

# Economic Rates of Return on Higher Education in Greece: Master vs PhD

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## Abstract

Given the increasing demand for postgraduate studies in Greece, the question arises whether master's or doctoral studies are more economically efficient for individuals not pursuing an academic career, where PhD is mandatory. Therefore, the aim of this article is the comparative study of the economic rates of return of Master's and Doctoral education. To achieve this aim, the methodology used is based on the extended Mincer equation adapted to the Greek reality. This research uses data from the Household Budget Survey (HBS). The HBS survey was conducted by the Hellenic Statistical Authority covering 6196 private households throughout the country. This paper's contribution lies in the comparative analysis of the rates of return of master's and doctoral level graduates' studies in the Greek labor market.

## Keywords

Mincer Equation, Rates of Return on Education, PhD-Holders, Educational Policy

## 1. Introduction

It is well known that having a degree/diploma at a higher level of education is associated with better employment opportunities, higher income and by extension a better quality of life.

Indeed, according to data from the report of OECD (2023): "Education at a Glance, 2023" (see OECD, 2023: Table A2.4, p. 103) employment rates are higher when the level of education is higher. Specifically in the case of Greece, the employment rates are 79% for those with a university degree when the corresponding average for the countries of OECD is 88% and 91% for those with an MA or PhD, a percentage that is the same for the case of Greece and for the OECD average.

It is worth noting that, according to the data in **Table 1**, in Greece in recent years there has been an increasing trend not only of the number of tertiary education students but also of post-graduate students.

**Table 1.** Students—graduates (Bachelor, Master, PhD) 2015/16 - 2019/20.

Students Graduates	2015/16	2016/17	2017/18	2018/19	2019/20
Undergraduates students	202831	186208	190652	237241	264024
Graduates	34491	33380	33430	38460	39146
Postgraduates (Master's) students	52946	66295	71313	78518	84077
Master's-holders	13276	15292	18373	19106	20577
Doctoral students	33452	28682	29221	30671	31167
PhD-holders	2003	1877	1558	1774	1597

Source: Hellenic Statistical Authority (2024): Greece in figures. <https://statistics.gr/el/greece-in-figures>.

It is noted that according to data up to the academic year 2015/16, 40,554 doctorates had been recorded at the National Documentation Centre (EKT). Most of PhD holders, 86.2% received their doctoral award from Greek universities, 11.2% graduated from other countries in European Union, while 2.4% were from North American countries, mainly the United States of America.

In addition, from the data in **Table A1** (see Appendix), it follows that the expected duration of studies in Greece is 20 years, which corresponds with the highest expected duration of studies in the countries of OECD and EE. The expected duration of studies amounts to 20 years requires the completion of post-graduate studies at the MA degree (1 - 2 years in kindergarten, 6 years in elementary school, 6 years in high school, 4 - 5 years in university and 1 - 2 years for master's studies). Therefore, the main research question is whether it is more economically advantageous to complete postgraduate studies at the master's level or to continue studies to obtain a doctoral degree.

This research question is typically answered by considering the cost of studies, the duration of studies, potential sources of funding for postgraduates' studies, job market prospects and long-term benefits. Concerning the cost of studies, it is noted that tuition fees for obtaining a master's degree, which typically lasts 1 to 2 years, are usually high although there are some master's programs without tuition fees. Doctoral programs which typically last 4 to 6 years or more, usually do not have tuition fees. During doctoral programs, students often receive scholarships or a salary as teaching or research assistants. Regarding job market prospects, master's graduates enter the workforce earlier than doctoral graduates in well-paid positions that require less specialized knowledge. PhD holders, as mentioned in the next section, primarily pursue academic positions or roles in research centers which are limited compared to the supply. Additionally, the personal characteristics of the master's or doctoral degree holder are crucial to their career development.

Taking the above into consideration, the research question will be answered

based on the economic rates of return on education of master's degree holders and PhD's holders. The calculation of the economic rates of return considers all costs, both direct and indirect, associated with acquiring a master's or doctoral degree. In this paper, the estimation of the rates of return on education will be based on the Mincer methodology (see sections 4 and 5).

The contribution of this paper to the literature is the comparative study of rates of return on education of Master's degree holders and PhD holders, specifically concerning the case of Greece. This comparative study is considered useful for policymakers.

The next section refers to the relevant literature, specifically focusing on PhD holders.

## 2. Literature Review

The students' main reasons to do an MBA course are related to the possibilities of improving their career, acquiring new skills, obtaining leadership positions and building professional net works (de Rosa et al., 2022).

However, many recent studies refer to the employment of PhD degree holders in the labor market. This is because the number of PhD holders has increased significantly compared to previous decades.

PhD programs were established to formalize the process of becoming an academic and a researcher. However, with the rapid rise of PhD holders beyond academic positions, the question of what to do with PhD's as sovereign in higher education studies over the last couple decades (Sarrico, 2022), overcoming the possible bias of credentialism inflation (Santos, Horta, & Heitor, 2016). Recent research has already addressed the issue of doctoral curricula in terms of transferable skills (Rodrigues et al., 2018).

According to (Sarrico, 2022), although the aim of doctoral education was first and foremost the efficient reproduction of academic staff, PhD's graduates are increasingly seeking employment in the non-academic.

In accordance with the study of Hanks and Kniffin (2014) and Di Paolo (2016), PhD's holders are less satisfied with non-monetary aspects of non-academic jobs.

Per Stern's (2004) study job offers received by PhD's are lower in salary than expected, As stated by the findings of the studies of (Bloch, Graversen, & Pedersen, 2015; Roach & Sauermann, 2010) preferences for monetary and non-monetary outcomes are important in understanding industry destinations of PhDs, deepening the cleavage between science and good pay.

Also based on the study of Marini and Henseke (2023) a PhD has on average an economic pay-off that it also depends on one's capacity to acquire leadership positions, so that they suggest further relevant research.

It is noted that the rates of return on higher education in Greece in recent years have fluctuated at the level of 8.6% (Magoula, 2023, 2024). It is also clarified that according to the results of study of Magoula (2024) the rates of return

on higher education is only 6.1% in the public sector and a higher 9.6% in the private sector of employment.

Therefore, it will be more cost-effective to invest in a Master or PhD degree, if the returns on postgraduate studies are higher than 8.6%.

The remainder of the study is organized as follows: section 3 presents the data, section 4 briefly describes the Methodological issues, section 5 presents the empirical results, section 6 provides the discussion and section 7 concludes.

### 3. Data

We processed data from the Household Budget Survey (2022), (see: <https://www.statistics.gr/en/statistics/-/publication/SFA05/2022>).

The HBS survey was conducted by the Hellenic Statistical Authority covering 6196 private households throughout the country. The Household Budget Survey is a national survey collecting information for representative samples of households, on households' composition, members' expenditure on goods and services as well as on their income (Table 2).

**Table 2.** Annual wage, experience and age based on highest level of education.

Highest level of education they have completed:		Wage in euro	Experience	Age
Primary	Mean	9429.14	41.66	53.66
	N	147	147	147
	Std. Deviation	4454.437	8.532	8.532
Highschool (Gymnasium)	Mean	10626.81	31.01	49.01
	N	266	266	266
	Std. Deviation	4334.862	9.363	9.363
General lyceum or EPAL	Mean	11795.76	27.48	45.48
	N	988	988	988
	Std. Deviation	5673.235	10.585	10.585
Vocational education (IEK)	Mean	12161.62	24.35	42.35
	N	343	343	343
	Std. Deviation	5844.300	10.915	10.915
BSc	Mean	14772.13	23.11	45.11
	N	1034	1035	1035
	Std. Deviation	7740.134	10.856	10.856
Msc or MA	Mean	20935.51	22.19	44.19
	N	248	248	248
	Std. Deviation	12198.972	9.260	9.260
Phd	Mean	24708.01	29.08	51.08
	N	50	50	50
	Std. Deviation	24567.157	7.837	7.837
Total	Mean	13569.65	26.25	45.69
	N	3076	3077	3077
	Std. Deviation	8250.335	11.254	10.663

Source: ELSTAT (Hellenic Statistical Authority), *Household Budget Survey* (2022).  
<https://www.statistics.gr/en/statistics/-/publication/SFA05/2022>.

The different wages by education level explains the demand for the different education levels. Considering the costs per level of education, we try to estimate the rates of returns to education. The rates of return ( $r$ ) to schooling equates the value of a lifetime earnings of the individual to the net present value of costs of education. For an investment the rate of return to schooling should be positive. The calculation of the educational training returns is done with various methodological approaches (Psacharopoulos & Patrinos, 2018).

In this study, the approach based on the extended Mincer equation is chosen, specifically tailored for the case of Greece (see the following sections).

#### 4. Methodology: Mincer Equation

Based on the data that we have from the Household Budget Survey (2022) we will apply the Mincer Method (1974). The Mincer method has provided a great service in estimating returns to schooling by means of the semi log earnings functions (see Becker & Chiswick, 1966). This Method provides estimates of the average monetary returns of one additional year of education (Patrinos, 2016).

According to the standard Mincer equation, income from work is equal to:

$$\ln W = a + bS + c(EXP) + d(EXP)^2 + u \quad (1)$$

In function (1) the dependent variable  $W$  (wages) which is the income from work is determined by the following independent variables:  $S$  (schooling) which equals years of education and  $(EXP)$  experience which corresponds to work experience. Work experience ( $EXP$ ) is calculated as follows:  $EXP = AGE - S$  (total years of study)  $- 6$ (age of enrolment in compulsory education).

Depending on the needs of the research the Mincer equation method also includes various dummy variables.

In our model we extend the Standard Mincer equation with the dummies variables  $S_2$  and  $S_3$ , to estimate the rates of returns to higher education.

$$\ln W = a + b_2S_2 + b_3S_3 + c(EXP) + d(EXP)^2 + u \quad (2)$$

where  $S_2$  is equal to 1 for persons who completed secondary school, 0 otherwise,  $S_3$  is equal to 1 for persons who completed at least a university degree, 0 otherwise.

The coefficient estimates,  $b_2$ ,  $b_3$  in Equation (2) are approximate estimates of the income differentials attributable to each of these levels of schooling, relative to the excluded category.

The marginal rate of return to schooling (per year of extra study) is given by the following formula:

$$r_{(\text{higher versus secondary})} = (b_3 - b_2) / (n_3 - n_2) \quad (2.a)$$

where  $n_2$ ,  $n_3$  are respectively the years of education associated with the levels of education  $S_2$  and  $S_3$ .

Then to estimate the monetary rewards of the additional years of study for the

acquisition of the master's degree (MS or MA), and doctoral (Phd) diploma, we specialize the Mincer Equation (2) by introducing the dummy variables  $S_4$  and  $S_5$ :

$$\ln W = a + b_2 S_2 + b_3 S_3 + b_4 S_4 + b_5 S_5 + c(EXP) + d(EXP)^2 + u \quad (3)$$

where  $S_4$  is equal to 1 for persons who have a Master degree, 0 otherwise;  $S_5$  is equal to 1 for persons who has a Phd diploma, 0 otherwise.

The coefficient estimates  $b_4$ ,  $b_5$  in Equation (3) are approximate estimates of the income differentials attributable to each of these levels of schooling, relative to the excluded category.

By analogy with relation to (2a) we calculate the rate of return to schooling  $r$  (Master's degree versus Bachelor's degree) and  $r$  (Phddiploma versus Master's degree).

## 5. Earnings Functions: Empirical Results

The estimation results of the Equation (2) are significant and are listed in the following **Table 3**:

**Table 3.** Estimates of earnings regression (2), entire sample.

Variables	Coefficient	t-value	Sig.
Constant	8.328	149.758	0.000
Secondary	0.247	5.258	0.000
Higher	0.593	12.172	0.000
Experience	0.047	14.0611	0.000
(experience) <sup>2</sup>	-0.001	-10.451	0.000
<b>STATISTICS</b>			
R		0.425	
R <sup>2</sup>		0.180	
Adj. R <sup>2</sup>		0.179	
St. Error of the estimate		0.504	
F		169.487	
dF		4	
Sig.		0.000	
N		3141	

Source: ELSTAT (Hellenic Statistical Authority), *Household Budget Survey* (2022).  
<https://www.statistics.gr/en/statistics/-/publication/SFA05/2022>.

According to relation of the formula (2a) and considering that the normal duration of study in standard higher education in Greece is 4 years it follows from the results of **Table 3**:

$$r(\text{higher vs secondary}) = (0.593 - 0.247)/4 = 0.086 \quad (2b)$$

From formula (2b) it is concluded that the efficiency of higher education

(Bachelor's degree) is 8.6%. In other words, the efficiency of higher education in Greece has remained the same (8.7%) since 1993, in about thirty years (see: Magoula & Psacharopoulos, 1999; Magoula, 2023, 2024).

The estimation results of Equation (3) are statistically significant and are listed in the following **Table 4**:

**Table 4.** Estimates of earnings regression (3), entire sample.

Variables	Coefficient	t-value	Sig.
Constant	8.340	152.248	0.000
Secondary	0.256	5.543	0.000
Bsc	0.527	10.909	0.000
ms or ma	0.856	15.168	0.000
Phd	0.893	10.710	0.000
Experience	0.045	13.637	0.000
(experience) <sup>2</sup>	-0.001	-9.981	0.000
<b>STATISTICS</b>			
R		0.456	
R <sup>2</sup>		0.208	
Adj. R <sup>2</sup>		0.206	
Std. Error of the estimate		0.496	
F		134.366	
dF		6	
Sig.		0.000	
N		3141	
Adj R <sup>2</sup>		0.206	

Source: ELSTAT (Hellenic Statistical Authority), *Household Budget Survey* (2022).

<https://www.statistics.gr/en/statistics/-/publication/SFA05/2022>.

From the results of **Table 4**, the following rates of return emerge:

1) Taken into account that the typical duration of postgraduate study programs in Greece is 2 years, is deduced to:

$$r(\text{ms or ma vs Bsc}) = (0.856 - 0.527)/2 = 0.1645.$$

$$\text{Such as : } r(\text{ms or ma vs Bsc}) = 16.4\%$$

2) Considering that the minimum standard duration for obtaining doctoral diplomas in Greece is 3 years, is deduced to:

$$r(\text{ma or ms vs phd}) = (0.893 - 0.856)/3 = 0.0123.$$

$$\text{Such as : } r(\text{ma or ms vs phd}) = 1.2\%$$

where as if the average value of 4 years is considered as the duration for obtaining a doctoral diploma than it is concluded that:

$$r(\text{ma or ms vs phd}) = (0.893 - 0.856)/4 = 0.009.$$

$$\text{Such as : } r(\text{ma or ms vs phd}) = 0.9\%.$$

It is worth noting that, according to the data from the [Metrics EKT \(2024\)](#) report, more than 52% of all PhD candidates in Greece complete their doctoral studies in more than 5 years. Therefore, in this case, the rate of return of doctoral studies is even lower than 0.99%.

In conclusion, based on this research, it emerged that Master (MS or MA) degrees provide the highest rates of return, which is 16%, while the rate of return of Ph.D.'s is almost lower than 1%.

## 6. Discussion

According to the research outcomes, the rates of return on higher education have remained at about 8.6% since 1993. In contrast, the rate of return for a master's degree is more than double. It is 16.45%. This means that investing in a master's degree is particularly rewarding for the labor market. The high monetary rewards of postgraduate diplomas explain the high demand of Greeks for postgraduate's studies for master's degree.

The rates of return for PhD holders are approximately 0.9% if they have completed a master's program and continued their studies for an additional 4 years to obtain their doctoral degree. These rates are even lower if the duration of doctoral studies is longer. It is worth noting that according to data from the National Documentation Centre (Report 2024) more than 52% of doctoral candidates complete their studies in more than 5 years.

The low rates of return of doctoral studies explain, according to the data from the National Documentation Centre (Report 2024), the stay of Greek PhD holders abroad for 5 - 10 years. The mobility of doctorate holders differed according to employment status (employed-unemployed and inactive) and the type of activity (research-non research). It is also noted that most of PhD-holders, about 57.0% were employed in the higher education sector, 20.6% in the government sector and 8.7% in the business sector. In accordance with the National Documentation Centre's report regarding job satisfaction, 58.7% of employed holders stated that their work was related to the subject of their doctoral degrees. The main factors for satisfaction were "contribution to society", "job location" and "level of responsibility". As expected, because of the low rates of return of doctoral studies, financial remuneration, in the form of salary and benefits, provided the least satisfaction.

Furthermore, it is worth noting that based on the data in the [Table 4](#), the rate of return on investment in doctoral studies without prior master's degree is approximately 9% when the duration of studies is 4 years and about 6% when the duration of studies is 6 years. In other words, the rate of return on investment in education for obtaining a doctoral degree is almost 8.7%, that is the rate of return on bachelor's degree. It is also important to note that the effectiveness of investing in education to obtain a doctoral degree depends on individual goals and personal characteristics. Additionally, it should be noted that as indicated by the data from National Documentation center's report, despite the low rates of

return on doctoral studies, the employment rate for PhD holders increased from 85% in 2017 to 88% in 2019 and 92% in 2020.

Finally, it is worth noting that based on the data in the **Table 2**, the average annual wage of PhD holders with about 29 years of experience is 24708.01 euros that is greater than the corresponding average annual wage of master's degree holders with 44 years of experience that is 20935.51 euros.

## 7. Concluding Remarks

In conclusion, the rate of return on investment in education for obtaining a master's degree is significantly higher than that for obtaining a doctoral degree. Due to the very low rates of return on education for acquiring a doctoral degree, further study is necessary to evaluate social rates of return on education for obtaining doctoral degree and to investigate the existence of the phenomenon of over-education in Greece.

Last but not least, greater interconnection/Interface research is needed in research centers as well as the university Institutions with the production leading to a higher efficiency of research. So, it will be essential for policy to focus on the possibility of implementing the findings of doctoral research in both the public and private sectors.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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## Appendix

**Table A1.** School Expectancy 2017-2021.

	2017	2018	2019	2020	2021
<b>Euro area</b>					
Austria	17	17	17	18	18
Belgium	19	19	19	19	19
France	17	17	17	17	17
Germany	18	18	19	19	19
Greece	19	19	20	...	...
Estonia	18	18	18	18	18
Ireland	19	20	19	19	19
Spain	18	18	18	18	19
Italy	17	17	17	17	....
Croatia	17	17	17	17	17
Cyprus	17	17	17	17	18
Latvia	18	19	19	18	19
Lithuania	19	19	18	18	18
Luxembourg	15	15	15	15	15
Malta	16	16	16	16	16
Netherlands	19	19	19	19	19
Portugal	17	17	18	18	18
Slovakia	16	16	16	16	16
Slovenia	18	18	18	18	18
Finland	21	21	21	21	21
<b>Non-euro area</b>					
Bulgaria	16	16	16	16	16
Denmark	20	20	20	20	20
Hungary	17	17	17	17	17
Poland	18	18	18	18	18
Romania	...	...	...	...	...
Sweden	21	21	21	21	21
Czechia	....	17	17	17	18

Source: Eurostat.