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Testing for Screening using vocational skills: The case of upper secondary general and vocational education in Greece

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Testing for Screening using vocational skills: The case of upper secondary general and vocational education in Greece

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Abstract

The paper examines if upper secondary education acts as a filter in the private sector of the Greek labor market and tests both the «strong» version and the «weak» version of the screening hypothesis. The paper uses the method of Mincerian earnings function with an interaction term on years of education or training and experience in labor market. The data has been collected through primary research and include employees who are graduates of upper secondary, general and vocational education and lower secondary education (control group) and they are working in the private sector. Applying the method reveals that for the employees in the private sector (Total data) who are holders of an upper secondary education diploma (general and vocational) and lower secondary education diploma the criteria of the weak version are met. Particularly, per gender and in above educational cases, the results are statistically significant for females and show that is valid the weak version. As concerns the males, the results are not statistically significant.

Keywords: Upper secondary education, general and vocational, human capital, screening hypothesis

1. Introduction

In the context of Economic education, one of the fields of interest of several researchers is to investigate the confirmation of the theory of human capital against the hypothesis that questioned it, the screening hypothesis. That is, the study related to the level of remuneration and the efficiency of individuals. If the fact that a person who has a higher level of education compared with another and at the same time enjoys a higher salary, is a result of his higher efficiency or his employer's prior assessment that he can be more efficient. According to the founders of the theory of human capital (Schultz, 1961; Becker, 1964; Mincer, 1974) through education and training the production, accumulation and dissemination of human capital is achieved. Schultz (1960, 1961, 1963, 1968, 1971) and Mincer (1958, 1974) pointed out that knowledge and skills possessed by the person individual increase his productivity and contribute to the formation of his earnings. Becker (1964) argued that education is an investment in human capital with cost and stream of future benefits. Mincer (1974) found that workers' earnings from their jobs are affected by their level of education and work experience and he interpreted theoretically in this way earning inequalities among workers. Education is a private and social investment which contributes to the creation of human capital, in order for both individuals and society as a whole to reap benefits, financial (salary) but also non-financial (improved health, longer life, greater possibility of participation in community life etc.). On the other hand, in the early 1970s important economists such as Arrow (1973), Spence (1973) and Stiglitz (1975) attempted to explain the relationship between education and wages on the basis of information theory. Thus, the filter hypothesis arose which argues that people with higher levels of education enjoy higher earnings, because

employers when hiring assume that these people are likely to be more productive. The employer because it is not possible to know in advance the productivity of the potential employee who will hire, observe and indirectly distinguish other individual characteristics of the employee that constitute the "mark", in order to distinguish him. The strongest signal is the education of the individual. Proponents of this hypothesis argue that education and training act as a signal by which individuals' abilities are filtered and do not serve as a mechanism for boosting their productivity (Berg, 1971; Arrow, 1973; Spence, 1973; Stiglitz, 1975).

Psaharopoulos (1979) separated the filter hypothesis into two versions, the "weak" and the "hard" version. Based on the "weak" version, the employer will best reward the one who has a higher level of education when hiring two people, because he assumes that he will be more productive and cannot know in advance their productive abilities and over time, he will control his productivity. If employees' earnings continue to diverge then the employer has made a correct estimate. However, if the employees' earnings converge over time, then we have the "hard" version of the filter hypothesis, because over time the employer corrected the wrong decision he had taken at the time of hiring, since the most educated person was not the most productive. Therefore, in this case the degree acted only as the wrong signal.

This paper tests both the «strong» and the «weak» version of the screening hypothesis. The data were collected through primary research and include earnings from wage labor of full-time workers in the private sector (in all three sectors of production), in Greece, graduates of upper secondary General and Vocational Education and lower secondary education.

The rest of work is organised as follows. In Section 2, we summarise the literature of screening hypothesis. In Section 3, we present a brief reference of upper secondary general and vocational education. In Section 4, we present the methodology and model. In Section 5, we present the empirical analysis, we mention the sources and the data of the research, we examine the upper secondary education as a filter and we report the results and in Section 6, we mention some concluding remarks.

2. Literature review

Empirical studies have shown that there is a positive relationship between education and the formation of earning from work (Mincer, 1958, 1974; Harmon et al, 2001; de la Fuente, 2003; Bassanini et al., 2005; etc.). In recent decades, two contrary approaches have been developed. The theory of human capital and the filter hypothesis. According to the first, education and training contribute to the increase of wages and earnings, because they directly increase the individual productivity of individuals, since through education and training their cognitive, behavioral and manual abilities and skills are improved (Mincer, 1974; Becker, 1975). On the other hand, the filter hypothesis holds that higher earnings may not be due only to the productivity of individuals and that education and training are indicators of competence without necessarily raising the level of inherent productivity (Arrow, 1973; Spence, 1973; Stiglitz, 1975). As a result, the most competent people invest in education and training in order to be selected by employers, who in turn, having no better information, they use education and training to select the most capable employees. The relatively recent literature considers that the two approaches (the theory of human capital and the filter hypothesis) complement each other, since education offers benefits both from the accumulation of human capital and during “screening” (Weiss 1995). Both approaches demonstrate the existence of a positive relationship between education and earnings (Li, et al 2009).

Empirical tests of human capital theory and the filter hypothesis support the former (Tucker, 1985). Layard and Psacharopoulos (1974) found no evidence for the filter hypothesis.

A number of empirical studies designed to test the validity of the screening hypothesis have employed various data sets, methodologies and techniques but have reported 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, 1984; 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; Li et al., 2009; Aina and Pastore, 2012; DeVaro and Waldman, 2012; Patrinos and Savanti, 2014). Evidence supporting the filter hypothesis has been found in Australia, Israel, Japan and Singapore, but not in Greece, Malaysia, the Netherlands, Sweden and Egypt. Ambiguous results have been obtained in the United Kingdom and the USA, while no corresponding studies have been conducted in Western European countries such as France, Germany, Italy, Spain and Portugal (Brown & Sessions, 2004).

So far, only a few studies on the screening hypothesis have focused on Greece (Lambropoulos, 1992; Magoula & Psacharopoulos, 1999; Psacharopoulos & Tsamadias, 2001; Tsamadias & Chanis, 2012; Chanis & Tsamadias, 2022).

3. The Greek secondary educational system

The Greek formal education system consists of three levels. The first level includes Primary Compulsory Education, which is provided in Nursery and Primary School. The second level includes Secondary Education and the third level includes Tertiary Higher Education, which is the last level of the formal education system. The "National Framework of Qualifications" classifies the qualifications obtained in Greece into eight levels. Table 1 presents the structure of the Greek formal educational system.

Table 1: The structure of the Greek formal educational system (2020-21)

Levels	Duration of studies (years)	Age	ISCED	Compulsory or non-compulsory
Primary education				
Nursery school	2	4-6	Level 0	Compulsory
Primary (elementary school)	6	6-12	Level 1	Compulsory
Secondary education				
Lower secondary education	3	12-15	Level 2	Compulsory
Upper General secondary education	3	15-18	Level 4	Non-compulsory
Upper Vocational secondary education	3	15-18	Level 4	Non-compulsory
Higher education				
University	4-6	18+	Level 6	Non-compulsory
Postgraduate studies	1+	22+	Level 7	Non-compulsory
Doctoral studies	3	24+	Level 8	Non-compulsory

Source: EOPPEP (National Organisation for the Certification of Qualifications and

Vocational Guidance)[1]

Secondary Education in Greece has a fixed duration of studies, grants nationally recognized certificates from the state, is part of the graduated educational scale and is divided into two cycles: compulsory Lower Secondary Education and non-compulsory Upper Secondary Education.
The first cycle includes the compulsory Secondary education, which is provided in the Gymnasium, day and evening, the course lasts for three years and the students enroll automatically until they reach the age of 16 and General Education courses are taught.
The purpose of Gymnasium is to provide basic knowledge to students, to promote their all-round development, to cultivate their skills, inclinations, abilities and interests.
The second cycle, which follows, includes upper Secondary non-compulsory education which is divided into General and Vocational education and lasts three years.
In the General Lyceum, upper general education knowledge is provided in order to promote students' critical thinking, abilities and creativity and the course lasts 3 years. Final year students are asked to choose one of the following four scientific fields: i. Humanities, legal and social sciences, ii. Positive and Technological Sciences, iii. Health and Life Sciences and iv. Economic and Informatics Sciences and they may be admitted to higher educational institutions after participating in Panhellenic National entrance exams.
The Vocational upper secondary School (EPAL) combines the students' acquisition of general education knowledge as well as technical-professional knowledge through the three-year secondary study cycle. Students, in addition, have the opportunity to attend the post-secondary course, the apprenticeship class, which is optional with a duration of one year, belongs to the non-formal education system and integrates students into the working environment, while at the same time attending specialization and certification courses in school.
The nine fields of study of EPAL are: i. Agriculture, Food and Environment, ii. Administration and Economy, iii. Structural Projects, Built Environment and Architectural Design, iv. Applied Arts, v. Electrical, Electronics and Automation, vi. Mechanical Engineering, vii. Maritime professions, viii. Information Technology and ix. Health Welfare and Wellness. A percentage of the places of the total number of entrants to the higher educational institutions corresponds to the graduates of the Vocational upper secondary School (EPAL) after their participation in National Panhellenic entrance exams.
The secondary education system is supervised by the Ministry of Education and is offered in public and private schools. Funding for public secondary education is covered by the state budget.

4. Methodology and model

In this paper we use the Mincerian method to test the screening hypothesis. We limit the test to include upper secondary education versus lower secondary education, and then we limit the test to include upper secondary general education versus lower secondary education and upper secondary vocational education versus lower secondary education separately. Thus, we included in our analysis employees from the private sector in order to conduct a more rigorous test of the non-convergence of experience-earnings profiles with an interaction term:

[1] https://www.eoppep.gr/index.php/el/qualification-certificate/national-qualification-framework

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

Y_i is the gross earning of person i, LnY_i is the logarithm of gross earning of person i, S_i is the duration of studies in years of the i person, EX_i is the years of experience that person i has from his job, S_i*EX_i is the interaction term, *a* is a constant, *b*, *c* and *d* are the regression coefficients and u_i is the disturbance term. Type (1) is estimated by using the empirical data of the variables Y_i, S_i and EX_i. The sign of the coefficient *d* and its statistical significance identify whether we have a case of filtering or not.

5. Empirical Analysis

The sampling and the sample are presented and then it is examined whether Upper Secondary Education as a whole and separately Upper Secondary General and Vocational Education, as well as by gender, functions as a filter.

5.1. Sources and data

The data was collected with a primary survey conducted throughout the country in the second half of 2022 and include the annual gross earning of the year 2020 of employees with salaried employment and full-time employment in the private sector and are graduates of the General Lyceum, the Vocational Lyceum and the Gymnasium (control group). Productivity bonuses are included in the annual earnings, while graduates of GEL, EPAL and Gymnasium who work as freelancers are not included, because it is difficult to separate from their earning that part which belongs exclusively to their work from that which belongs to other productive factors (land, capital, entrepreneurship), as well as those who work part-time. Earnings does not include extraordinary financial benefits and overtime pay, nor pay resulting from additional training. The sampling was carried out on the basis of stratified data from primary, secondary and tertiary sector of the economy of the year 2020 (reference period), because it offers increased accuracy in the estimates it provides and additionally provides the corresponding estimates per layer/category (Zairis, 1991).

The total size of the sample n_0, as well as the layers was determined by the type (2):

$$n_o = \frac{\sum W_h \cdot S_h^2}{\bar{Y}^2 \cdot CV^2(\bar{y})} \quad (2)$$

$W_h = \frac{N_h}{N}$ is the weight of each layer in the population
N: population size,
N_h : the size of the h layer
S_h^2: the variation of each layer, replaced by the value obtained based on the observations of the pilot sample
S.E ($\bar{y}$): standard error of the mean
CV: the coefficient of variation
$\bar{Y}$: the real average income of Gymnasium, GEL and EPAL graduates, which was replaced by the value obtained based on the observations of the pilot sample

Table 2 presents the structure of the population and of the sample by level of education in private sector of employment in Greece, 2020. The reason for choosing the private sector to draw our sample is that it better reflects education–driven differences in productivity.

Table 2: Structure of the population and of the sample by level of education in private sector of employment in Greece, 2020

Educational levels	Population	Sample
	Private sector	Private sector
Graduates of Gymnasium	129,939	347
Graduates of GEL	437,940	1,167
Graduates of EPAL	145,203	387
Total	713,082	1,901

Source: Hellenic Statistical Authority (2020) and processing by the researchers

5.2. Upper secondary education as a filter

Initially, it was appreciated and presented graphically the mean gross annual earnings by years of experience and levels of secondary education for private sector workers.

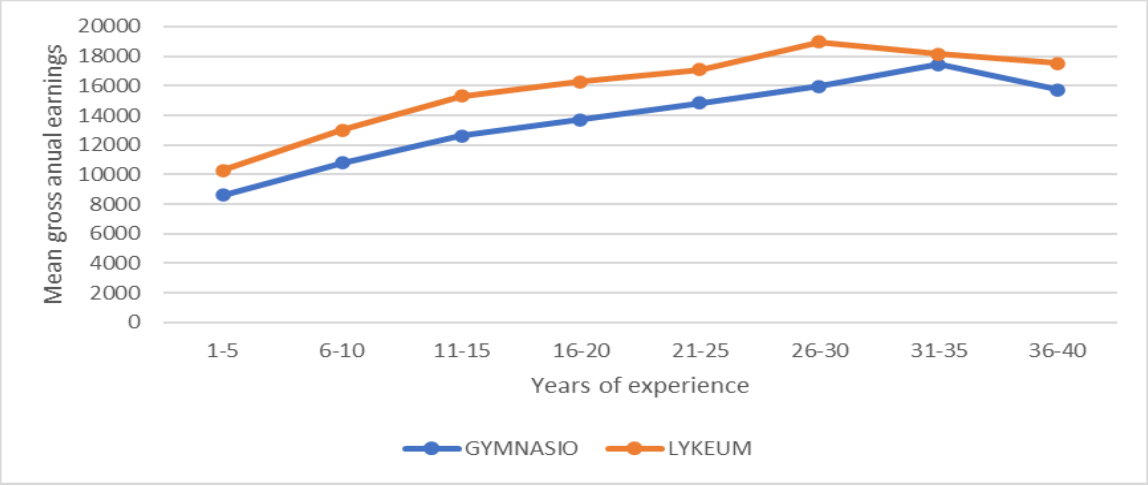

Figure 1: Mean gross annual earnings by years of experience and levels of Secondary Education for private sector workers (in Euros, 2020)

From Figure 1 it follows that employers pay higher salaries at the initial point of hiring to the graduates of Lyceum than to the graduates of Gymnasium. The earning profiles of the two categories of workers (Gymnasium and Lyceum) probably diverge with the passage of time.

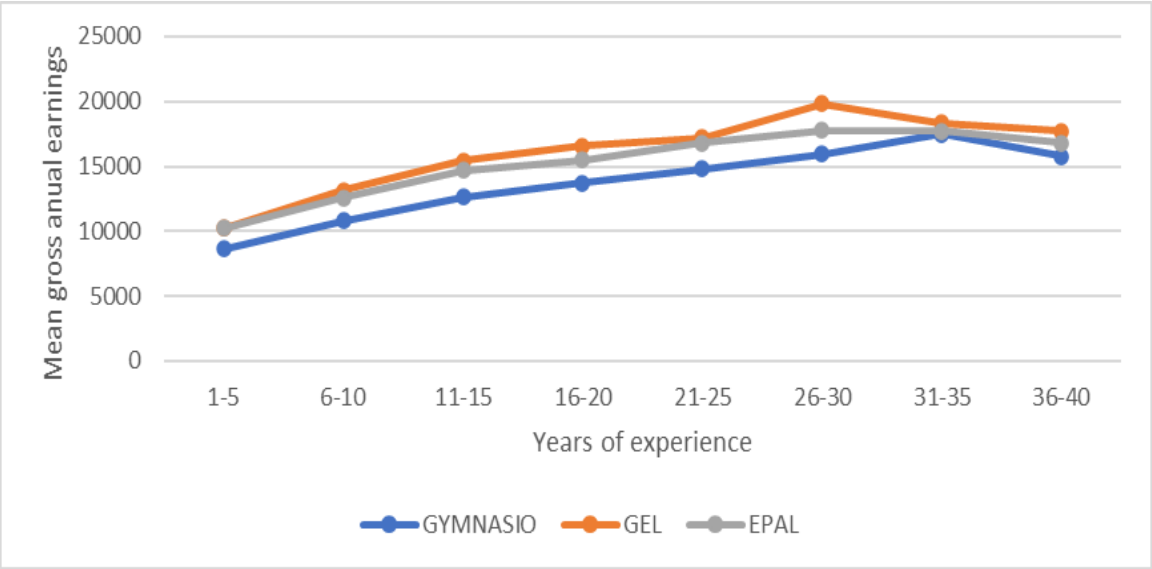

Figure 2: Mean gross annual earnings by years of experience in lower secondary education (GYMNASIO) and upper secondary education (GEL & EPAL) for private sector workers (in Euros, 2020)

From Figure 2 it follows that employers pay GEL and EPAL graduates higher salaries at the initial point of hiring than to the graduates of Gymnasium. The earning profiles of the two categories of workers in lower secondary education and upper general secondary education probably diverge with the passage of time and the same can be seen for the earning profiles of the two categories of workers in lower secondary education and upper vocational secondary education.

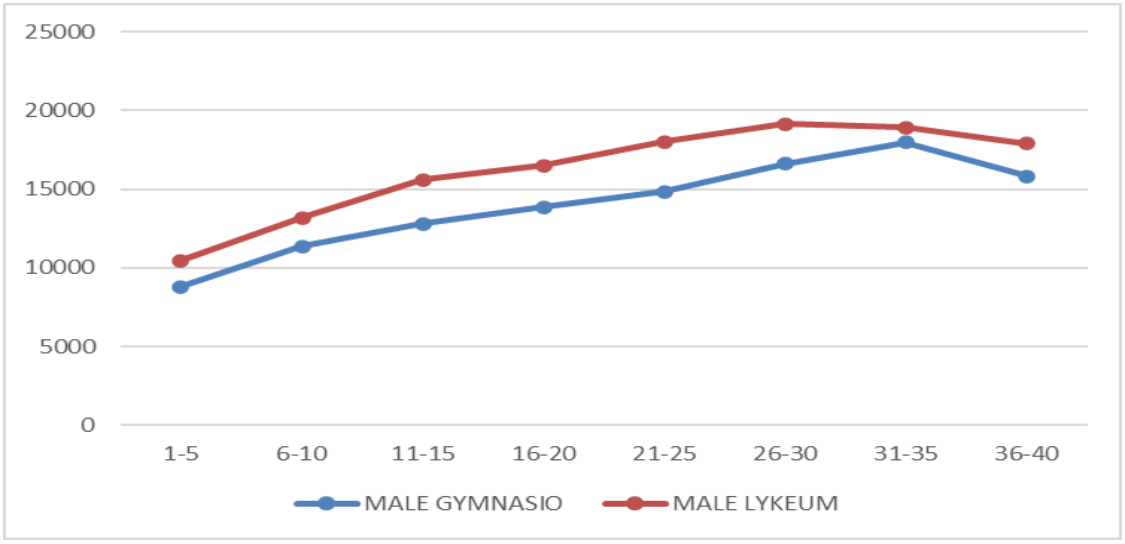

Figure 3: Mean gross annual earnings by years of experience and levels of Secondary Education for male private sector workers (in Euros, 2020)

From Figure 3 it follows that employers pay to the male graduates of Lyceum higher wages at the initial point of hiring than to the male graduates of Gymnasium. The earning

profiles of male workers from levels of Secondary Education (Gymnasium and Lyceum) present a rather vague picture with the passage of time.

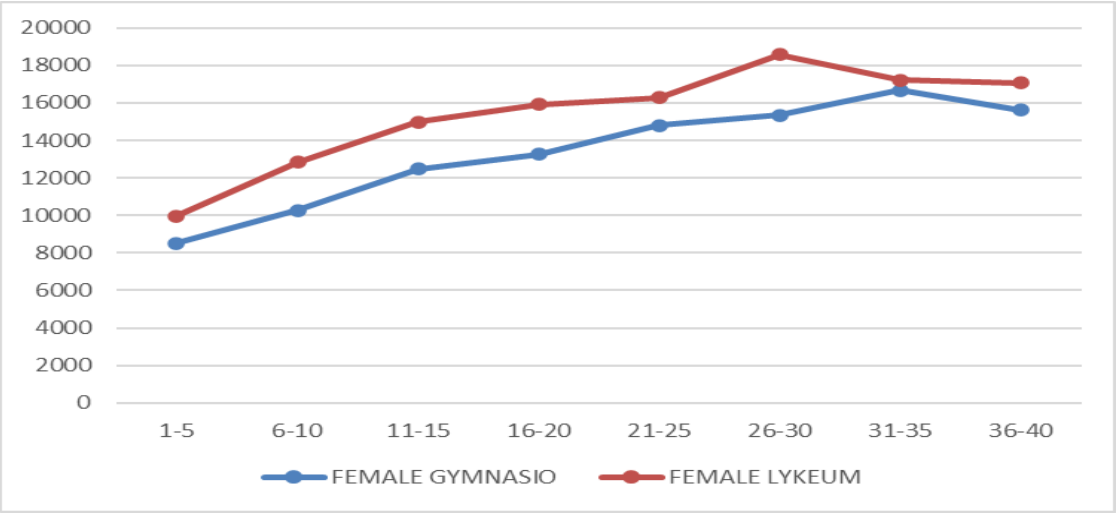

Figure 4: Mean gross annual earnings by years of experience and levels of Secondary Education for female private sector workers (in Euros, 2020)

From Figure 4 it follows that employers pay higher wages at the initial point of hiring to the female graduates of Lyceum than to the female graduates of Gymnasium. The earning profiles of female workers from levels of Secondary Education (Gymnasium and Lyceum) probably diverge with the passage of time.

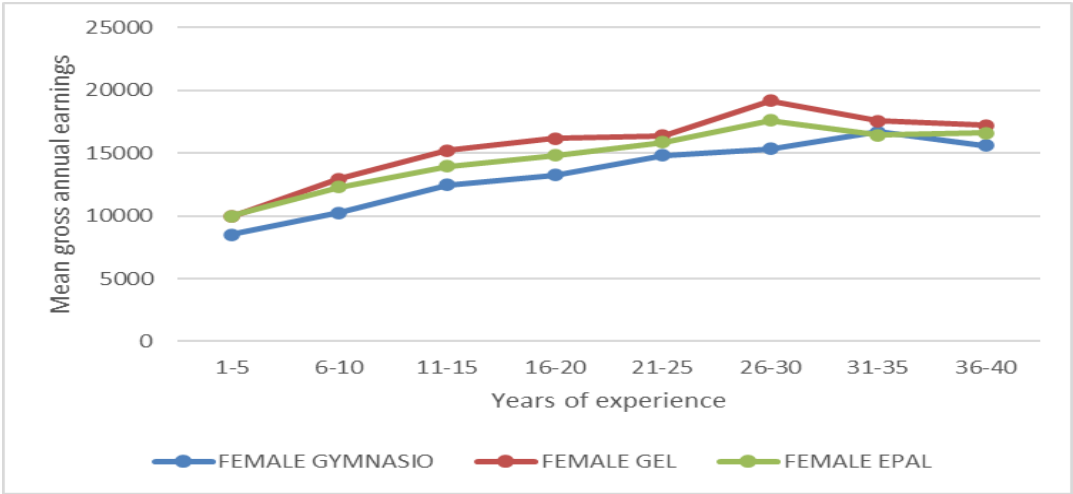

Figure 5: Mean gross annual earnings by years of experience and levels of Secondary Education for female private sector workers (in Euros, 2020**)**

From Figure 5, it follows that employers pay to the female GEL and EPAL graduates higher salaries at the initial point of hiring than to the female graduates of Gymnasium. The earning profiles of female workers in lower secondary education (GYMNASIO) and upper general and vocational secondary education (GEL & EPAL) for private sector workers probably diverge with the passage of time.

Below is presented a test for the sign and significance of the *S * EX* interaction term. The results are given in the following tables 3, 4, 5, 6.

Table 3: Testing for the screening hypothesis (dependent variable: LnYG)

Independent variables	Upper Secondary Education (LYKEUM)	Upper General Secondary Education (GEL)	Upper Vocational Secondary Education (EPAL)
α (constant)	8.523**	8.486**	8.647**
	(134.51)	(132.40)	(120.32)
S	0.0637**	0.0678**	0.0499**
	(11.63)	(12.10)	(7.52)
EX	0.0264**	0.0260**	0.0268**
	(7.73)	(7.46)	(6.90)
S * EX	-0.0007004**	-0.000649**	-0.0007403 **
	(-2.36)	(-2.12)	(-2.06)
Adj. R^2	0.6130	0.6175	0.6404
F	1,004.28	815.23	436.08
Significance	0.000	0.000	0.000
N	1,901	1,514	734

Note: ** Significance at the 5% level

The results of Table 3 reveal that, in upper secondary education (overall but also by education category, general and vocational) the critical interaction term, coefficient d, is negative with statistical significant level of importance 5%. These results indicate that in upper secondary school (overall, GEL, EPAL) the weak version of the filter hypothesis is valid. The explanatory power of the model, Adj. R^2, fluctuates from 61.30% to 64.04%. This level of fluctuation is satisfactory, given that we use cross-sectional data. In particular, the t-statistic is satisfactory. To improve the test, we have fitted the above function separately to males and females.

Table 4, 5 and 6 shows the testing for the screening hypothesis in Secondary Education by gender.

Table 4: Testing for the screening hypothesis in Upper Secondary Education (LYKEUM) by gender (dependent variable: LnYG)

Independent variables	Male	Female
α (constant)	8.745**	8.372**
	(95.10)	(97.00)
S	0.0459**	0.0753**
	(5.82)	(10.01)
EX	0.0171**	0.03292**
	(3.63)	(6.67)
S * EX	$+0.0001334^{NS}$	-0.0013189**
	(0.33)	(-3.06)
Adj. R^2	0.6230	0.6108
F	576.53	447.83
Significance	0.000	0.000
N	1,046	855

Note: ** Significance at the 5% level and NS non-significant

The results of Table 4 reveal that, in the private sector among female graduates of Upper Secondary Education the critical term of interaction, factor d, is negative with a statistical significance level of 5%. Therefore, the weak version of the filter hypothesis holds for the females. In male upper secondary school graduates, the critical term of interaction, factor d, is positive but not statistically significant. Therefore, the filter hypothesis is rejected for the males.

Table 5: Testing for the screening hypothesis in General Upper Secondary Education (GEL) by gender (dependent variable: LnYG)

Independent variables	Male	Female
α (constant)	8.700**	8.343**
	(93.44)	(95.99)
S	0.051**	0.0785**
	(6.31)	(10.26)
EX	0.0170**	0.03187**
	(3.53)	(6.39)
S * EX	+0.0001518^{NS}	-0.0012016**
	(0.36)	(-2.73)
Adj. R^2	0.6170	0.6267
F	433.81	396.01
Significance	0.000	0.000
N	807	707

Note: ** Significance at the 5% level and NS non-significant

The results of Table 5 reveal that, in the private sector among female graduates of General Upper Secondary Education the critical term of interaction, factor d, is negative with a statistical significance level of 5%. Therefore, the weak version of the filter hypothesis holds for the females. In male upper secondary school graduates, the critical term of interaction, factor d, is positive but not statistically significant. Therefore, the filter hypothesis is rejected for the males.

Table 6: Testing for the screening hypothesis in Vocational Upper Secondary Education (EPAL) by gender (dependent variable: LnYG)

Independent variables	Male	Female
α (constant)	8.873**	8.500**
	(89.49)	(82.00)
S	0.0317**	0.06098**
	(3.53)	(6.21)
EX	0.01679**	0.03495**
	(3.27)	(5.99)
S * EX	+0.0001694^{NS}	-0.0015441**
	(0.36)	(-2.81)
Adj. R^2	0.6452	0.6409
F	251.98	190.16
Significance	0.000	0.000
N	415	319

Note: ** Significance at the 5% level and NS non-significant

The results of Table 6 reveal that, in Vocational Upper Secondary Education the critical interaction term, coefficient d for female is negative with statistical significant level of importance 5%. These results indicate that for female graduates of Vocational Upper Secondary Education providing support to the screening hypothesis. On the other hand, the critical interaction term, coefficient d, for male is positive but not statistical significant. These results indicate that for male there is not a significant increase of earnings by years of experience, hence rejecting the screening hypothesis.

6. Concluding remarks

This paper tests both the «strong» version and the «weak» version of the screening hypothesis by using data on graduates of GEL, EPAL and GYMNASIUM. Using a Mincerian earnings function with an interaction term on years of education or training and experience, statistically significant diverge of earnings profiles in the private sector is found, giving strength to the "weak" version of screening hypothesis for Upper Secondary Education (overall, general, vocational), in terms of lower secondary education. Looking at each sex, it is found that only for females (general, vocational education and all upper secondary education) the «weak» version of screening hypothesis is valid.

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