 and 2006-07 (Table 1, Figure 1).

Figure 2 presents the number of Ph.D. graduates by field of study. The main categories-fields of study are Humanities, Social sciences, Natural sciences, Sciences of Engineering, Earth and Agricultural sciences, Healthcare sciences and Other sciences, including Law and Fine Arts. Overall, the number of Ph.D. graduates has increased, in all fields of study, for both women and men. The biggest increase though in the number of Ph.D. graduates has been observed in the fields of Healthcare sciences and Sciences of Engineering (Table 1 and Figure 2).

Specifically, in the field of Engineering we observe a gradual increase in Ph.D. graduates, especially for men, with several peaks. The most significant peak is observed in the academic year 2004-05, where the number of Ph.D. graduates reached

857 (72.2% of the total number) while 15% of them were women. In Healthcare sciences, peaks are observed in the academic years 1988-89 and 2006-07. In the academic year 1988-89 the number of Ph.D. graduates was 760 (76.5% of the total number) while 35% of them were women. In the academic year 2006-07 the number of Ph.D. graduates reached 1426 individuals (58.5% of the total number) while 41% of them were women. In the field of Humanities, the highest increase is observed in 2001-02, corresponding to 321 graduates (38.2% of the total number), 57% of which were women. In Social and Natural sciences we observe a peak in the academic year 2008-09 which corresponds to 191 graduates (50% of them were women) and 288 individuals (42% of them were women), respectively. In Earth and Agricultural Sciences a significant peak is observed in 2009-10, where the number of Ph.D. graduates reached 159 individuals (8.4% of the total number) while 45% of them were women. Finally, in the field of Other sciences we observe a significant increase in the academic year 2005-06, in which the number of Ph.D. graduates was 67 individuals (6.4% of the total number) and 52% of them were women.

3.2 Census Data and descriptive statistics for Ph.D. holders, 2001

The aforementioned aggregate data are drawn from the Statistics of Education. This data base however does not contain data on individual characteristics. Thus, for estimation purposes we will utilize data from the 2001 Census, a sample corresponding to 10% of the Greek population. This sample consists of 1988 individuals, Ph.D. holders, aged between 28 to 65 years old, (1,395 men and 593 women) (see Table 2). The average Ph.D. holder's age is 41 years old while 66% of them are married. Furthermore, most of the Ph.D. holders in Greece have obtained their degree in the field of Healthcare sciences (502 individuals, 25.3% of the total) followed by Humanities (366 individuals, 18.4% of the total) (see Table 2). Also, 69% of the total number of Ph.D. holders have received their degree from a Greek university.

Table 2 and Figure 3 present the employment status of Ph.D. holders in academic and non-academic sectors in the year 2001, by field of study. As can be seen, 31% of the stock of Ph.D. holders works in the academic sector and 69% in the non-academic one. Most Ph.D. holders working in academia in 2001 have their doctorate in the field of Natural sciences (27.8% of the total number of those working in academia) with the share of women standing at 16%. Also, a significant number of Ph.D. holders working in academia have their doctorate in Humanities (19.8%), where the share of women is 42%.

In the non-academic sector, most Ph.D. holders have their doctorate in Healthcare sciences (30.8%) and in Humanities (17.8%). The former work mostly outside academia (84.3%) and most of them are men, with the share of women reaching the 28% mark. The share of women in Humanities is high relative to other fields, corresponding to 51%. Most Ph.D. holders in this field of study are working outside academia (66.7%) and most of them are women (55%).

Table 3 shows the employment status of Ph.D. holders in Greece, in the year 2001, by sector of industry and by gender. The sectors of industry are divided into five major categories according to NACE Rev1-2D. The first category/sector refers to agriculture, livestock, fishing, retail and manufacturing (Agriculture & Manufacturing). The second category/sector refers to services (Services) which includes commercial activities, food services, transportation and similar activities. The third refers to the sector of public administration (Public Administration), the fourth to Education (Education), and the fifth refers to the sector of the Health care services (Health Care). We observe that most Ph.D. holders in Greece in 2001 were employed in Education (43.6%), and in Healthcare (23.5%). Also, most men and women Ph.D. holders are employed in the sector of Education (42.3% and 47%, respectively), as well as in Health Care (22.4% and 26.2%, respectively) (see Table 3).

Regarding the employment of Ph.D. holders by field of study, it is observed that those who have their doctorate in Humanities (79.6%), Social sciences (35%), Earth and Agricultural sciences (51%), Sciences of Engineering (45%) and Other sciences (39%) work in Education (Figure 4)**.** Most of the Ph.D. holders in Healthcare Sciences work in the Health Care sector (72.6%), (Figure 4). In addition, the share of women working in the sector of Education have a doctorate in the field of Humanities (51%) and in Natural sciences (18%) (Figure 5).

For the purposes of our analysis four main occupation categories have been created based on the ISCO88/STEP92 categorization and according to the education/skills needed for each category. The first category refers to Legislators, Senior officials and Managers, the second to Professionals, the third to Technicians and Associate Professionals and the fourth to the Office and Clerks Related Professionals. Ph.D. holders working in academia are included in the occupational category of Professionals (Table 4). We can see in Figure 6 that most Ph.D. holders in Greece are employed in the "Professional" occupational category (77.4%). This holds for both, men and women (77.2% and 77.8%, respectively).

Data on earnings are derived from the Greek Labor Force Survey (LFS) and refer to the median net earnings of Ph.D. holders in Greece, in 2001, by sector of industry.

The median monthly salary of Ph.D. holders, across all occupations, is about 1,360€, and it varies between 818€ and 1,712€. The median monthly salary of men Ph.D. holders is about 1,345€ and of women is about 1,400€. The highest median monthly salaries are observed in the sector of Health Care (1,487€) and in Education (1,445€), which includes salaries in academia. We observe in Figure 7 that the median monthly salary of Ph.D. holders is higher for the occupational category of professionals, where 80% of them earn a median monthly income between 1,400€-1,599€, followed by Legislators, Senior officials and Managers where 62% of them earn a median monthly income between 1,000€-1,199€.

In conclusion, in 2001, 70% of Ph.D. holders are men, 30% are women and 25% have their Ph.D. degree in Healthcare sciences. The share of women varies among the fields of study, with the highest appearing in Humanities (51%) and the lowest in Sciences of Engineering (14%). Regarding employment, 33% of men and 27% of women work in academia. Most Ph.D. holders are employed in Education and in the sector of Health Care. The highest median net monthly salary for Ph.D. holders is observed in the occupational category of Professionals.

4. Econometric analysis

The first model to be used is a binary probit model explaining the probability of being employed in the academic sector utilizing a set of individual characteristics and family related covariates (Per), a set of field of study related covariates (Fac) and the country (C) where the Ph.D. was obtained:

$$y_i^* = \alpha + \beta Per_i + \gamma Fac_i + \delta C_i + \varepsilon_i \quad \textbf{(1)}$$

where y_i^* takes the value of 1 if the Ph.D. holder works in academia and 0 if he/she works elsewhere. The set of individual characteristics and family related covariates (Per), includes age, as well as, dummies indicating gender, marital status and the country of birth. The set of field of study related covariates (Fac), includes dummies indicating the individual's field of study. The variable (C) is a dummy variable that takes the value of 1 if the Ph.D. holder obtained his/her Ph.D. degree from a Greek university (Table 5).

Multinomial logit models are used in order to analyze the predicted probability of choosing employment in various sectors of industry and in an occupational category for Ph.D. holders (Schmidt and Strauss, 1975). These probabilities are assumed to be affected by individual characteristics and family related covariates (Per), a set of

wealth related covariates (W), a set of field of study related covariates (Fac) and the country where the PhD was granted (C):

$$y_i^{**} = \alpha + \beta Per_i + \gamma W + \delta Fac_i + \zeta C_i + \varepsilon_i \quad \textbf{(2)}$$

$$y_i^{***} = \alpha + \beta Wage_i + \gamma Per_i + \delta W_i + \zeta Fac_i + \xi C_i + \varepsilon_i \quad \textbf{(3)}$$

where y_i^{**} is the probability of choosing employment in a particular sector of industry while y_i^{***} is the probability of choosing employment in an occupational category.

The set of individual characteristics and family related covariates (Per), includes variables indicating age, gender, marital status, country of birth, and if he/she lives in the same place where he/she was born. The set of wealth related covariates (W) includes dummies indicating the size of his/her residence (three classes of size, 0-99, 100-199 and greater than 200 square meters), and the ownership status. In equation (3), the median net monthly salary (Wage) of each occupational category is also included. Detailed presentation of the variables used in probit and multinomial logit models are presented at Table 5.

4.1 Empirical results for the probability of working in the academic sector for Ph.D. holders in Greece

Table 6 presents the estimation results of the probit analysis for the probability of working in academia (model 1). Maximum likelihood estimates of the model's parameters, as well as marginal effects, are reported. Most of the variables are statistically significant. Age positively affects the probability of working in academia by 6%, but at a decreasing rate. Also, marriage positively affects the probability by 7%. The gender variable is not statistically significant. The field of study is also a statistically significant factor that positively influences the probability of working in academia. A Ph.D. degree in every field of study increases the probability of working in academia when compared to a Ph.D. degree in Healthcare sciences. For example, an individual who has obtained his/her Ph.D. in Natural sciences has a probability of working in academia of 40.7% compared to someone who has obtained his/her degree in Healthcare sciences. Similarly, having a Ph.D. degree in the field of Earth & Agricultural sciences increases the probability by 35.6%, and in the field of Sciences of Engineering by 32.5%. A Greek Ph.D. degree positively affects the probability of working in academia by 4.2%. Probit results with a gender interaction variable indicate that being female and having a Ph.D. in Humanities and Natural sciences negatively affect the probability of working in the academic sector. In other words, the obtained results show that a young, married Ph.D. holder, who has obtained his/her

doctoral degree in Natural sciences, granted by a Greek educational institution, has the highest probability of working in academia.

4.2 Empirical results for the probability of choosing employment in various sectors of industry/occupational categories for Ph.D. holders in Greece

Table 7 presents the estimation results of the multinomial logit analysis for the probability of choosing employment in various sectors of industry (model 2). Maximum likelihood estimates of the model's parameters, as well as relative risk ratios are reported. The empirical results indicate that the field of study seems to have the strongest impact on the probability of choosing employment in the various sectors of industry. In general, a Ph.D. holder in the field of Humanities, Social sciences etc. is more likely to work in the sectors of Services, Public Administration, and Education compared to Ph.D. holders in the field of Healthcare sciences. For example, a Ph.D. holder in the field of Earth & Agricultural sciences and/or Sciences of Engineering is more likely to choose employment in the sector of Agriculture and Manufacturing by 151 and 517 times, respectively, relatively to someone who has his/her Ph.D. in Healthcare sciences and works in the sector of Heath Care. Similarly, a Ph.D. holder in the field of Sciences of Engineering and Other sciences is more likely to work in the Services category, by 1,774 and 2,151 times, respectively, compared to the base category. Also, Ph.D. holders in the fields of Humanities, Social sciences, Natural sciences, Earth & Agricultural sciences, Sciences of Engineering and Other sciences are more likely to work in the sector of Public Administration by a factor of 203, 111, 69, 69, 362 and 152 respectively, compared to the reference category. Lastly, the relative risk ratio of working in the sector of Education is expected to increase for those who have their doctorate degree in the field of Humanities, Sciences of Engineering and Other sciences by a factor of 303, 209 and 125 respectively, compared to the reference category. The coefficient on the gender dummy is negative and statistically significant in all sectors of industry but the sector of Public Administration, although the relative risk ratios are smaller than unity. Women Ph.D. holders are less likely to work in the sectors of Agriculture and Manufacturing, Services and Education by 0.29, 0.49, and 0.65 times respectively, compared to men.

The variables measuring wealth seem to positively affect the probability of choosing employment in various sectors of industry. The results indicate that if the size of the residence is up to 99 square meters and the Ph.D. holder is the sole owner of this residence then he is more likely to choose employment in the sectors of Agriculture

& Manufacturing and in Public Administration, compared to a Ph.D. holder residing in a house larger than 200 square meters. The variable indicating internal mobility (Live where born) appears to negatively affect the probability of choosing employment in the sectors of Services, Public Administration and Education, compared to the reference category, although the relative risk ratios are smaller than unity.

Table 8 presents the estimation results of the multinomial logit analysis for the probability of choosing employment in various occupational categories (model 3). Maximum likelihood estimates of the model's parameters, as well as relative risk ratios are reported. According to the obtained results, the wage variable is a statistically significant one and positively influences the probability that a Ph.D. holder works in the occupational categories of Professionals and Technicians/ Associate Professionals by a factor of 1231 and 420 respectively, compared to the effect that the wage variable has on those working in the occupational category of Office & Clerks related Professionals. Women Ph.D. holders, in comparison to men, are less likely to choose employment in the occupational categories of Legislators, Senior officials & Managers, and Professionals by a factor of 0.24 and 0.37 respectively. If the Ph.D. holder is married, then he/she is more likely to be observed working in the occupational categories of Legislators, Senior officials & Managers and Technicians & Associate Professionals than the occupational category of Office & Clerks Related Professionals. Lastly, the field of study remains a significant factor affecting the probability of choosing employment in a specific occupational category. In particular, if an individual has his/her doctorate in the fields of Humanities, Social sciences, Earth & Agricultural sciences, Sciences of Engineering and Other sciences relative to Healthcare sciences, then he/she is more likely to work in the occupational category of Legislators, Senior officials & Managers by 12, 16, 8, 18 and 8 times respectively, relative to the base category. If an individual has his/her doctorate in the field of Engineering, relative to Healthcare sciences, then he/she is more likely to work in the occupational category of Professionals by a factor of 8. Similarly, if he/she has a doctorate in the field of Natural sciences then he/she is less likely to work in the occupational category of Professionals by a factor of 0,4. The probability of working in the occupational category of Technicians & Associate Professionals is higher for individuals who have their doctorate in the field of Social sciences and Natural sciences.

5. Conclusions

The main objective of this paper was to investigate the factors influencing the probability of a Ph.D. holder in Greece working in the academic sector, as well as the probability of choosing employment in various sectors of economic activity and occupational categories. Probit and multinomial logit models were employed using the 2001 Census data.

Probit analysis results indicate that being young, married and having a Ph.D. in the fields of Natural Sciences, Earth and Agricultural Sciences and Sciences of Engineering, obtained from a Greek University, increases the probability of working in academia.

The empirical results of multinomial logit analysis for the probability of choosing employment in various sectors of industry for Ph.D. holders in Greece indicate that the field of study is the most statistically significant variable. The probability of working in the sector of Agriculture and Manufacturing is higher for those having their Ph.D. in the fields of Earth & Agricultural sciences and Sciences of Engineering. Similarly, the probability of working in the sector of Services is higher for those having their Ph.D. in the fields of Sciences of Engineering and Other sciences. Finally, the probability of working in the sector of Education is higher for individuals with a doctorate in the field of Humanities and Sciences of Engineering. The coefficient on the gender variable is negative and statistically significant in all sectors of industry, with the exception of Public Administration, but relative risk ratios are smaller than unity.

Regarding occupational choice, the obtained results indicate that the wage variable and the field of study are the most important variables affecting the probability of choosing employment in an occupational category. Specifically, wages affect positively the probability of working in the occupational categories of Professionals and Technicians/Associate professionals. The fields of study are important determinants affecting the probability of choosing work in an occupational category. Ph.D. holders in the fields of Humanities, Social sciences, Earth & Agricultural sciences, Sciences of Engineering and Other sciences are more likely to work in the occupational category of Legislators/Senior officials & Managers. Women Ph.D. holders are less likely, compared to men, to choose employment in the occupational category of Legislators/Senior officials & Managers and in the category of Professionals by a factor of 0.24 and 0.37, respectively.

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Table 1: Total number of Ph.D. graduates by field of study, Greece 1981-2010

Academic year	Humanities	Social sciences	Natural sciences	Sciences of Engineering	Earth & Agricultural sciences	Healthcare sciences	Other sciences	Total
1981/1982	29	8	50	25	10	181	11	314
1982/1983	37	16	47	19	11	305	10	445
1983/1984	43	5	40	15	16	109	6	234
1984/1985	50	8	53	31	30	227	15	414
1985/1986	39	12	59	36	36	245	14	441
1986/1987	22	17	30	38	27	220	11	365
1987/1988	49	15	59	49	26	675	11	884
1988/1989	52	18	56	69	28	760	10	993
1989/1990	40	20	69	43	23	270	9	474
1990/1991	47	12	66	112	59	400	16	712
1991/1992	56	36	100	72	39	294	19	616
1992/1993	36	19	74	70	23	305	5	532
1993/1994	57	9	70	98	30	387	18	669
1994/1995	105	36	105	85	28	186	22	567
1995/1996	81	23	102	106	57	182	7	558
1996/1997	93	25	97	108	41	244	25	633
1997/1998	162	34	108	154	55	183	18	714
1998/1999	139	61	130	289	41	145	22	827
1999/2000	175	40	164	158	57	170	18	782
2000/2001	189	33	114	358	96	143	34	967
2001/2002	321	41	109	177	59	96	34	837
2002/2003	314	129	140	205	71	108	26	993
2003/2004	159	59	205	266	80	86	91	946
2004/2005	235	70	131	857	53	221	22	1589
2005/2006	165	105	193	195	57	405	67	1187
2006/2007	259	134	242	252	90	1426	33	2436
2007/2008	197	128	213	313	93	432	28	1404
2008/2009	234	191	288	456	48	549	31	1797
2009/2010	289	185	278	494	159	449	38	1892

Source: Statistics of Education 1980-2010, ESYE Table 2: Employment status of Ph.D. holders in Greece by field of study, 2001.

Table 2: Employment status of Ph.D. holders in Greece by field of study, 2001

	1. Ph.D. holders in Greece in the year 2001			2. Ph.D. holders in Greece, working in academia at the year 2001			3. Ph.D. holders in Greece working in non-academic sector in the year 2001		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
All fields of study	1988	1.395	593	616	456	160	1372	939	433
			30%			26%			32%
Humanities	366	180	186	122	71	51	244	109	135
			51%			42%			55%
Social Sciences	262	179	83	65	39	26	197	140	57
			32%			40%			29%
Natural Sciences	347	264	83	171	143	28	176	121	55
			24%			16%			31%
Sciences of Engineering	296	255	41	104	94	10	192	161	31
			14%			10%			16%
Earth & Agricultural sciences	102	81	21	41	31	10	61	50	11
			21%			24%			18%
Healthcare Sciences	502	362	140	79	58	21	423	304	119
			28%			27%			28%
Other Sciences	113	74	39	34	20	14	79	54	25
			35%			41%			32%

Source: Greek Census 2001.

Note: The above numbers of Ph.D. holders correspond to 10% of the actual population of Ph.D. holders. Source: Census of Greece 2001.

Table 3: Employment of PhD holders by sector of industry and gender, Greece, 2001

Sectors of industry *		Gender		
		Men	Women	Total
1	Agriculture & Manufacturing	93	11	104
2	Services	294	97	391
3	Public Administration	98	43	141
4	Education	581	264	845
5	Health Care	308	147	455
	Total	1,374	562	1,936

Source: Greek Census 2001.

*Two-digit census industry in five-way grouping.

Table 4: Employment of PhD holders by occupational category, Greece, 2001

Categories of Occupation *		Gender		
		Men	Women	Total
1	Legislators, Senior officials and Managers	149	28	177
2	Professionals	1103	442	1545
3	Technicians and Associate Professionals	113	62	175
4	Office and Clerks Related Professionals	64	36	100
	Total	1429	568	1997

Source: Greek Census 2001.

*Two-digit census occupation in four-way grouping by sex.

Table 5: Variables used for estimation purposes

Variables	
Age	Age
Age^2	Age at square
Female	Dummy variable of sex (1 = woman, 0 = man)
Married	Dummy variable of marital status (1 = married, 0 = non married)
House size 0-99m^2	Dummy variable for residence size (0-99 square meters)
House size 100-199m^2	Dummy variable residence size (100-199 square meters)
House size 200>m^2	Dummy variable for residence size (200- square meters)
House Owner	Dummy variable of ownership status (1 = owner, 0 = not owner)
Lnwage	Natural logarithm of wage
Live Where Born	Dummy variable indicating if the Ph.D. holder lives where he was born (1 = at the same place, 0 = not at the same place)
Country of Birth	Dummy variable indicating if the Ph.D. holder is born in Greece or in another country (1 = Greece, 0 = another country)
Humanities	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in sciences of Humanities
Social Sciences	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in Social sciences
Natural Sciences	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in Natural sciences
Earth & Agricultural Sciences	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in Earth & Agricultural sciences
Sciences of Engineering	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in Sciences of Engineering
Health Care Sciences	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in Healthcare sciences
Other Sciences	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma in Other sciences
Country Studied	Dummy variable indicating if the Ph.D. holder has obtained his/her diploma from a Greek university

Source: Greek Census 2001.
Lnwage: Source LFS 2001.

Table 6: Probit results: probability of working in academia*

Probit results			Probit results with interactions		
Variables	Coefficients (Std. error)	Marginal Effects	Variables	Coefficients (Std. error)	Marginal Effects
Age	0,176***	0,060***	Age	0,175***	0,059***
	(0,0314)			(0,0317)	
Age^2	-0,002***	-0,001***	Age^2	-0,002***	-0,001***
	(0,0003)			(0,0003)	
Female	-0,081	-0,027	Female	0,105	0,036
	(0,0711)			0,1851	
Married	0,206***	0,069***	Married	0,224***	0,075***
	(0,0686)			(0,0850)	
			Married * Female	-0,043	-0,014
				(0,1434)	
Country of Birth	-0,013	-0,004	Country of Birth	0,033	0,006
	(0,1007)			(0,1016)	
Humanities	0,798***	0,297***	Humanities	0,983***	0,367***
	(0,1015)			(0,1289)	
			Humanities* Female	-0,439**	-0,133***
				(0,2093)	
Social Sciences	0,554***	0,201***	Social Sciences	0,482***	0,177***
	(0,1137)			(0,1366)	
			Social Sciences* Female	0,209	0,075
				(0,2400)	
Natural Sciences	1,092***	0,407***	Natural Sciences	1,214***	0,450***
	(0,0984)			(0,1133)	
			Natural Sciences* Female	-0,496**	-0,144***
				(0,2241)	
Earth & Agricultural Sciences	0,933***	0,356***	Earth & Agricultural Sciences	0,867***	0,331***
	(0,1458)			(0,1658)	

			Earth & Agricultural Sciences * Female	0,350 (0,3448)	0,129
Sciences of Engineering	0,866*** (0,1088)	0,325***	Sciences of Engineering	0,926*** (0,1198)	0,348***
			Sciences of Engineering * Female	-0,259 (0,2840)	-0,081
Other Sciences	0,692*** (0,1450)	0,263***	Other Sciences	0,577*** (0,1789)	0,217***
			Other Sciences * Female	0,299 (0,3053)	0,109
Country Studied	0,124* (0,069)	0,042*	Country Studied	0,143** (0,070)	0,047
Constant term	-5,846*** (0,7303)		Constant term	-5,833*** (0,7384)	
Number of observations: 2005			Number of observations: 2005		
LR $chi^2(12)$: 219,25			LR $chi^2(19)$: 238,78		
Pseudo R^2: 0,089			Pseudo R^2: 0,0965		
Log likelihood = -1127,1945			Log likelihood = -1117,4325		
Level of significance: ***a=1%, **a=5%, *a=10%,					
*Test for endogeneity was rejected by the data, (STATA ivprobit procedure)					

Data source: Greek Census 2001.

Table 7: Multinomial Logit Results: probability of working in sectors of industry for Ph.D. holders in Greece*

	P1/P5		P2/P5		P3/P5		P4/P5	
Variables	Coefficients (Std. error)	Relative Risk Ratios**	Coefficients (Std. error)	Relative Risk Ratios	Coefficients (Std. error)	Relative Risk Ratios	Coefficients (Std. error)	Relative Risk Ratios
Age	0,0477	1,0488	-0,2335**	0,7917	-0,1775	0,8373	-0,0876	0,9191
	(0,176)		(0,124)		(0,136)		(0,108)	
Age^2	-0,0008	0,9991	0,0023*	1,0022	0,0024*	1,0024	0,0011	1,0011
	(0,002)		(0,001)		(0,001)		(0,001)	
Female	-1,2333***	0,2913	-0,7189***	0,4872	-0,1012	0,9037	-0,4272**	0,6523
	(0,405)		(0,259)		(0,294)		(0,217)	
Married	0,2242	1,2513	0,1342	1,1437	-0,2639	0,7679	0,3541	1,4249
	(0,354)		(0,227)		(0,298)		(0,232)	
House size (0-99 m^2)	2,4335***	11,3997	0,7407	2,0974	1,1741*	3,2352	0,4788	1,6143
	(0,688)		(0,385)		(0,465)		(0,312)	
House size (100-199 m^2)	1,2542*	3,5050	0,6424*	1,9011	0,6407	1,8978	0,1897	1,2089
	(0,690)		(0,366)		(0,454)		(0,295)	
House Owner	0,9515***	2,5896	-0,1018	0,9031	0,6119**	1,8440	-0,3179	0,7277
	(0,376)		(0,254)		(0,315)		(0,216)	
Live Where Born	0,1079	1,1140	-0,4398*	0,6441	-0,8386***	0,4323	-0,5449***	0,5799
	(0,351)		(0,244)		(0,276)		(0,205)	
Country of Birth	-1,2342	0,2910	-0,1111	0,8948	0,356	0,9650	0,1159	1,1229
	(0,513)		(0,413)		(0,489)		(0,363)	
Humanities	-10,1842	0,0000	6,1839***	484,9209	5,3143***	203,2331	5,7140***	303,0938
	(688,711)		(0,676)		(0,614)		(0,491)	
Social Sciences	5,0870***	161,9154	5,8051***	331,9929	4,7131***	111,4048	3,3905***	29,6821
	(0,632)		(0,548)		(0,483)		(0,333)	
Natural Sciences	4,3323***	76,1219	5,0937***	162,9895	4,2331***	68,9286	4,1967***	66,4665
	(0,793)		(0,543)		(0,474)		(0,297)	

Earth & Agricultural Sciences	5,0196***	151,3561	5,6597***	287,0671	4,2314***	68,8140	3,8431***	46,6705
	(0,759)		(0,675)		(0,673)		(0,496)	
Sciences of Engineering	6,2482***	517,0829	7,4807***	1773,61	5,8911***	361,798	5,3427***	209,0837
	(0,818)		(0,750)		(0,717)		(0,611)	
Other Sciences	3,9475***	51,8076	7,6737***	2150,943	5,0259***	152,3137	4,8304***	125,2703
	(1,339)		(0,860)		(0,895)		(0,745)	
Country Studied	-0,4028	0,6684	0,5338**	0,5863	0,1826	1,2004	0,1874	1,2062
	(0,352)		(0,271)		(0,311)		(0,246)	
Constant term	-60145		1,7321		-1,6091		-0,2466	
	(4,037)		(2,898)		(3,225)		(2,564)	
P1 : The probability of working in the sector of Agriculture & Manufacturing								
P2 : The probability of working in the sector of Services								
P3 : The probability of working in the sector of Public Administration								
P4 : The probability of working in the sector of Education								
P5 : The probability of working in the sector of HealthCare (base category)								
Number of observations: 1754								
LR $chi^2(64)$: 1485,25								
Pseudo R^2: 0,3187								
Log likelihood = -1587,4733								
Level of significance: ***a=1%, **a=5%, *a=10%,								
*STATA was used for the estimation of multinomial logit model								
**Standard interpretation for the relative risk ratio is for a unit change in the predictor variable; the relative risk ratio of an outcome relative to the reference group is expected to change by a factor of the respective parameter estimate given the variables in the model are held constant								

Data source: Greek Census 2001.

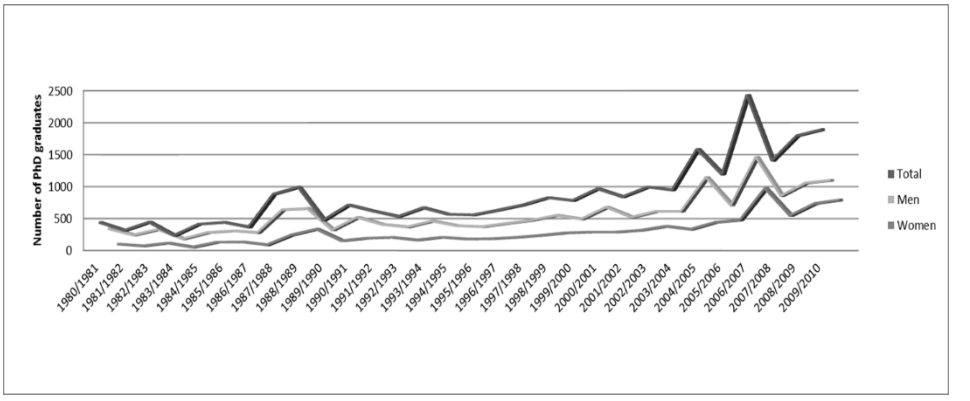
Table 8: Multinomial logit results: probability of working in an occupational category for Ph.D. holders in Greece*

	P1/P4		P2/P4		P3/P4	
Variables	Coefficients (Std. error)	Relative Risk Ratios**	Coefficients (Std. error)	Relative Risk Ratios	Coefficients (Std. error)	Relative Risk Ratios
lnwage	0,7442	2,1048	7,1156***	1230,999	6,0413***	420,4178
	(1,411)		(1,268)		(1,813)	
Age	-0,1275	00,8803	0,0064	1,0065	-0,5761**	0,5621
	(0,232)		(0,213)		(0,251)	
Age^2	0,0017	1,0018	0,0002	1,0002	0,0061**	1,0061
	(-0,003)		(-0,002)		(0,003)	
Female	-1,4098***	0,2442	-0,9913***	0,3711	0,0307	1,0312
	(0,473)		(0,395)		(0,486)	
Married	0,7924*	2,2087	0,3974	1,4879	1,2544***	3,5057
	(0,454)		(0,394)		(0,513)	
House size (0-99 m^2)	-0,4113	0,6628	-0,7273	0,4832	0,2875	1,3331
	(0,857)		(0,787)		(0,948)	
House size (100-199 m^2)	0,6245	1,8673	0,4684	1,5975	1,3389	3,8149
	(0,909)		(0,845)		(0,992)	
House Owner	-0,2802	0,7556	-0,0701	0,9323	0,4389	1,5510
	0,460		(0,407)		(0,532)	
Live Where Born	0,6755	1,9650	-0,7745*	0,4609	0,4799	1,6160
	(0,497)		(0,429)		(0,563)	
Country Of Birth	-0,2084	0,8119	0,4872	1,6277	13,6121	815961
	(0,842)		(0,764)		(438,422)	
Humanities	2,5198***	12,4259	0,9413	2,5634	-0,1022	0,9028
	(0,873)		(0,703)		(0,887)	
Social Sciences	2,7822***	16,1552	-0,0711	0,9314	2,0414***	7,7014
	(0,910)		(-0,774)		(0,858)	
Natural Sciences	0,3001	1,3500	-0,8820*	0,4139	-1,9772**	0,1384
	(0,767)		(0,549)		(0,853)	

Earth & Agricultural Sciences	2,0553**	7,8090	-0,0121	0,9879	-0,0441	0,9568
	(1,043)		(0,885)		(1,102)	
Sciences of Engineering	2,9206***	18,5534	2,0831**	8,0291	0,4189	1,5204
	(1,075)		(0,936)		(1,247)	
Other Sciences	2,1513*	8,5962	1,2176	3,3793	0,8969	2,4520
	(1,293)		(1,126)		(1,317)	
Country Studied	-0,6726	0,5103	0,9556*	0,3846	-0,8821	0,4139
	(0,568)		(0,532)		(0,619)	
Constant term	-3,3082		-46,9629***		-44,9263	
	(11,643)		(10,499)		(438,645)	
P1 : The probability of working in the occupational category of Legislators, Senior officials & Managers						
P2 : The probability of working in the occupational category of Professionals						
P3 : The probability of working in the occupational category of Technicians & Associate Professionals						
P4 : The probability of working in the occupational category of Office & Clerks related Professionals (base category)						
Number of observations: 1702						
LR $chi^2(51)$: 416,93						
Pseudo R^2: 0,2469						
Log likelihood = -635,89491						
Level of significance: ***a=1%, **a=5%, *a=10%						
*STATA was used for the estimation of multinomial logit model						
**Standard interpretation for the relative risk ratio is for a unit change in the predictor variable; the relative risk ratio of an outcome relative to the reference group is expected to change by a factor of the respective parameter estimate given the variables in the model are held constant.						

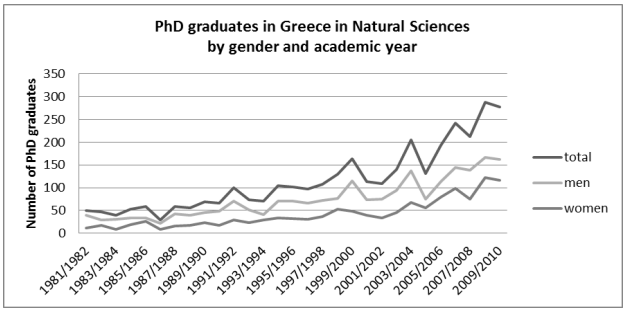
Data source: Greek Census 2001.

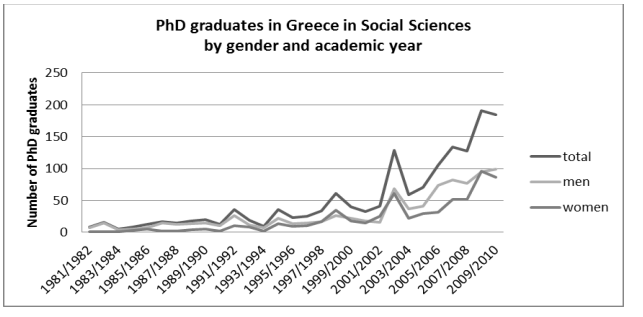
Figure 1: Total number of Ph.D. graduates by academic year and gender, Greece, 1981-2010

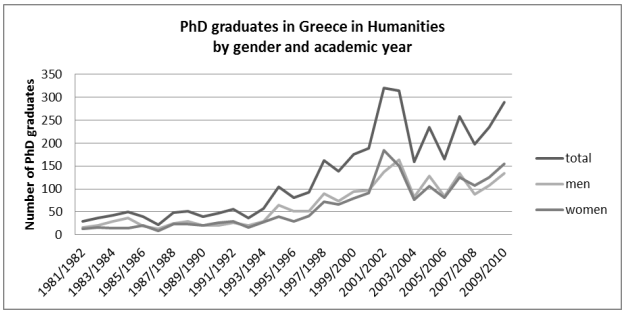


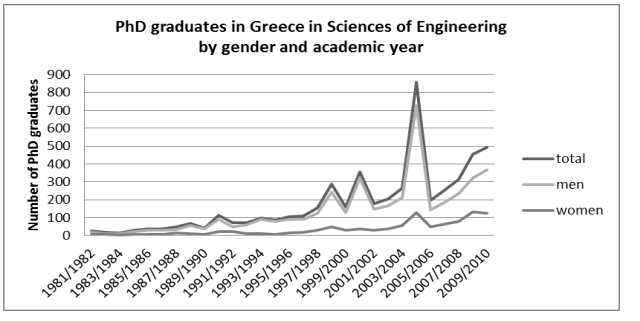
Source: Statistics of Education 1980-2010, ESYE.

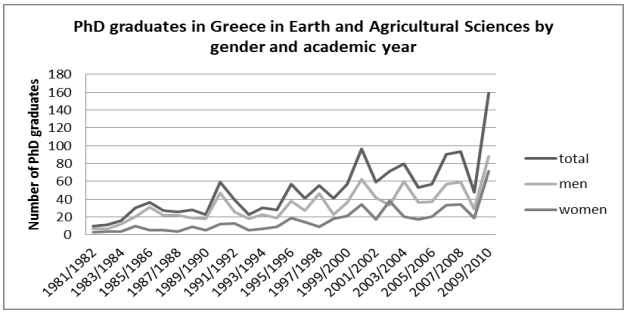
Figure 2: Ph.D. graduates by field of study and gender, Greece, 1981-2010

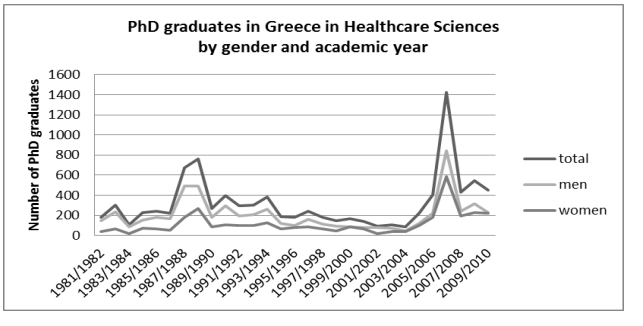


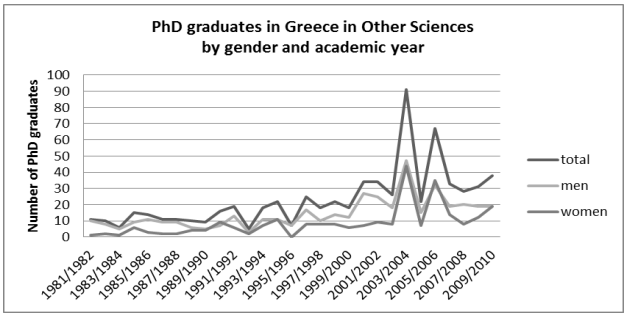



PhD graduates in Greece in Humanities
by gender and academic year
Number of PhD graduates
0
50
100
150
200
250
300
350
1981/1982
1983/1984
1985/1986
1987/1988
1989/1990
1991/1992
1993/1994
1995/1996
1997/1998
1999/2000
2001/2002
2003/2004
2005/2006
2007/2008
2009/2010
total
men
women


PhD graduates in Greece in Sciences of Engineering
by gender and academic year
Number of PhD graduates
0
100
200
300
400
500
600
700
800
900
1981/1982
1983/1984
1985/1986
1987/1988
1989/1990
1991/1992
1993/1994
1995/1996
1997/1998
1999/2000
2001/2002
2003/2004
2005/2006
2007/2008
2009/2010
total
men
women

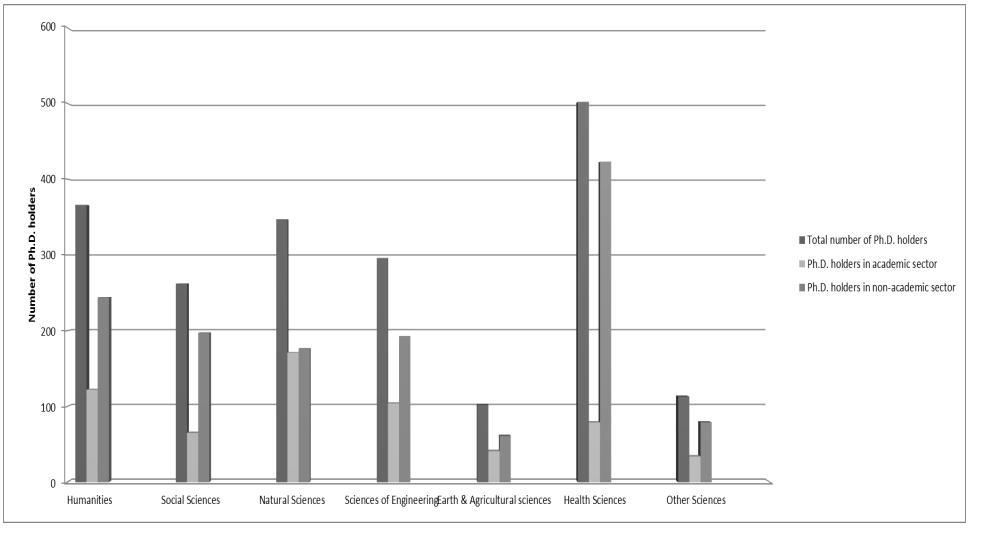

PhD graduates in Greece in Earth and Agricultural Sciences by
gender and academic year
Number of PhD graduates
0
20
40
60
80
100
120
140
160
180
1981/1982
1983/1984
1985/1986
1987/1988
1989/1990
1991/1992
1993/1994
1995/1996
1997/1998
1999/2000
2001/2002
2003/2004
2005/2006
2007/2008
2009/2010
total
men
women


PhD graduates in Greece in Healthcare Sciences
by gender and academic year
Number of PhD graduates
0
200
400
600
800
1000
1200
1400
1600
1981/1982
1983/1984
1985/1986
1987/1988
1989/1990
1991/1992
1993/1994
1995/1996
1997/1998
1999/2000
2001/2002
2003/2004
2005/2006
2007/2008
2009/2010
total
men
women



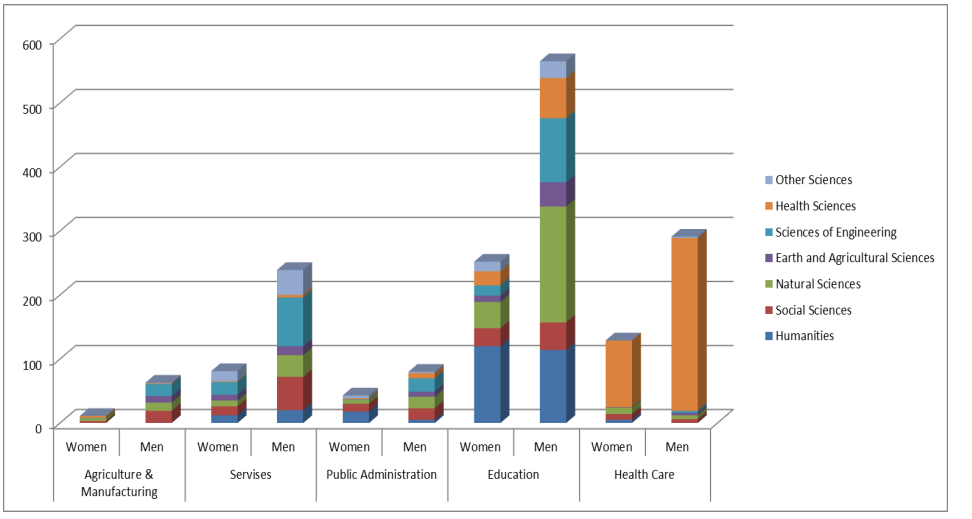
Source: Statistics of Education 1980-2010, ESYE.

Figure 3: Employment of Ph.D. holders in academic and non-academic sectors, by field of study, Greece, 2001



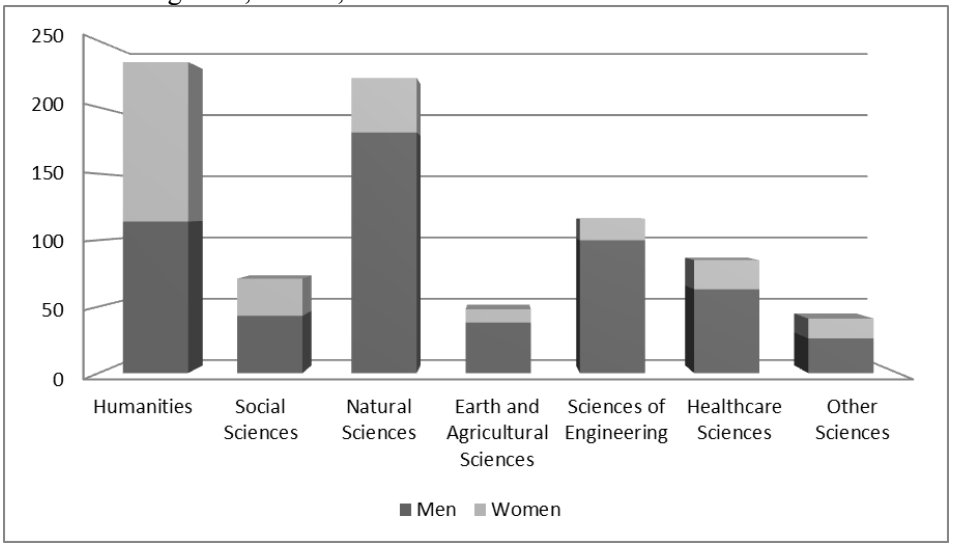
Source: Greek Census 2001 (10% of the Greek population).

Figure 4: Employment of Ph.D. holders in sectors of industry by field of study and gender, Greece, 2001



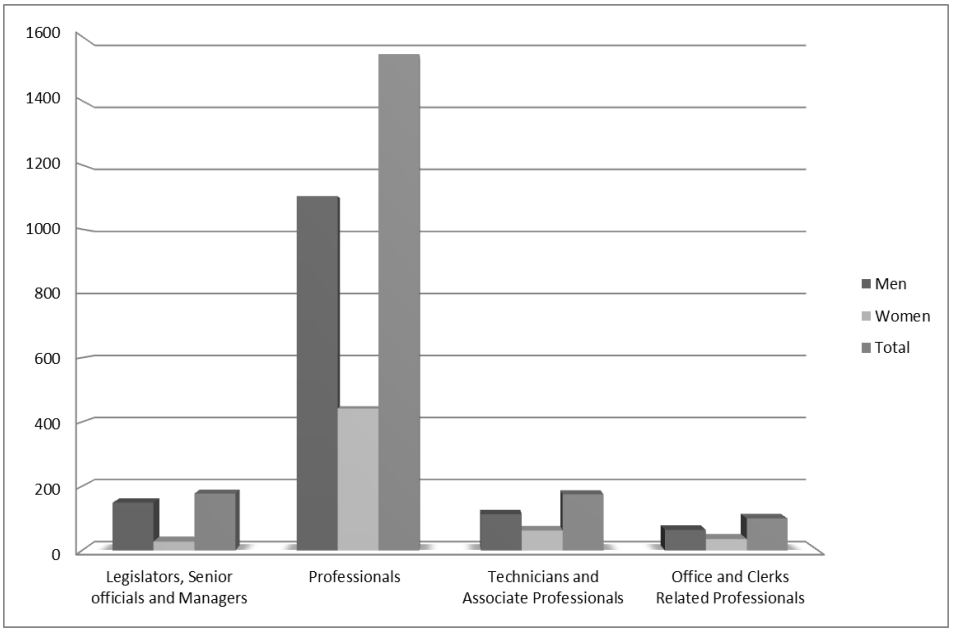
Source: Greek Census 2001.

Figure 5: Employment of Ph.D. holders in the sector of Education by field of study and gender, Greece, 2001



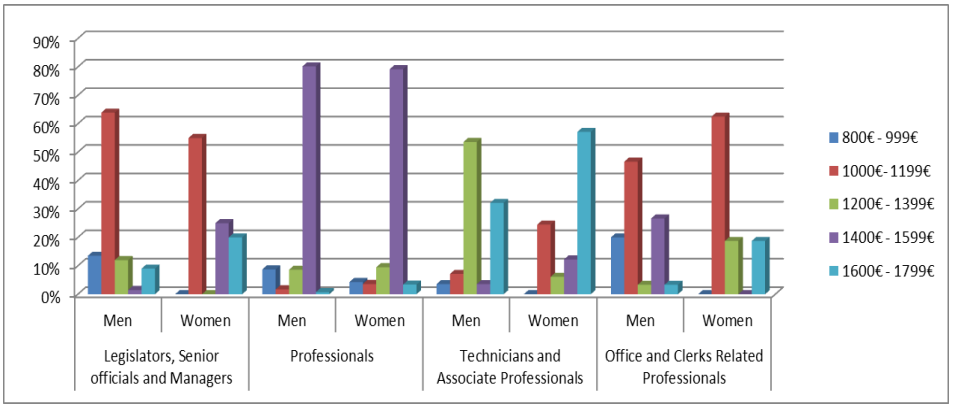
Source: Greek Census 2001.

Figure 6: Employment of Ph.D. holders by occupational category and gender, Greece, 2001



Source: Greek Census 2001.

Figure 7: Median monthly salary for Ph.D. holders by occupational category and gender, Greece, 2001



Source: Greek LFS 2001.