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Human Capital Theory vs. Screening Hypothesis: Evidence from the Greek Health Sector

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Abstract

This study tests whether the human capital theory is stronger than the screening hypothesis, using data from the Greek health sector. The paper estimates the rates of return of workers in the Greek health sector and tests the screening hypothesis. The evidence shows that the 'weak' version of the screening hypothesis is valid, but in general, the empirical results are consistent with the human capital theory.

JEL: J24, I26

Key words: Rate of Return, Human Capital, Screening Hypothesis, Greek Health Sector

1. Introduction

An important question that has been attempted to be answered in the literature is whether a person with higher education is paid more because his earnings reflect his higher productivity or because it is discounted that he is more efficient. More than 35 years have elapsed and yet, much is still unknown about the relative importance of screening hypothesis versus the human capital theory. Following the seminal study (Arrow, 1973), testing for the screening hypothesis has remained a popular research activity in economics of education.

According to the human capital literature (Schultz, 1961; Becker, 1964; Mincer, 1974) education and training are the main channels of producing, accumulating and diffusing human capital. Based on the human capital theory, (Schultz, 1961; Becker 1964) education and training enhance productivity and lead to higher earnings-wages. On the other hand, according to the screening hypothesis, employers use education and training so as to hire workers with greater ability from a pool of job applicants whose qualities are not certain. Screenists argue that education and training serve as a filter mechanism for individuals' abilities and not so much as a productivity enhancing mechanism (Berg, 1971; Arrow, 1973; Spence, 1973; Stiglitz, 1975).

One particular method of testing for the screening hypothesis is the distinction between "strong" version and "weak" version. According to the "strong" version, employers will continue to pay higher wages to the more educated-trained, after the employee has been with

them for some time. According to the "weak" version, employers do in fact offer higher starting salaries to the more educated-trained relative to the less educated-trained in the absence of any other information on the new employees expected productivity (Psacharopoulos, 1979).

The aim of this paper is the comparative analysis between the theory of human capital and the screening hypothesis. The paper estimates the rates of return of health system workers (nurses) and test the screening hypothesis. Data used come from a sample based on a survey contacted by the authors. This sample is comprised of selected private hospitals.

Our paper contributes to the literature by adding new estimates about the value of human capital theory (hct) from a country that is a member of the European Union and the Eurogroup. Also, after a decade of economic crisis, Greece has managed to stabilize its economy and to produce primary surpluses. The data were also drawn from a sector which has an important offer to individuals and the society. Today it is at the "first line" of tackling a new crisis, which is health crisis but with a very significant impact on the economy at global level.

The rest of paper is organized as follows: In section 2, we summarize the main points of the screening literature. Section 3 presents a brief reference on the Greek Health System, whilst section 4 outlines the sampling and data. In section 5, we report the empirical analysis. Finally, in section 6, we provide some concluding comments.

2. A Brief Literature Review

There is strong empirical evidence of a positive relationship between education - training and wages (Willis, 1986; Murphy and Welch, 1990). These empirical findings, as it is often the case with empirical research, do not go unchallenged. Two contrasting views have emerged in recent decades. Human capital theory argues that education and training directly augment individual productivity by enhancing the cognitive, behavioral and manual capacities, and thereby wages and earnings (Mincer, 1974; Becker, 1975). In contrast, under the screening hypothesis, education and training are merely indicators of ability (Arrow, 1973; Spence, 1973; Stiglitz and Weiss, 1995). This hypothesis assumes that individuals hold different levels of productivity from the day they are borne. Thus, education and training merely signal inherent productivity without contributing. More able individuals invest in education and training to signal their higher abilities, and employers use education and training to select more able individuals in the absence of any better information, but education and training itself need not contribute to productivity. In short, human capital theory holds that the economic value of education is productive, while the screening hypothesis argues for the informative value of education. Human capital theory and screening hypothesis are the two elementary, competitive and complementary theories in the economics of education. They both try to explain the positive relationship between education and earnings (FengLiang Li, et al 2009).

Furthermore, another approach has been proposed to contrast a "strong" and a "weak" version of the screening hypothesis. It addresses a theoretical distinction between the "weak" and the "strong" version of the screening hypothesis, depending on whether pay irrational wages at the initial hiring point (weak) or continuously (strong) (Psacharopoulos, 1979).

If employers have limited information on ability, they might use education-training as a filter ("weak" screening), but as they accumulate direct evidence on productivity of workers on the job, they will cease using education-training as a filter in determining promotions and pay increases. Only in the case where employers do not observe productivity directly, as

employees accumulate experience, they will continue to pay more for education-training as a signal of ability ("strong" screening). In the case of "weak" screening, the earnings premium associated with education-training should decline with experience, whereas in the case of "strong" screening, this should not be true. Psacharopoulos (1979) reported that the differential associated with experience was higher in the distributive trades (assumed a competitive sector without "strong" screening) than in public administration, rejecting the hypothesis that "strong" screening might persist in non-competitive sectors. The "weak" screening hypothesis, on the other hand, concedes that whilst the primary role of education and training is to signal, it may also augment inherent productivity. The "strong" screening hypothesis presumes productivity to be immutable with education and training being used exclusively as a signal.

A number of empirical studies, designed to test the validity of the screening hypothesis have employed various data sets, methodologies and techniques, suggesting no clear consensus on the matter by reporting contradictory results (Taubman and Wales, 1973; Layard and Psacharopoulos, 1974; Wiles, 1974; Wolpin, 1977; Psacharopoulos, 1979, 1983; Riley, 1976, 1979; Lee, 1980; Katz and Ziderman, 1980; Albrecht, 1981; Fredland and Little, 1981; Liu and Wong, 1982; Miller and Volker, 1983; Tucker, 1985, 1986; Cohn et al. 1986,1987; Arabsheibani, 1989; Ziderman, 1992; Oosterbeek, 1992; Groot and Oosterbeek, 1994; Brown and Sessions, 1999; Bedard, 2001; Riley, 2001; Spence, 2002; Heywood and Wei, 2004; Miler, Mulvey and Martin, 2004; Miler, 2009; FengLiang Li, Xiaohao Ding, Morgan W. John, 2009; Patrinos and Savanti, 2014).

So far, there have been only a few studies on the screening hypothesis concerning Greece (Magoula and Psacharopoulos, 1999; Psacharopoulos and Tsamadias, 2001; Tsamadias and Chanis, 2012). Empirical studies have failed to support the existence of screening, even the "weak" version.

3. A Brief Review of Greek health system

Nowadays in the country there are 277 hospitals which have 45,267 beds. Of these, 147 are private hospitals. In addition, there are 201 Health Centers and about 200 former polyclinics of Social Insurance Institution, which constitute the Primary National Health Network. Furthermore, there are 1,487 regional centers in rural areas and 127 local health units in urban areas. All these units belong to 7 Health Districts, which mainly have a supervisory and coordinating role. The administration is exercised mainly centrally by the Ministry of Health and the respective minister chooses the directors and the members of administrations of hospitals.

Although the private hospitals are more than the public hospitals, about 65% of hospital beds are in public hospitals and only 35% in the private sector. This is because most private hospitals are small or medium in size (general, obstetric or psychiatric mainly). Greek hospitals show the lowest average length of stay in the E.U. (5.2 days), while the average fullness of the beds (74%) is similar to the E.U. average.

One of the problems of the national health system is the lack of staff and the proportion of doctors and nurses. Greece has the largest number of doctors and the smallest number of nurses in proportion to its population, throughout the European Union. While the health system needs at least 2-3 nurses per doctor, the ratio is about 1.3. As concerns the shortages of non-medical staff and mainly nurses, is estimated that about 20,000 nurses are missing. In general, only 5.4% of the country's workforce is employed in the health sector, while the corresponding percentage in OECD countries exceeds 10%.

In terms of operating costs, the National Health System offers universal coverage, but relies on taxation and insurance. In addition, it shows a very large share of private spending. In Greece, 90% of private health expenditures come directly from "users" (citizens), and only 10% is covered by private insurance companies. During of the financial crisis, the health spending has reduced. The "memorandum" goal was to limit public spending to 6% of GDP and in particular, the public spending on medicines to 1% of GDP. This goal has been achieved since 2011. Nowadays the public spending is around 5%, while the average in EU countries is 7%. Total health expenditure in 2016 reached at 8.45% of GDP, from 9.47% in 2009 (OECD average: 15.3%). Only for the period 2012-2016, the reduction has reached at 14.7 billion €[1].

4. The Data

Our study uses data (gender, marital status, age, years of work, educational level, income) provided by the human resource departments of two private general hospitals located in Athens (we focus on Athens since the majority of hospitals are located there) for the year 2017.Our sample focuses on permanent nursing staff and doctors and does not include individuals who are self-employed or part-time workers, given that human capital externalities are more likely to manifest among workers that have constant, daily contact with each other. The reason for choosing the private sector to draw our sample is that it better reflects education–driven differences in productivity. Our sample consists of full-time employed nursing staff from the following educational groups: holders of postgraduate degrees, graduates of tertiary education (Universities, Higher Technological Institutions), graduates of post-secondary institutions, and secondary education graduates (General Lyceum, Technical Vocational Lyceum) and doctors. According to the Hellenic Statistical Authority (2017a), the total number of employed nursing staff (both in private and public sector) in 2017 was 38,400 and the total number of employed doctors was 23,555. Given that the number of beds in private hospitals is about the 35% of the total number of beds (Hellenic Statistical Authority, 2017a), we can roughly estimate that about 13,440 nurses are employed in the private sector (no accurate data about the number of nursing staff employed in the private sector are available) and 8,244 doctors. Our sample (283 individuals) represents the 0.45% of the total population (and the 1.3% of the population employed in the private sector). The fact that the data were provided by the human resource departments of large companies ensures the good stratification of our sample.

5. Empirical Analysis

The paper uses the Mincerian method for the estimation of rate of return to private investment and to testing the screening hypothesis. We estimate the rate of return of nurses who are graduates of post-secondary initial vocational training institutes, higher technological educational institutions, universities and postgraduate programs as well as doctors. We note that the graduates of secondary education (control group) are nurses. They have completed the direction of health studies in vocational high school. The basic function is estimated by using the gross earnings, the actual experience and by gender.

The private rate of return has been estimated by using the formula:

[1] Georgakopoulos, Th. (2020), https://www.euractiv.gr/section/koinoniki-eyropi/opinion/ena-neo-ethniko-systima- ygeias/

$$LnY_i = a + b \cdot S_i + c \cdot EX_i + d \cdot EX_i^2 + u_i \quad (1)$$

Where: Y_i is the gross annual earnings of individual i, S_i is the years of study of individual i, EX_i is the experience (number of years) of individual i, a is the constant, u_i is the disturbance term and b, c, d are the regression coefficients.

Table 1: The rate of return of nurses who are graduates of post-secondary initial vocational training institutes (Control group the graduates of secondary education)

Independent Variables	Male	Female	All
	Dependent Variable (LnYg)		
a (Constant)	8.5933**	8.6334**	8.618**
	(46.92)	(69.18)	(82.52)
S	0.0421**	0.0448**	0.044395**
	(3.21)	(5.33)	(6,16)
EX	0.0502**	0.0366**	0.0400**
	-6,28	(5.71)	(7.93)
EX^2	-0.0007**	-0.0003**	-0.00047**
	(-3.48)	(-2.43)	(-3,68)
Adj. R^2	0.9015	0.8299	0.8474
F	65.07	103.45	158,29
Signif	0.0000	0.0000	0.0000
N	22	64	86

Note: ** statistically significant at 5%

Table 2: The rate of return of nurses who are graduates of higher technological educational institutions (Control group the graduates of secondary education)

Independent Variables	Male	Female	All
	Dependent Variable (LnYg)		
a (Constant)	8.807**	8.759**	8.76**
	(52.60)	(63.58)	(82.74)
S	0.0483**	0.0507**	0.0506**
	(4.64)	-6,21	(8.02)
EX	0.0268**	0.0223**	0.0236**
	(2.0)	(3.48)	(4.29)
EX^2	-0.00043NS	-0.00024NS	-0.00028NS
	(-1.10)	(1.16)	(-1.66)
Adj. R^2	0.5248	0.4016	0.4629
F	14.99	21.58	38.64
Signif	0.0000	0.0000	0.0000
N	39	93	132

Note: ** statistically significant at 5% and N.S non significant

Table 3: The rate of return of nurses who are graduates of universities (Control group the graduates of secondary education)

Independent Variables	Male	Female	All
	Dependent Variable (LnYg)		
a (Constant)	8.307**	8.343**	8.346**
	(40.83)	(69.97)	(80.56)
S	0.0654**	0.0718**	0.0702**
	(5.27)	(10.83)	(12.01)
EX	0.0601**	0.0341**	0.0395**
	(3.38)	(4.25)	(5.38)
EX^2	-0.00122**	-0.000365NS	-0.000561**
	(-2,59)	(-1.62)	(-2.76)
Adj. R^2	0.7574	0.7469	0.7442
F	21.81	63.96	83.44
Signif	0.0000	0.0000	0.0000
N	21	65	86

Note: ** statistically significant at 5% and N.S non significant

Table 4: The rate of return of nurses who are graduates of postgraduate programs (Control group the graduates of universities)

Independent Variables	Male	Female	All
	Dependent Variable (LnYg)		
a (Constant)	8.558**	8.545**	8.384**
	(20.63)	(17.00)	(23.95)
S	0.0494**	0.0612**	0.0687**
	(2.27)	(2.07)	(3.36)
EX	0.0751**	0.0408**	0.05**
	(4.84)	(3.13)	(5.02)
EX^2	-0.00195**	-0.00087**	-0.00118**
	(-4.61)	(-2.02)	(-3.8)
Adj. R^2	0.5462	0.3903	0.4355
F	8.62	9.96	16.94
Signif	0.0000	0.0000	0.0000
N	20	43	63

Note: ** statistically significant at 5%

Table 5: The rate of return of doctors (Control group the graduates of secondary education)

Independent Variables	Male	Female	All
	Dependent Variable (LnYg)		
a (Constant)	8.242**	8.102**	8.149**
	(32.24)	(58.78)	(54.30)
S	0.0802**	0.0874**	0.0802**
	(6.76)	(15.70)	(13.57)
EX	0.0542**	0.0363**	0.053**
	(2.23)	(2.66)	(3.59)
EX^2	-0.00125**	-0.00032NS	-0.001**
	(-2.21)	(-0.94)	(-2.88)
Adj. R^2	0.6112	0.8784	0.7497
F	23.01	111.73	89.88
Signif	0.0000	0.0000	0.0000
N	43	47	90

Note: ** statistically significant at 5% and N.S non significant

Table 6: The Private Rate of Return (%) by using the Mincerian method

Level of education	Male	Female	All
Nurses			
PSIVTI	4.21	4.48	4.43
	(0,0131166)	(0,0084023)	
HTEI	4.83	5.07	5.06
	(0,0104052)	(0,0081703)	
Universities	6.54	7.18	7.02
	(0,0124244)	(0,0066394)	
Master's	4.94	6.12	6.87
	(0,021844)	(0,0295424)	
Doctors			
Universities	8.02	8.74	8.02
	(0,0118681)	(0,055679)	

Note: a. Calculations of researchers, b. in parenthesis the std error, c. PSIVTI: Post-secondary initial vocational training institutes, d. HTEI: Higher technological educational institutions

The above findings suggest that the private rate of return of doctors is higher than that of nurses. In addition, the private rate of return of nurses seems to increase with the level of education up until university (i.e., university-educated nurses have a higher return than those with PSIVTI and HTEI educational backgrounds). Furthermore, the rate of return of females appears to be higher than that of male, for both doctors and nurses and at each level of education. However, with respect to this result, according to the Wald chi squared test with 1 degree of freedom, the difference in coefficients between these two groups is not statistically

significant (the values are: for PSIVITI, 0.029, for HTEI, 0.033, for Universities, 0.2, for Master's, 0.1 and for doctors, 0.01). Finally, all of the above results are in accordance with the human capital theory.

A more elaborate test refers to the "weak" versus the "strong" version of the screening hypothesis. According to the "weak" version, employers could initially offer higher wages to the more educated-trained workers due to the absence of information on their prospective productivity. But if education - training was really used as a screening device, and the more educated-trained were not more productive relative to their less educated-trained counterparts, private employers would adjust downwards the initial wage premium they offered. Or, the observed experience-earnings profiles of people with different levels of education and training would converge, rather than diverge, over time.

We narrow down the test to refer to health sector at each level education. Thus, we included in our analysis employees from the private health sector in order to conduct a more rigorous test of the non-convergence of experience-earnings profiles with an interaction term:

$$LnY_i = a + b * S_i + c * EX_i + d . (S_i * EX_i) + u \quad (2)$$

Where: Y_i is the gross annual earnings, S_i is the years of study and EX_i is the experience (number of years). $S_i * EX_i$ is an interaction term, a is a constant, b, c, d are the regression coefficients and u is the disturbance term. The sign of the coefficient d along with its statistical significance determine whether we have a case of filtering or not. This means that if d were positive and significant, it would indicate divergence of the two profiles, while if it were negative and significant, it would indicate convergence of the two profiles, hence lending support to the screening hypothesis. To further fine-tune the test, we have fitted the above function separately to males and females.

Tables 7-11 present a test for the sign and significance of the S*EX interaction term.

Table 7: Testing for the Screening Hypothesis to nurses who are graduates of post-secondary initial vocational training institutes (Dependent variable: LnY_G)

Independent Variables	**Male**	**Female**	**All**
a (Constant)	8.579**	8.559**	8.560**
	(15.73)	(26.40)	(31.06)
S	0.0588NS	0.0606**	0.0603**
	(1.41)	(2.44)	(2.85)
EX	0.0359NS	0.0355NS	0.0342**
	(1.22)	(1.91)	(2.3)
S*EX	-0.0098NS	-0.00093NS	-0.000951NS
	(-0.44)	(-0.7)	(-0.83)
Adj. R^2	0.8371	0.8147	0.8236
F	36.96	93.31	133.32
Signif	0.0000	0.0000	0.0000
N	22	64	86

Note: ** significant at 5% and N.S non significant

The results in Table 7 suggest that the "strong" version of the screening hypothesis hold for the samples of Females (column 2) and All (column 3). In both of these cases, education has a positive effect on earnings. The interaction term (S*EX) is insignificant throughout. Also, the variable that measures education (in years) is insignificant in the case of males.

Table 8: Testing for the Screening Hypothesis to nurses who are graduates of higher technological educational institutions (Dependent variable: LnY_G)

Independent Variables	**Male**	**Female**	**All**
a (Constant)	7.602**	8.172**	8.093**
	(22.60)	(26.99)	(34.21)
S	0.140**	0.0928**	0.0992**
	(6.02)	(4.64)	(6.30)
EX	0.0867**	0.0543**	0.0586**
	(4.73)	(3.15)	(4.42)
S*EX	-0.00522**	-0.00267**	-0.00298**
	(-4.10)	(-2.28)	(-3.31)
Adj. R^2	0.6675	0.4261	0.4947
F	26.43	23.77	43.75
Signif	0.0000	0.0000	0.0000
N	39	93	132

Note: ** significant at 5%

In all columns of Table 8, the findings support the "weak" version of the screening hypothesis, that is, the earnings of individuals decrease with experience (in all cases, the interaction term (S*EX) is statistically significant).

Table 9: Testing for the Screening Hypothesis to nurses who are graduates of universities (Dependent variable: LnY_G)

Independent Variables	**Male**	**Female**	**All**
a (Constant)	7.087**	8.346**	8.109**
	(17.67)	(31.55)	(34.99)
S	0.183**	0.078**	0.0979**
	(6.18)	(4.21)	(5.95)
EX	0.0989**	0.027NS	0.0425**
	(4.65)	(1.80)	(3.28)
S*EX	-0.00623**	-0.000393NS	-0.00164NS
	(-3.99)	(-0.37)	(-1.77)
Adj. R^2	0.8252	0.7366	0.7307
F	32.48	60.66	77.89
Signif	0.0000	0.0000	0.0000
N	21	65	86

Note: ** significant at 5% and N.S non significant

Table 10: Testing for the Screening Hypothesis to nurses who are graduates of postgraduate programs (Dependent variable: LnY_G)

Independent Variables	Male	Female	All
a (Constant)	12.564**	5.892**	6.924**
	(8.76)	(5.27)	(7.13)
S	-0.159NS	0.231**	0.172**
	(-1.85)	(3.42)	(2.93)
EX	-0.229**	0.22**	0.131**
	(-2.44)	(3.04)	(2.04)
S*EX	0.0142**	-0.0124**	-0.00717NS
	(2.49)	(-2.83)	(-1.84)
Adj. R^2	0.2388	0.4415	0.3355
F	2.99	12.07	11.43
Signif	0.0000	0.0000	0.0000
N	20	43	63

Note: ** significant at 5% and N.S non significant

The results in Table 9 suggest that the "strong" version of the screening hypothesis hold for the samples of Females (column 2) and All (column 3). In both of these cases, education has a positive effect on earnings. The interaction term (S*EX) is insignificant throughout. Contrary, the findings support the "weak" version of the screening hypothesis for the sample of males. The interaction term (S*EX) is statistically significant.

Table 11: Testing for the Screening Hypothesis to doctors (Dependent variable: LnY_G)

Independent Variables	Male	Female	All
a (Constant)	7.015**	8.521**	7.38**
	(16.36)	(32.03)	(31.16)
S	0.189**	0.0637**	0.158**
	(6.97)	(3.18)	(9.91)
EX	0.0907**	0.0045**	0.0711**
	(4.08)	(0.3)	(5.83)
S*EX	-0.00554**	0.00147NS	-0.00402**
	(-4.08)	(1.28)	(-5.02)
Adj. R^2	0.6935	0.8804	0.7877
F	32.67	113.90	111.10
Signif	0.0000	0.0000	0.0000
N	43	47	90

Note: ** significant at 5% and N.S non significant

The results in Table 10 suggest that the "weak" version of the screening hypothesis hold for the sample of Females (the interaction term (S*EX) is statistically significant) and the "strong" version of the screening hypothesis hold for the sample of All (the interaction term (S*EX) is insignificant). As concerns the sample of Males, while experience exerts a negative

effect on earnings, the interaction term S*EX suggest that the marginal effect of education on earnings increases further for larger experience values.

The results in Table 11 suggest that the "weak" version of the screening hypothesis hold for the samples of Males (column 1) and All (column 3). In both of these cases, education has a positive effect on earnings. The interaction term (S*EX) is statistically significant.

The explanatory power of the model, $AdjR^2$, is fluctuated from 42.61% to 88.04%, except the case of test the screening hypothesis to graduates of postgraduate programs. This is considered to be satisfactory, given that we make use of cross-sectional data. In general, the t-statistic is satisfactory. These results indicate that the difference of initial earnings of workers converge for the remaining of their career. To summarize the results of testing for the existence of screening, we find a slightly negative convergence of the experience-earnings profiles between the workers (except the males who are master holders and female doctors) under comparison, hence our findings support slightly the view that the education of workers at health sector might only be used as a screening device, apart from the case of female doctor and male nurses who are graduates of master programs.

6. Concluding Remarks

This paper examined the extent to which estimated returns to schooling reflect productivity differences using data from the health sector of Greece. According to the empirical findings, the rates of return of nurses of given educational level are higher than those with lower educational level. Also, we found a statistically weak convergence of the experience-earnings profiles, except some levels of education. Therefore, the provided evidence shows that the 'weak' version of screening hypothesis is valid in general. Finally, the empirical findings are consistent with a human capital interpretation of the relationship between education and earnings. Given the contribution of human capital to productivity and development, we propose for future research the ways that the education will increase the level of productivity.

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