

ISSN Online: 2162-2086 ISSN Print: 2162-2078

RR on Education in Greece: Public vs Private Economic Sector, 1977-2022

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How to cite this paper: Magoula, T. (2024). RR on Education in Greece: Public vs Private Economic Sector, 1977-2022. *Theoretical Economics Letters, 14*, 524-535. https://doi.org/10.4236/tel.2024.142027

Received: January 20, 2024 Accepted: April 15, 2024 Published: April 18, 2024

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Abstract

The aim of this article is to examine the rates of return to education in the public and private sectors in Greece during the period 1977-2022. Overtime, rates of return on education in the public sector in Greece are lower than their counterparts in the private sector. The contribution to literature is in estimating the economic returns to education, as decision makers should incorporate them into the planning policy for enhancing the public sector in Greece.

Keywords

Education, Rates of Return, Public Economic Sector, Private Economic Sector

1. Introduction

The investment in education depends primarily on the labor market expectations of the trainees. According to the international bibliography, the amount of the salary is determined among other indicators, by the years of education and the years of work experience of the person. There are several methodological approaches to estimating the rates of return to education to the individual's salary (Patrinos, 2016; Psacharopoulos & Patrinos, 2018).

From the recent data of the Labor Force Survey concerning the year 2022 and conducted by ELSTAT it appears that the largest percentage of workers in Greece who are employed in the public sector, approximately 70% have completed higher education (see Appendix, Table A.1). Therefore, the question is raised whether the returns to education to the wage of those employed in the public sector are higher than the corresponding ones in the private sector. We will try to answer this question in our present article.

2. Literature Review

It should be noted that in the case of Greece, several relevant studies have been carried out from the decade of the 1960's until today. As an example, we mention the studies of Leibenstein (1967), Psacharopoulos (1982), Lambropoulos and Psacharopoulos (1992), Patrinos (1995), Magoula (1998, 1999, 2023), Magoula and Psacharopoulos (1999) and Prodromidis and Prodromidis (2008). Regarding the comparison of the results of the rates of return on education in the private and public sector in Greece we noted the following:

According to the Leibenstein's (1967) study the rates of return to schooling for employees was 6.4% in the public economic sector and 7.3% for employees in the private economic sector (see **Table 1**).

Psacharopoulos (1982) assessed the income function for Greece based on ELSTAT 1977.

He found that years of education and experience account for more than a third of the people's income. This result is compatible with relevant results from the international experience. Psacharopoulos estimated that the private rate of return on education for an additional year of training averaged 5.0%. This percentage is relatively low compared to international data. The explanation given by Psacharopoulos (1982) for this low rate of return to education was that the number of graduates exceeded market demand creating a buyer's market and a corresponding downward pressure on wages. As a result, the returns to education decreased.

Per their study Lambropoulos and Psacharopoulos (1992) processed data from 1300 workers for the years 1977, 1981, and 1985. They used the Mincerian equation method. Cohn and Addison (2006) based on the results of Lambropoulos and Psacharopoulos (1992) findings, they extracted the rates of return on education for the public and private sectors in Greece, which are described in Table 1.

It should also be noted that the results concerning the year 1977 based on the research of Lambropoulos and Psacharopoulos (1992) are compatible with those of the research of Patrinos (1995).

Per Magoula's (1998, 1999) and Magoula's and Psacharopoulos's (1999) studies, they processed data from the Household Budget Survey which it was conducted in the years 1993-1994. The authors referred to it as the 1993 Survey, because most of the data evaluated was collected in the year 1993. This Survey was conducted by the National Statistical Service of Greece (ESYE the previous name of ELSTAT) covering 6756 households in the entire country. The findings of their research on the rates of return to education in the public and private sectors are reported in **Table 1**.

According to the data of **Table 1**, the results of the Magoula's (1998, 1999) and Magoula's and Psacharopoulos's (1999) studies converge with the findings of the Leibenstein's (1967) research.

Table 1. Rates of return to Education in Greece, by sector, 1977, 1981, 1985 and 1993 (%).

Year (Overall Returns)	Public Sector	Private Sector
1977	6.4	7.3
1981	4.1	5.0
1985	3.4	4.0
1993	6.3	7.0

Source: Lambropoulos and Psacharopoulos (1992), Table 1, Magoula (1998) Table 7.10, Magoula (1999) Table 8 and Table 9, Magoula and Psacharopoulos (1999), Table 6.

It should be noted that the results are not completely comparable overtime, because either the models applied, or the sources of the data used differ.

The study conducted by Prodromidis and Prodromidis (2008) examined the evolution of private rates of return to schooling in Greece during 1988-1999 period by level of education (primary, secondary, and tertiary) and not by economic sector (public, private).

In addition, Magoula's (2023) research investigated the trend of the rates of return on higher education in Greece for the period 1962-2022. She observed that there is no significant increase in the rates of return to schooling, which led her to conclude that educational reforms are necessary.

So, from 1993 to today 2023 almost 30 years, there have been no research results regarding the rates of return on education in the public and private sectors in Greece. However, to continue the research we analyzed data from the Household Budget Survey (2022). The remainder of the study is organized as follows: Section 3 briefly describes the Methodological issues, section 4 provides the Data, section 5 presents the Empirical results, section 6 provides the Discussion, and section 7 concludes.

3. Methodological Issues

Based on the data that we have from the Household Budget Survey (2022) we will apply the Mincer Method (1974). The Mincer equation explains earnings as a function of schooling and labor market experience, giving a clear sense of average monetary returns of one additional year of schooling (Patrinos, 2016).

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

$$\ln W = a + bS + c \left(\text{EXP} \right) + d \left(\text{EXP} \right)^2 + u \tag{1}$$

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).

Mincerian equation can be used to estimate returns at different levels of schooling by converting the continuous year of schooling variables (S) into a series of dummy variable.

So, we extend the basic Mincer equation with the dummies variables S_2 and S_3 , to estimate the rates of returns to higher education.

$$\ln W = a + b_2 S_2 + b_3 S_3 + c (EXP) + d (EXP)^2 + u$$
 (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.

After fitting this extended earning function, the private rate of return to different levels of schooling can be derived from the Psacharopoulos' formula. Psacharopoulos (1982) suggests that the marginal rate of return to schooling (per year of extra study) is given by the following formula:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2)$$
(3)

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

4. Data

We processed data from the Household Budget Survey (HBS, 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 sample of households, on households' composition, members' expenditure on goods and services as well as on their income.

The following **Table 2** and **Table 3** describe the processed data from the HBS used in our analysis.

From **Table 2**, it is evident that approximately half of the population of the sample consists of males and the other half comprises females. Additionally, roughly twice as many people are employed in the private sector compared to the public one.

Furthermore, referring to **Table 3**, it is noted that although according to the results of the ELSTAT Labor Force Survey, 2022 (see **Table A.1** in the Annex), 69.2% of the employees working in the public sector have completed higher education, in our sample, 43.3% of the total employees in both the public and the private sectors have completed higher education, while 51.9% have completed secondary education.

Table 2. Employees by economic sector.

SEX	PUBLIC SECTOR	PRIVATE SECTOR	PUBLIC & PRIVATE
MEN	472	1146	1618
WOMEN	535	978	1513
EMPLOYEES (TOTAL)	1007	2124	3131

Source: ELSTAT, Household Budget Survey (HBS, 2022), https://www.statistics.gr/en/statistics/-/publication/SFA05/2022.

Table 3. Employees by educational level.

Educational level	Frequency	Percent	Valid percent
Primary	147	4.7	4.8
Secondary	1597	51.0	51.9
Higher	1333	42.6	43.3
Total	3077	98.3	100,0
Missing system	54	1.7	
Total	3131	100	

Source: ELSTAT, Household Budget Survey (HBS, 2022), https://www.statistics.gr/en/statistics/-/publication/SFA05/2022.

5. Income Function: Empirical Results

In the following tables, we present the results of the data processed from https://www.statistics.gr/en/statistics/-/publication/SFA05/2022.

According to our model:

$$\ln W = a + b_2 S_2 + b_3 S_3 + c (EXP) + d (EXP)^2 + u$$
 (4)

First, we estimate the Mincerian equation 4 for all the employees without discrimination based on public or private sector employment.

The estimates of regression (4) can be found in **Table 4**.

According to the results of the **Table 4**, the rate of return to education for workers in public and private economic sectors is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.584 - 0.239)/4 = 0.345/4 = 0.8625$$

Therefore, the rate of return to schooling for all employees is 8.63%. This finding is almost equivalent to the corresponding average rate of return to schooling in the regions of Europe, and Central Asia (Patrinos and Montenegro, 2021, Table 3).

As a follow-up, we estimate regression 2 by using only employee from the public sector (Table 5).

Table 4. RR to education for employees in public and private economic sectors.

	Model ^a	Cilotuii	Unstandardized Coefficients		Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	8.331	0.057		147.407	0.000
	Experience	0.048	0.003	0.966	14.317	0.000
	Experience * experience	-0.001	0.000	-0.750	-10.775	0.000
	Secondary	0.239	0.048	0.215	4.966	0.000
	Higher	0.584	0.050	0.521	11.717	0.000

R = 0.425, $R^2 = 0.180$, Adj. $R^2 = 0.179$, Std. Error of the estimate 0.50274, F = 168.969, dF = 4, Sig. = 0.000, N = 3131.

Note: Model regression, sum of squares 170.827, mean square 42.707, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

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

Table 5. RR to education for employees in public sector.

	Model ^a		Unstandardized Coefficients		Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	8.215	0.108		75.728	0.000
	Experience	0.049	0.007	1.022	7.305	0.000
	Experience * experience	-0.001	0.000	-0.836	-5.758	0.000
	Secondary	0.375	0.088	0.398	4.264	0.000
	Higher	0.619	0.089	0.667	6.923	0.000

R = 0.412, $R^2 = 0.170$, Adj. $R^2 = 0.166$, Std. Error of the estimate 0.415, F = 50.980, dF = 4, Sig. = 0.000, N = 1007.

Note: Model regression, sum of squares 35.042, mean square 8.760, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

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

Based on **Table 5**, the rate of return to education for employees in public economic sector is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.619 - 0.375)/4 = 0.244/4 = 0.061$$

Thus, the rate of return to education for workers in the public economic sector is 6.1%. This finding (6.1%) is less than the corresponding (8.63%) for employee in entire economic sector. According to the Patrinos's and Montenegro's (2021) study this finding represents the average rate of return to schooling by

region, specifically Middle East and North Africa (Table 3).

Given that the rate of return to schooling for employees in both the private and public sectors is higher (8.63%), upgrading the public sector becomes a necessity.

To answer the basic query of our survey we need to examine the rates of return to education for private sector workers.

Therefore, we estimate the Mincerian equation (2) for the employees in the private sector. The results of this estimation are presented in **Table 6**.

Table 6. RR to education for employees in private sector.

	Model ^a		Unstandardized Coefficients		Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	8.363	0.068		123.233	0.000
	Experience	0.047	0.004	0.947	11.741	0.000
	experience * experience	-0.001	0.000	-0.732	-8.803	0.000
	Secondary	0.195	0.057	0.163	3.434	0.001
	Higher	0.579	0.061	0.469	9.511	0.000

R = 0.398, $R^2 = 0.158$, Adj. $R^2 = 0.157$, Std. Error of the estimate 0.540, F = 97.749, dF = 4, Sig. = 0.000, N = 2124.

Note: Model regression, sum of squares 114.035, mean square 28.509, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

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

From the data in **Table 6**, the rate of return to education for workers in private economic sector is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.579 - 0.195)/4 = 0.384/4 = 0.096$$

Hence, the rate of return to education for employees working in the private sector is 9.6% that is higher than the corresponding rate of return to education for the employees in the public sector.

To further verify the validity of the above results, we examine the rates of return of education on wages separately for male and female employees in both the public and private sectors. These results are described in **Tables 7-10**.

According to the data in **Table 7** the rate of return to education for men in public economic sector is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.290 - 0.096)/4 = 0.194/4 = 0.0485$$

Therefore, the rate of return is 4.85%.

Based on the data in **Table 8**, the rate of return to education for women in public economic sector is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.947 - 0.551)/4 = 0.396/4 = 0.099$$

So, the rate of return is 9.9%.

Referring to **Table 9**, the rate of return to education for men in private economic sector is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.548 - 0.143)/4 = 0.405/4 = 0.1012$$

Hence, the rate of return is 10.1%.

Table 7. RR to education for men in public sector.

	Model ^a	O IIOUIII	Unstandardized Coefficients		Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	8.501	0.154		55.362	0.000
	Experience	0.061	0.009	1.374	6.827	0.000
	Experience * experience	-0.001	0.000	-1.210	-5.885	0.000
	Secondary	0.096	0.123	0.113	0.777	0.437
	Higher	0.290	0.125	0.344	2.329	0.020

R = 0.390, $R^2 = 0.152$, Adj. $R^2 = 0.144$, Std. Error of the estimate 0.391, F = 20.841, dF = 4 Sig. = 0.000, N = 472.

Note: Model regression, sum of squares 12.765, mean square 3.191, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

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

Table 8. RR to education for women in public sector.

	Model ^a	Unstandardized Coefficients		Standardized Coefficients	Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	7.975	0.144		55.475	0.000
	Experience	0.035	0.010	0.687	3.640	0.000
	experience * experience	0.000	0.000	-0.439	-2.206	0.028
	Secondary	0.551	0.118	0.524	4.652	0.000
	Higher	0.947	0.121	0.934	7.815	0.000

R = 0.508, $R^2 = 0.258$, Adj. $R^2 = 0.252$, Std. Error of the estimate 0.406, F = 45.868, Df = 4, Sig. = 0.000, N = 535.

Note: Model regression, sum of squares 30.227, mean square 7.557, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

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

Table 9. RR to education for men in private sector.

	Model ^a		Unstandardized Coefficients		Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	8.387	0.088		95.501	0.000
	Experience	0.059	0.005	1.200	11.219	0.000
	experience * experience	-0.001	0.000	-0.935	-8.514	0.000
	Secondary	0.143	0.073	0.122	1.954	0.051
	Higher	0.548	0.078	0.453	7.029	0.000

R = 0.478, $R^2 = 0.228$, Adj. $R^2 = 0.226$, Std. Error of the estimate 0.502, F = 82.386, Df = 4, Sig. = 0.000, N = 1146.

Note: Model regression, sum of squares 82.991, mean square 20.748, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

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

Table 10. RR to education for women in private sector.

	Model ^a		Unstandardized Coefficients		Т	Sig.
		В	Std. Error	Beta		
1	(Constant)	8.372	0.103		81.547	0.000
	Experience	0.035	0.006	0.728	5.998	0.000
	experience * experience	-0.001	0.000	-0.580	-4.638	0.000
	Secondary	0.222	0.087	0.193	2.546	0.011
	Higher	0.578	0.094	0.491	6.167	0.000

R = 0.343, $R^2 = 0.118$, Adj. $R^2 = 0.114$, Std. Error of the estimate 0.536, F = 31.619, dF = 4, Sig. 0.000, N = 978.

Note: Model regression, sum of squares 36.315, mean square 9.079, Sig. 0.000.

Source: ELSTAT, Household Budget Survey (HBS, 2022),

 $\underline{https://www.statistics.gr/en/statistics/-/publication/SFA05/2022.}$

From the data in **Table 10**, the rate of return to education for women in private economic sector is estimated as follows:

$$r_{\text{(higher versus secondary)}} = (b_3 - b_2)/(n_3 - n_2) = (0.578 - 0.222)/4 = 0.356/4 = 0.089$$

As a result, the rate of return is 8.9%.

In summary, the results are presented in Table 11.

Table 11. RR on education by sex and economic sector, 2022.

HBS, 2022	PUBLIC SECTOR	PRIVATE SECTOR	PUBLIC & PRIVATE
Men	4.85% (N = 472)	10,1% (N = 1146)	8.4% (N = 1618)
Women	10% (N = 535)	9% (N = 978)	10.23% (N = 1513)
Total	6.1% (N = 1007)	9.6% (N = 2124)	8.6% (N = 3131)

Source: ELSTAT, Household Budget Survey (HBS, 2022), https://www.statistics.gr/en/statistics/-/publication/SFA05/2022.

6. Discussion

In accordance with the information provided by Table 11, the rate of return of education on the wages of male employees is less than half of that observed for female employees in the public sector. Given that the number of male and female individuals in the sample employed in the public sector is approximately the same, this result explains the low rate of return of education in the public sector.

Additionally, from the data in **Table 11**, it is evident that the rates of return of education on the wages of employees in the public sector are significantly lower than those of employees in the private sector. Therefore, the strong demand for public sector jobs in Greece cannot be explained by the public sector employees' rates of return to education. As per Papapetrou (2006) research, the primary reason behind Greece's high inclination towards public sector work is the endowment of personnel.

The results of **Table 11** are compatible with the corresponding findings of Magoula's (1998, 1999 and 2023) studies and Magoula's and Psacharopoulos's (1999) research. These results converge with the corresponding ones from the Leibenstein's (1967) research.

In conclusion, overtime rates of return to education in the public sector in Greece are lower than their counterparts in the private sector. It is strongly recommended that the rates of return on education be considered while planning Greece's public sector upgrade since they are useful instrument for Economic Policy Planning.

More specifically to improve the rates of return in the public sector a reform is proposed in the structure and operation of the public sector so that job positions correspond to education, training, and skills of the employees. That means greater productivity of the public sector and consequently an increase in contribution of education to the development of Greece.

7. Conclusion

The rates of return of education on the wages of public sector employees in Greece have remained at the same levels as those observed in the 1970s and 1990s decades (see **Table 1** and **Table 11**). Given that during the 1977-2022 period of 45 years,

the rates of return of education on the wages of private sector employees have increased by more than 30% reform in the public sector is deemed necessary.

Furthermore, a significant disparity in the rates of return of education to wage ratio has been observed between men and women employed in the public sector. This divergence necessitates further study.

Conflicts of Interest

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

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Appendix

Table A.1. Labor force in public sector, 2022.

	N	%
1) Primary	26,683	3.6
2) Secondary	201,975	27.2
3) Higher	513,889	69.2
Total	742,546	100.0

Source: ELSTAT, (Hellenic Statistical Authority), *Labor Force* (2022), https://www.statistics.gr/en/statistics/-/publication/SJO01/2022.