The Evaluation of Private Investments on Greek Post-Secondary Initial Vocational Education and Training

by
Stefanos Chanis, Constantinos Tsamadias
University of Piraeus, Piraeus, Greece.
Harokopio Uninersity, Athens, Greece
shunipi@gmail.com, ctsamad@hua.gr

Abstract: In Greece, Post-Secondary Initial Vocational Education and Training (PSIVET) is a sub-system of Life Long Learning. The study evaluates, ex-post, the profitability of private investments to PSIVET. It estimates the rates of return by using both cost-benefit and Mincer methods. Mincer method is applied by using the actual and the potential experience. Stratified sampling has been employed with a proportional distribution throughout the country's private sector in order to derive a sample from the earnings data. Also, data on private cost have been used.
The empirical results have shown that the rates of return of the private investment to PSIVET by using both internal rates of return and Mincer method with actual experience converge. The results (4.8%) are slightly satisfactory. The result from Mincer method by using potential experience is much higher. Moreover, sensitivity analysis has shown that the rates of return are increased by 33.3 to 37.8 %, when the duration of studies in PSIVET system is decreased by one semester (25 %).

Key words: Post Secondary Vocational Education and Training, Human Capital, Evaluation, Cost-Benefit Analysis, Mincer method, Greece
JEL classification: O15, Z 13

1 Introduction

According to economic literature, education and training (E&T) is the principal institutional mechanism which produces, accumulates and diffuses human capital and that delivers a variety of market and non market benefits, externalities and spillovers for individuals, companies, economy and society as a whole. Individuals profit from investment in E&T through higher wages. No less important are the lower probability of unemployment and higher rates of labour force participation for more highly educated-trained individuals (European Commission, 2005). E&T is a consumer good and mainly a capital good for individuals and society. The notion of E&T as a capital good is rooted in the human capital theory which attaches a high premium to human skills as a factor of production in the development process. Investing in human resources is indeed essential to increase employability, economic prosperity and social welfare. The return of private investments in E&T drives the demand for E&T (Becker, 1964). There have been many empirical studies on the returns of private and social investments in E&T in a number of countries covering the period 1960s to the present. All these studies showed that the investment in E&T is a "good" investment both from private and social point of view (Psacharopoulos and Patrinos, 2004a).
In Greece, so far, there have been only a few empirical studies in order to assess the private rates of return of investment in education. However, there has not been any published work on lifelong learning and particularly on the Post Secondary Initial Vocational Education and Training (P.S.I.V.E.T.). The P.S.I.V.E.T. is a sub-system of the life – long learning system.
The main objective of the present study is to ex-post evaluate the private investment on PSIVET. The paper is using primary, cross-sectional, data (year 2009). The data collected throughout the private sector of entire country, by proportional stratified sampling. The 2009 is the last year before Greece join to the support mechanism (European Commission, European Central Bank, International Monetary Fund) and begin the violently reforms in economy, especially in labour markets and public administration.
The rest of paper is organized as follows: Section 2 describes briefly the Greek PSIVET

system. Section 3 presents a review of the empirical literature. Section 4 presents the empirical analysis i.e. methodology and models, sources and data, empirical methods, calculations, results and discussion. Finally, section 5 summarizes the main concluding remarks of the study.

2 A Brief Reference on Greek Post-Secondary Initial Vocational Training System

In Greece, the lifelong learning system is running in parallel with the formal educational system (Tsamadias and Chanis, 2012). The basic component of the lifelong learning is the training system (Law 3369/2005). The training system consists of the Initial Training and the Continuing Training. The educational system, does not intensively contribute to the acquisition of practical or vocational skills. Table 1 shows the structure of the formal Initial Training System (post-compulsory and post-secondary) (Law 1992).

Table 1: The Structure of the Greek Formal Initial Training System

Levels	Duration of Training	Age	ISCED	Compulsory
Post-Secondary level				
Initial Vocational Training Institutes	2 years	≥ 18	Level 4	No
Post-Compulsory level				
Initial Vocational Training Institutes	2 years	≥ 15	Level 4	No

The Initial Vocational Training System is supervised by the Ministry of Education and it is mainly provided by both the public and the private Vocational Training Institutes (I.E.K.s). However, some I.E.K.s are under the supervision of other ministries and agencies. The I.E.K.s provide all types of vocational training and ensure that students obtain all necessary qualifications by imparting scientific, technical, vocational and practical knowledge and cultivating skills to facilitate students' occupational integrations and adaptations to the changing needs of the production process. Graduates of compulsory education may enrol the post-compulsory I.E.K.s, as well as graduates of every type of Lyceum and Technical Vocational Schools (T.V.S.) may enrol the post-secondary I.E.K.s. The duration of training for the Unified Lyceum certificate holders is four semesters. Each training year consists of two self-contained semesters. T.V.S. or Technical Vocational Lyceum (T.V.L.) cycle 2 certificate holders are directly admitted to the third semester of the I.E.K. in their specialisation area (total duration of study: one year) or they may choose another I.E.K. specialisation area, in which case they study for the regular module of four semesters. Gymnasium graduates over 18 years old are accepted by certain I.E.K.s and they may study for up to two semesters. During the terms, the students attend compulsory theoretical, laboratory and mixed classes in the framework of the educational curricula, which cover a wide range of branches and specialisations in the following fields: Information Technology - Telecommunications – Networks, Financial and Management Services, Food and Drink, Transport and Tourism, Electronics - Electrics – Engineering, Construction, Industrial Chemistry, Applied Arts, Energy-Environment, Health-Cosmetics-Social Services, Communications and Mass Media, Clothing and Footwear, Culture and Sport and Agriculture. Students in public I.E.K.s are charged fees for each semester. Scholarships are available in certain circumstances. In addition, students have the opportunity to participate in subsidised practical exercises. The fees charged by the private I.E.K.s vary and they are annually adjusted to allow for the current regulations. Trainees, who completed successfully their training in public and private I.E.K.s, are awarded a Vocational Training Certificate, which allows them to take the qualifying examinations leading to the award of a Vocational Training Diploma at the level of post-secondary (3+) vocational training. Nationwide examinations, held twice a year, include theoretical and practical tests.

The Greek PSIVET is an Institution-based system. It is a full-time vocational education and training in institutions. However, institution-to-work transition is not well-developed. Links with firms are scarce and there is no formal way to absorb and channel graduates into the labor market. Liagouras, Protogerou and Caloghirou (2003) found mismatching between education and training and the labour market in Greece. Also, Livanos (2009) found that the link between educational and training system and labour market is week. Furthermore, some evidence suggests that the strength of these links depends on whether training is provided on-the-job or off-the-job. The quality of links depends on the design of institutions (Ariga and Brunallo, 2002). Regarding to the demand for E&T, observed over time high social demand for higher education and for PSIVET despite the rates of return is low in relation to other countries (Tsamadias and Chanis, 2011). In Appendix, Table A1 shows the number of graduates of PSIVET in Greece from 2000 to 2009 for public and private I.E.K.s. Participation in the labour market is closely related to levels of E&T. The higher an individual's E&T level, the more likely it is that he or she will participate in the labour market. In this case, the indicators of the participation of the PSIVET and SE graduates in the labor market for the year 2009 were 93.47% and 88.28% respectively (Chanis, 2012). These results are consistent with the human capital theory.

3 Empirical literature reviews

The last five decades, two methods have dominated in estimates to private and social investment and policies in E&T. The first is the Cost – Benefit analysis (Short cut, Elaborate or Full discounting) and the second is based on the Mincer earnings equation (Psacharopoulos and Patrinos, 2004b). The elaborate method (net present value, internal rate of return) has a powerful and strong logic (welfare economics). The private rates of return to education, to be more precise, the internal rates of return to education is the rate of discount that equates the net present value of the life-time earnings of an individual, taken as the benefits of education, to the net present value of the private costs of education. The Mincer method takes the coefficient on the education variable as the return to an extra year of education (Mincer, 1974). More sophisticated econometric techniques have been adopted to refine the estimates from the earnings equation. There have been numerous studies, international and country-specific of the rates of return to private and social investment in education, vocational education and training. The paper presents some of those employed the elaborate (internal rates of return) and Mincer methods.

Okpako Enaohwo and Osakwe (1986) estimated the rate of return of private investment in vocational education (nursing field) in Nigeria. The data used in this study were collected by using a questionnaire. Apply the elaborate method (I.R.R.) Gomez-Castellanos and Psacharopoulos (1990) estimated the private and the social rates of return on investment at various levels of education in Ecuador by using data from the household survey. Apply the elaborate method and the Mincer method. Grootaert (1990) estimated the private and the social rates of return on investment in formal and non-formal vocational education in Côte d'Ivoire. The data were collected from a survey of living standards. Also, the study applies sensitivity analysis. Apply the elaborate method and the Mincer method. Psacharopoulos and Alam (1991) estimated the private and the social rates of return on investment at different levels of education in Venezuela. The data were collected from the household survey. Apply the elaborate method and the Mincer method. Fiszbein and Psacharopoulos (1993) estimated the private and the social rates of return on investment in education in Venezuela. The data were collected from the household survey in Venezuela. Apply the elaborate method. Bevc (1993) estimated the private and the social rates of return on investment in education in the former Yugoslavia. Apply the elaborate method. Psacharopoulos and Velez (1994) estimated the private rates of return on investment at different levels of education in Uruguay. The data were collected from the household survey. Apply the Mincer method.

Psacharopoulos, Velez and Patrinos (1994) estimated the private and the social rates of return on investment at different levels of education in Paraguay. The data were collected from the household survey in Paraguay. Apply the Mincer method. Bennett, Glennerster and Nevisons (1995) estimated the private rates of return on investment in education and training in Bretagne. The data were collected from the general household survey. Apply the Mincer method. Nonneman and Cortens (1997) estimated the private and the social rates of return on investment in education in Belgium. The data were collected from the household survey. Apply the elaborate method (I.R.R.). Stanovnik (1997) estimated the rates of return on investment in education in Slovenia. The data were collected from the household survey. Apply the Mincer method. Belli, Khan and Psacharopoulos (1999) estimated the private and the social rates of return on investment in tertiary education in Mauritius. Apply the short-cut method and the elaborate method (Net Present Value). Siphambe (2000) estimated the rates of return on investment in education in Botswana. The data were collected from the household survey and by survey of the author. Apply the Mincer method. Campos and Jolliffe (2003) estimated the private rates of return on investment in education in Hungary. The data were collected from the National Labour Centre of Hungary. Apply the Mincer method. Sakellariou (2003) estimated the private rates of return on investment in formal and technical/vocational education in Singapore. The data were collected from the Labour Force Survey. Apply the Mincer method. Moenjak and Worswick (2003) estimated the rates of return on investment in vocational education in Thailand. The data were collected from the Labour Force Survey of Thailand. Apply the Mincer method. Okuwa (2004) estimated the private rates of return on investment in higher education in Nigeria. The data were collected from the Labour Market Survey. Apply the Mincer method. Daly, Fleming and Lewis (2006) estimated the private rate of return to higher education in Australia. The data were collected from the Australian Bureau of Statistics (A.B.S.). Apply the elaborate method (I.R.R.) Kahyarara and Teal (2008) estimated the private rates of return on investment in academic and vocational education in Tanzania. The data were collected at two time periods (1999-2000, 2002). Apply the Mincer method. Leigh (2008) estimated the rates of return on investment in various levels of education in Australia. The data were collected from the household survey, incomes and labour dynamics in Australia. Apply the Mincer method. Yakusheva (2010) estimated the private rates of return on investment in Post-Secondary education. The data were collected from the survey of U.S. Department of Education. Apply the Mincer method.

In the case of Greece, Leinbenstein (1967) estimated the rate of return on secondary and higher education. The earnings' data were collected from a small number of enterprises in Athens. Psacharopoulos (1982) estimated the rate of return on investment in education for the years 1960, 1964 and 1977. The data were collected from the National Statistical Service of Greece. Apply the Mincer method. Psacharopoulos and Kazamias (1985) estimated the rates of return of the private and the social investment on education. The data were collected from N.S.S.G. (National Statistical Service of Greece). Apply the elaborate method (I.R.R.) Lampropoulos and Psacharopoulos (1990) estimated the private and the social rate of return on investment in higher education. The data were collected from K.E.P.E, I.O.B.E. and Public Sector. The data cover the period 1960-1987. Apply the Mincer method. The social rate of return is estimated by using the short-cut method. Hadjidema (1998) estimated the rates of return of the private and the social investment in higher education (for five subject groups, i.e. economics, law, mathematics, medicine and engineering). The earnings' data were derived from the pay scales of the public sector, the P.P.C. (Public Power Corporation), the Greek banks, the N.H.S. (National Health System) and the S.I.I. (Social Insurance Institution). The direct cost's data were obtained from the Ministry of Education, Lifelong Learning and Religion. Apply the elaborate method (I.R.R.) Magoula and Psacharopoulos (1999) estimated the private

and the social rate of return on investment in education. The data were collected from the National Statistical Service of Greece. Apply the elaborate method and the Mincer method. Tsakloglou and Cholezas (2000-2001) estimated the private rate of return on investment in education. The data were collected from the National Statistical Service of Greece (household budgets 1974, 1987/88 and 1993/94). The sample consists of employees aged 14-64 years. Apply the Mincer method. Tsamadias (2001) estimated the rate of return of private investment on Tertiary Technological Education. Apply the elaborate method, the Mincer method and the short-cut method. (2002) estimated the rate of return of private and social investment on Tertiary Technological Education. Also, the study applies sensitivity analysis. Apply the elaborate method and the Mincer method. (2004) estimated the rate of return of private investment on Tertiary Technological Education by gender. Apply the Mincer method. The data (in 3 papers) were collected via stratified sampling. Cholezas and Tsakloglou (2006) estimated the private rate of return on investment in education by gender. The data were collected from the National Statistical Service of Greece (household budgets 1988, 1994 and 1999). Apply the Mincer method. Prodromidis and Prodromidis (2007) estimated the private rate of return on investment in various levels of education. The data were collected from the National Statistical Service of Greece (1987/88, 1993/94 and 1998/99). The sample consists of employees aged 14-65 years. Apply the Mincer method. Table A2, in Appendix, shows briefly the above studies. The data of table shows that the more studies apply the method of Mincer, using the potential experience. The results from empirical studies show that the rates of return of private investment on education, vocational education and training are generally high and exceeding the level of 7% (European Commission, 2005). For Greece, the results are on average lower (Tsamadias and Chanis, 2011).

4 Empirical analysis

In this section, we present the models using for the estimation of private rates of return of investment in PSIVET, the primary cross-sectional data (year 2012), the calculation of private rates of return and the application of sensitivity analysis. The study uses two models. The cost-benefits analysis (Internal Rates of Return) and the Mincer method (Basic and Extended earnings function).

4.1 Cost - Benefit analysis

Cost-benefit analysis is a type of marginal analysis and it does not offer an automatic solution to the resource allocation problems for both individuals and society. It provides a conceptual framework for the examination of the costs of education and training in relation to the relative earnings of educated in PSIVET manpower.

In the present study, the elaborate method has been employed. The estimation of the rate of return, by using the elaborate method, requires the calculation of the monetary benefits and the private cost of the PSIVET. However, there are market and non-market benefits, as well as externalities and spill-overs of education and training, which have not been included in the model [Haveman and Wolfe (1984), Wolfe and Zuvekas (1997), McMahon (1987a, 1987b), Psacharopoulos (1999)]. The main monetary or market benefit of the PSIVET is the earnings' differentials between the PSIVET and the secondary education graduates. A key assumption for the private rate of return calculation is that observed wages are a good proxy for the marginal product of labor. In a competitive economy this is ensured by using data from the private sector of the economy. In this study, the earnings' differentials are used as a proxy in order to measure the difference in productivity of workers (human capital theory) (Woodhall, 1992). The ex – post private rates of return is the traditional «narrow private rates of return», which takes into account only the earnings' differentials (market benefits) and not the non-market benefits, the positive externalities and the spill-overs. The elaborate

method is the most suitable method for the estimation of the rates of return, because it takes into account the most important part of the individuals' earnings stream. However, it requires a significant amount of data on age-earnings profiles.

Internal Rates of Return

The estimation of the Internal Rate of Return (r_{psivet}) of the private investment in the PSIVET derives from the solution of the following general equation:

NPV =

$$\sum_{t=1}^{43} B_t \cdot (1+r_{PSIVET})^{-t} - \sum_{t=0}^{1} C_t \cdot (1+r_{PSIVET})^{t} = 0 \quad (1)$$

Where: $B_t = (\hat{E}_{N,\ PSIVET} - \hat{E}_{N,\ SE})_t$ for t=1, …43 is the difference of annual net earnings between the PSIVET graduates and the SE graduates.

$C_t = (APrC_{PSIVET})_t$, t=0, 1 is the annual average private cost, NPV is the net present value

The age-earnings' function for the PSIVET graduates and the SE graduates, is specified as:

$$\hat{E}_n = a + b.A_i + c.\ A_i^{\ 2} + u_i \quad (2)$$

where A_i is the age of the individual i, a is the constant, b and c are the slope coefficients and u_i is the disturbance term

The Annual Average Private Cost ($APrC_{PSIVET}$) is calculated by using the formula:

$APrC_{PSIVET}$ = Average Direct Private Cost + Average Indirect Private Cost in P.S.I.V.E.T. (3)

[Foregone Students' Earnings in I.E.K. ($_{N, SE}$)]

4.2 Mincer method

The method is also known as the "Earnings Functions Method" (Mincer, 1974, Psacharopoulos & Layard, 1979). There are two versions, the basic and the extended.

Basic Earnings Function

$$LnY_i = a + b \cdot S_i + c \cdot EX_i + d \cdot EX_i^2 + u_i \quad (4)$$

where:

Y_i, is the annual earnings of individual i and LnY_i, is the logarithm of income, S_i, is the years of study of individual i, EX_i, is the number of years of work experience of individual i, u_i , is the disturbance term, a, is the constant, b, c and d, are the coefficients. Note that, when we don't have data for actual years of experience, the potential years of experience of individual i, calculated by the formula:

Age of individual - Years of study – 6. The private rate of return derives from the b (S_i)

Extended Earnings Function

$$LnY_i = a + b_{psivet} \cdot D_{psivet} + c \cdot EX_i + d \cdot EX_i^2 + u_i \quad (5)$$

where D_{psivet} is a dummy variable with value 1 if the individual has finished the PSIVET and 0 if the individual has finished the SE. The private rates of return derives from the formula

$$r_t = \frac{b_{psivet}}{s_{psivet}} \quad (6)$$

4.3 Sources and data

The current survey, which was conducted in the first semester of 2010, has employed annual earnings in the year 2009 of the hired labour of the PSIVET and the S.E. graduates (control group). The questionnaires were addressed to the PSIVET and the S.E. graduates who had not received any additional education or training and were employed as full-time workers. Productivity bonuses have been included in the annual earnings, while earnings from the overtime work have not been included. Self-employed PSIVET and S.E. graduates have not been included, since it becomes too complicated when one attempts to separate the self-employment income from the income coming from other factors in the production process. Part-time employees have also been excluded. In the public sector, the earnings of the PSIVET and the S.E. graduates are the same (Law 3205/2003). Our sample was divided into two sub-samples. Sub-sample I consists of the PSIVET graduates who are employed in a full-

time basis in the private sector, while sub-sample II consists of a control group of the S.E. graduates who work as full time employees in the private sector. The sample has been stratified with a proportional distribution. The stratified sampling not only provides increased accuracy, but also allows separate estimates for each stratum. The proportional distribution is the most commonly used method of sampling by strata. This procedure is followed in the absence of information on the homogeneity of the strata to ensure a representative sample (Zairis, 1991). At the beginning of this project, a pilot sample of 135 observations (80 S.E. graduates and 55 PSIVET graduates) was collected. The minimum size of each stratum of the sample is determined by using the following formula:

$$n_0 = \frac{\Sigma W_h S_h^2}{\bar{Y}^2 CV_0^2(\bar{y}_{AN})} \quad (7)$$

Where the standard error $S.E.$ is estimated by using the formula:

$$SE(\bar{y}) = CV * \bar{Y} \quad (8)$$

where W_h is the weight of each stratum in the population, S_h^2 is the variance of each stratum, $\bar{Y}$ is the mean gross earnings (from the pilot sample) and $CV_0^2(\bar{y}_{AN})$ is the desired Coefficient of Variation. We note that, using the pilot sample, we calculated the mean earnings as 15.545 € per year. The C.V$_0$ has defined at 0.01 (1%)

Table 3 presents the structure of the total population and the sample by employment sector and level of education or training.

Table 3: The Structure of the Population and the Sample by Level of Education or Training and by Sector of Employment, 2009

Educational – Training Level	Population (%)		Sample
	Public Sector	Private Sector	Private Sector
S.E. Graduates	27.53	72.47	1,400
I.E.K.s Graduates	26.36	73.64	462

Source: Labour Force Survey, Statistical Service of Greece (NSSG, 2009)

4.4. Results and Discussion

The private rate of return was estimated by using the elaborate / full (IRR) method and the Mincer method (using the actual and the potential years of experience)

4.4.1 Internal Rates of Return

For the estimation of private rate of return by using the I.R.R., firstly we estimated the age-earnings profiles for PSIVET and SE graduates. Table 4 shows the regression results of the age-earnings functions of the private sector's PSIVET and secondary education graduates, by using the OLS method.

Table 4: Regression Analysis Results of Age-Earnings Function

Independent Variables	Employees	
	I.E.K. Graduates	S.E. Graduates
Age^2	-7.834** (-4.91)	-5.120** (-6.92)
Age	958.048** (7.44)	714.907** (12.15)
Constant	-9642.167** (-3.94)	-6515.248** (-5.84)

R^2	0.4325	0.4976
Adj.R^2	0.43	0.4969
F	174.90	691.94
Signif	0.0000	0.0000
N	462	1,400

Notes: 1. ** denote the statistical significance at the 5% level
2. Numbers in parentheses show the t-statistic values
3. See equation (x)

The signs of the coefficients conform to the human capital theory. The explanatory power of the model (R^2 - adjusted) is consistent with previous research. The t-statistic is particularly satisfactory. The calculations are based on equation (3).

Then is calculated the annual average private cost (cost per student). The annual average private cost in 2009 for PSIVET was 15,462 €.

Applying the equation (1) we found that the rate of return of the private investment in PSIVET is 4.76. In our calculations we used a discount rate equal to 3.09. It equals to the difference between the ten-year rates of Greek bond (5.69) and the inflation rate of Greece (2.6).

4.4.2 Mincer method

Applied Mincer method, the private rates of return was estimated using the basic earnings function and the extended earnings function. Also, we used the actual and the potential years of experience.

Table 5: Estimation of Basic and extended Earnings Function (using net earnings)

	Employees (PSIVET and S.E. Graduates)			
	Dependent Variable (LnYn)			
	Basic earnings function		Extended earnings function	
Independent Variables	Actual years of experience	Potential years of experience	Actual years of experience	Potential years of experience
a (Constant)	8.177**	7.265**	8.755**	8.589**
	(75.88)	(67.37)	(365.92)	(341.86)
S	0.0481**	0.110**	0.0963**	0.2207**
	(5.67)	(13.57)	(5.67)	(13.57)
EX	0.0516**	0.0579**	0.0516**	0.0579**
	(17.21)	(22.32)	(17.21)	(22.32)
EX^2	-0.00064**	-0.000739**	-0.00064**	-0.000739**
	(-7.85)	(-12.42)	(-7.85)	(-12.42)
R^2	0.4143	0.4794	0.4143	0.4794
Adj. R^2	0.4133	0.4785	0.4133	0.4785
F	438.08	570.21	438.08	570.21
Signif	0.0000	0.0000	0.0000	0.0000
N	1,862	1,862	1,862	1,862

Notes: 1. ** denote the statistical significance at the 5% level
2. Numbers in parentheses show the t-statistic values

The signs of the coefficients conform to the human capital theory. The explanatory power of the model (R^2 - adjusted) is fluctuated from 41-47% and is consistent with previous research. The R^2 – adjusted values are considered to be also satisfactory, given the fact that the data are cross-sectional. The t-statistic is particularly satisfactory.

Table 6 shows the private rates of return of investment in PSIVET

Table 6: The Rate of Return (%) of Private Investments in PSIVET

Cost Benefit Analysis	Mincer (Basic/Extended Earnings Function)	
Internal Rate of Return	Actual Experience	Potential Experience
4.76	4.81	11.03

The numerical results of rates of return with the two utilized methods (CBA/ IRR and Mincer with actual experience) are much closed. Instead, by using the potential experience, the private rate of return deviates significantly and is very higher. This finding is due to the fact that the actual is lower than potential experience (the PSIVET graduates remained out of labour for a long time period and individuals graduate from PSIVET at a later age). These findings converge to the finding of Tsamadias (2002). These findings show that the method of Mincer by using the potential experience over-estimates, more or less, the private rates of return of investment in education and training.

Table 7: The Private Rate of Return (%) of Investment in Education by changing the duration of Education and Training in P.S.I.V.E.T. (using net earnings)

	I.R.R.	Mincer (Basic/Extended Earnings Function)	
z		Actual Experience	Potential Experience
Base Case	4.76	4.81	11.03
-25%	6.56	6.42	14.71

We resort to a sensitivity analysis by using I.R.R. and Mincer method. Using elaborate method, the duration of studies is changed by one semester and the private cost by 25%. Using Mincer method, the duration of studies is changed by 6 months (with a ceteris paribus assumption holding all other constant, using the Mincer method). The regression analysis results are presented in Table A3 in Appendix. In Table 7 are presented the results of sensitivity analysis.

The results of sensitivity analysis shows that when the duration of studies in PSIVET is reduced by one semester (25%) the private rate of return, by using Mincerian method, is increased approximately by 33.47% (using the actual years of experience), and 33.36% (using the potential years of experience). Also, using the I.R.R., the private rate of return is increased approximately by 37.81%. Namely, the rate of return is elastic to duration of studies.

5. Concluding Remarks

This study estimates the private rates of return of investment in the Greek PSIVET by using the elaborate method (I.R.R.) and the Mincer method. The paper use cross-sectional data on the age-earnings profiles and the private cost in the year 2009. Sensitivity analysis is applied by decreasing the duration of vocational education and training in PSIVET. Note that the results reflect past conditions, concerning the demand, supply and earnings of PSIVET and SE graduates on critical year 2009 for Greece. The results from I.R.R. and Mincer method by using actual experience are much closed. The rates of return on the private investment to PSIVET is light satisfactory. It should be noticed that the calculated rates of return has been underestimated, since the non-monetary benefits, externalities and spillovers of the PSIVET have not been taken into account. Moreover, the residual value of the human capital after leaving the labor market has not been included in the calculations. In addition, the PSIVET graduates are more likely to participate in the labor market than the SE graduates. Concretely, the investment of individuals to PSIVET is profitable. Sensitivity analysis shows that the private rate of return is increased by 33.36 to 37.81%, when the period of studies and the private cost are decreased by 25%. Consequently, the private rates of return are sensitive to changes of the duration of studies and private cost parameter. Based on the

findings of the empirical analysis, we propose no further expansion of the PSIVET system. Moreover, the period of the general vocational education and training in IEKs should be reduced by one semester, while the training in jobs/firms should be increased respectively. For that matter, training in jobs/firms is generally considered to be the most promising approach. Furthermore, the revision of the training programs and courses will improve the quality and the external efficiency as well. This will lead to an alignment of the PSIVET with the Greek labor market. Since the private rates of return on the PSIVET have been estimated by using the earnings and the private cost data in 2009, a year in which the earnings had not been affected by the economic crisis, it would be interesting to calculate the private rate of return by using the earnings and cost data, as they are formed by the implemented economic program of "troika. This seems to be an interesting issue for further research.

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Appendix

Table A1: Public and Private I.E.K.s Graduates

Year	Public	Private	All
2000	16.342	14.407	30.749
2001	18.760	11.914	30.674
2002	11.936	11.768	23.704
2003	10.596	10.991	21.587
2004	9.630	11.499	21.129
2005	8.186	13.378	21.564
2006	6.685	16.136	22.821
2007	8.373	18.619	26.992
2008	9.789	20.921	30.710
2009	8.211	20.734	28.945

Source: O.V.E.T.

Table A2: Briefly the Literature Review

Author(s)	Year	Country	Elaborate	Mincer
Okpako Enaohwo and Osakwe	1986	Nigeria	x (IRR)	
Gomez-Castellanos and Psacharopoulos	1990	Ecuador	x	x
Grootaert	1990	Côte d'Ivoire	x	x
Psacharopoulos and Alam	1991	Venezuela	x	x
Fiszbein and Psacharopoulos	1993	Venezuela	x	
Bevc	1993	former Yugoslavia	x	
Psacharopoulos and Velez	1994	Uruguay		x
Psacharopoulos, Velez and Patrinos	1994	Paraguay		x
Bennett, Glennerster and Nevisons	1995	Bretagne		x
Nonneman and Cortens	1997	Belgium	x (IRR)	
Stanovnik	1997	Slovenia		x
Belli, Khan and Psacharopoulos	1999	Mauritius	x (NPV)	
Siphambe	2000	Botswana		x
Campos and Jolliffe	2003	Hungary		x
Sakellariou	2003	Singapore		x
Moenjak and Worswick	2003	Thailand		x
Okuwa	2004	Nigeria		x
Fleming and Lewis	2006	Australia	x (IRR)	
Kahyarara and Teal	2008	Tanzania		x
Leigh	2008	Australia		x
Yakusheva	2010	USA		x
Greece				
Leinbenstein	1967	Greece		
Psacharopoulos	1982			x
Psacharopoulos and Kazamias	1985		x (IRR)	

Lampropoulos and Psacharopoulos	1990			x
Hadjidema	1998		x (IRR)	
Magoula and Psacharopoulos	1999		x	x
Tsakloglou and Cholezas	2000-2001			x
Tsamadias	2001		x	x
Tsamadias	2002		x	x
Tsamadias	2004		x	x
Cholezas and Tsakloglou	2006			
Prodromidis and Prodromidis	2007			x

Table A3: Sensitivity Analysis using Mincerian Method (using net earnings)

Independent Variables	(-) 6 Months			
	Basic Earnings Function		Extended Earnings Function	
	Actual Years of Experience	Potential Years of Experience	Actual Years of Experience	Potential Years of Experience
	Dependent Variable (LnYn)			
a (Constant)	7.984** (56.59)	6.823** (48.83)	8.755** (365.92)	8.589** (341.86)
S	0.0642** (5.67)	0.1471** (13.57)	0.0963** (5.67)	0.2207** (13.57)
EX	0.0516** (17.21)	0.0579** (22.32)	0.0516** (17.21)	0.0579** (22.32)
EX^2	-0.000644** (-7.85)	-0.000739** (-12.42)	-0.000644** (-7.85)	-0.000739** (-12.42)
R^2	0.4143	0.4794	0.4143	0.4794
Adj. R^2	0.4133	0.4785	0.4133	0.4785
F	438.08	570.21	438.08	570.21
Signif	0.0000	0.0000	0.0000	0.0000
N	1,862	1,862	1,862	1,862

Notes: 1. ** denote the statistical significance at the 5% level
2. Numbers in parentheses show the t-statistic values