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Livanos, Ilias and Pouliakas, Konstantinos

University of Warwick, University of Aberdeen Business
School

30. October 2008

Online at <http://mpa.ub.uni-muenchen.de/14159/>
MPRA Paper No. 14159, posted 18. March 2009 / 10:31

Returns to education by academic discipline in the Greek labour market

Livanos, I.¹ & Pouliakas, K²

Key Words: academic discipline, wage returns, higher education, Greece
JEL- Code: J24, J31, J38.

Abstract

This paper examines the wage returns to different academic disciplines in the Greek labour market. Exploring wage responsiveness across the various degree subjects in the case of Greece is interesting, as it is characterised by high levels of graduate unemployment, which vary considerably by field of study, and relatively low levels of wage flexibility. Using micro-data from the most recently available waves (2000-2004) of the Greek Labour Force Survey (LFS), the returns to academic disciplines are estimated for the whole sample of graduates as well as by gender and public/private sector. Quantile regressions indicate that the OLS estimates are relatively robust to potential selectivity biases. The empirical results show considerable variation in wage premiums across the fields of study, with low returns for those that have a marginal role to play in an economy with a rising services/shrinking public sector. It is concluded that the Greek higher education system requires educational reforms that consider the future prospects of the different academic disciplines.

¹ Research Associate, Institute for Employment Research, University of Warwick, Coventry, UK.

² (Corresponding author) Invited Lecturer, University of Cyprus and Research Fellow, Centre for European Labour Market Research (CELMR), University of Aberdeen Business School, Edward Wright Building, Dunbar Street, Old Aberdeen AB24 3QY, UK – Tel. ++44 01224 272172, email: k.pouliakas@abdn.ac.uk.

1. Introduction

In the traditional theory of human capital (Becker, 1964; Mincer, 1974; Ben-Porath, 1967) the analysis has typically focussed on the amount of time devoted to the accumulation of the human capital stock that yields a given *level* of educational investment (e.g. PhD, Masters, university degree etc.). Based on this theoretical framework, much of the empirical work (as collated by Psacharopoulos, 1994) has largely focussed on estimating the rate of return to a *homogeneous* stock of human capital measured by variables such as years of schooling and/or levels of education. This assumption regards all workers as perfect substitutes in production at ratios proportional to their endowment of the time spend in the educational system and/or the associated educational qualification(s) obtained. “As such, *all* of the variation in wage rates can be attributed *only* to differences in *amounts* of human capital. *No implications exist concerning kinds of human capital*” (Polachek, 1981, p. 60).

Indeed, the standard human capital model has been criticized for its inability to yield any predictions concerning the occupational distribution (Blaug, 1976). The conventional practice of using years or levels of schooling as an explanatory variable in human capital earnings functions conceals most of the diversity of education. Yet there are plenty of reasons why considering variations in *types* of human capital may be as important as considering variations in *quantity*. For example, at the micro level interest continues to focus on the implications of the degree-conferral process for graduate unemployment or the under-representation of women and minorities in many technical degree categories (which tend to lead to higher-paid occupations; see Pouliakas and Livanos, 2008). Thus, by examining the kinds of human capital which people choose to invest in, one can understand important phenomena regarding the wage distribution.

Examining this issue within the Greek labour market context assumes greater significance due to the fact that Greece is recently embarking on a major reform of its higher educational system that entails, most significantly, the relaxation of Article 16 of its constitution in which the provision of ‘free’ education for all Greek citizens is enshrined. This is expected to lead to the establishment of

non-profit privately funded universities that will complement the existing state institutions. One of the main reasons underlying this initiative is the wide recognition that the zero opportunity cost of higher education has not only encouraged an over-supply of graduates, but has fostered their concentration into particular ‘prestigious’ disciplines (such as medicine and law) or those associated with a career in the influential Greek public sector (Katsanevas, 2002; OECD, 2005). This phenomenon underscores the importance of the weak labour market linkages to the degree-conferral process in Greece and brings into question the responsiveness of the higher educational system to changing national priorities, such as the desire of the Greek economy to secure competitiveness by becoming a knowledge-based hub in the South-eastern European region. It is thus evident that for the sake of the efficient allocation of human resources it is important to study the labour market implications of the degree selection process.

This paper contributes to the existing literature in various ways. First of all, it assesses the most recent wage impact of the type of human capital accumulated by workers as expressed by their field of study, which is relatively under-researched in the literature. Although the extent to which the university wage premium varies by college major has received increasing attention in the US, UK and Canada (Grubb, 1992; Rumberger and Thomas, 1993; Finnie and Frenette, 2003; Walker and Zhu, 2001; Blackaby, Murphy and O’Leary, 1999; Blundell et al., 2000; O’Leary and Sloane, 2005; Kelly et al., 2008), this study is the first investigation of this sort within the Greek labour market context. Second, it examines the case of Greece which is interesting due to the major educational debate that has taken place over the last decade in this country (Psacharopoulos, 1990) as well as the pronounced disparities found across fields of study. Third, it takes into consideration the gender and public/private sector dimension, since Greece has traditionally been characterised by large gender wage and employment disparities and a large and dominant public sector. Finally, the study also adopts the method of quantile regression as a robustness check of the OLS estimates, given that individuals within each quantile of the wage distribution are likely to be characterized by similar ability capacities.

The structure of the paper is as follows. Section 2 provides a brief overview of the Greek educational system, while section 3 describes the available literature on the returns to education in Greece. Descriptive statistics of the differences in the subject of degree and in the relative wages of Greek employees is then provided in Section 4, while the relevant econometric methodology is outlined in section 5. Using microdata from the most recently available waves (2000-2004) of the Greek Labour Force Survey (LFS), the differential returns to various academic disciplines in Greece are subsequently estimated in Section 6. Section 6 also explores potential heterogeneity issues in the sample, by investigating the differences in the returns to subject of degrees by gender, public/private sector and across quantiles of the wage distribution. Finally section 7 discusses the implications of the empirical findings for the design of appropriate educational policies within Greece, while section 8 concludes with suggestions for future research.

2. Higher education in Greece

The tertiary education system in Greece is divided into University Education, which is provided by the Universities (AEI), and Higher Technological Education, which is provided by the Technological Educational Institutes (TEI). The University System includes the Universities, the Polytechnics, the Higher Fine Arts Institute and the Hellenic Open University. There are 20 universities in Greece located in various towns. There are also 14 Technological Education Institutes. The main distinction between AEI and TEI are that TEI courses are of shorter duration relative to those offered by AEI, are more practically oriented and the entry requirements are in general lower.

Greece has experienced a rapid increase in its student population in recent decades, stemming primarily from the higher incomes that its citizens have enjoyed, as well as the tendency of its political leaders to view education as the main determinant of the country's future economic growth prospects and driver for the elimination of socio-economic disparities. The number of students that are enrolled in Greek universities has surged in the past four decades from just over 20,000 in 1960 to over 500,000 students at the end of 2002 (Papamatthaioy, 2002). These figures exclude the large number of Greeks that are enrolled in university courses abroad (Psacharopoulos, 1990).

A cause of greater concern, in the face of the rising graduate figures, is the tendency of students to select university disciplines that are regarded as ‘prestigious’ or as acting as a passport for entry into the historically large, and superior in terms of overall working conditions, Greek public sector. For instance, in the academic year 1999/2000 it was estimated that one in two students of higher education were registered in courses that are associated with the conventional fields of law, education, or medicine. By contrast, only one in twenty students were registered in high-tech departments concerned with information technologies (Papamatthaiou, 2002).¹ As noted by Psacharopoulos (2003), the problem lies in the fact that the direct costs of education are zero (since higher education is free in Greece), so individuals choose their studies according to criteria of social status rather than their future employment prospects. In addition, there is little uncertainty regarding the probability of dropping out due to poor performance, since students can remain within the university system for as long as they wish. All of these facts illustrate that a large part of the significant investment of Greeks in human capital has been directed towards professions that are not necessarily linked to the needs of the labour market.² In fact, the weak link between the educational system in Greece and the labour market has been persistently highlighted by the European Commission (1996) and the OECD (2005), both of which have argued that Greek universities are merely producing ‘degree holders’ who, in the face of the shrinking public sector, have a higher probability of experiencing unemployment/underemployment and/or receive low pay.

Imbalances in the supply and demand of particular professions in Greece are expected to result mainly in higher joblessness or underemployment and not in lower wages *per se*. On the one hand, Livanos (2008[a]) found that the chances of unemployment vary significantly across the various fields of study with graduates of disciplines that are traditionally related to the public sector, such as Humanities and Sociology, having poor employment prospects. In contrast, graduates of fields that are associated with the changing needs of the private sector, such as Computer Science, are likely to enjoy a low probability of joblessness. On the other hand, even though the level of pay of Greek graduates is found to be quite responsive to a tentative rise in unemployment at the aggregate level (Livanos, 2008[b]), the Greek labour market is in general characterised by relative wage rigidity,

since sectoral and enterprise pay rates are usually dictated by minimum effective floors that are set by national general collective agreements. An interesting question, therefore, is the extent to which the above-mentioned graduate supply patterns have affected the returns to various fields of study, or whether they have resulted solely in higher unemployment.

3. Literature Review

3.1 The returns to level of educational attainment in Greece

Most studies in the literature have focussed on calculating the rate of return to years of schooling or to various academic qualifications without taking into consideration the variation in the fields of study. This has also been typically the case in Greece, whereby there exist a number of papers investigating the private returns to a university education (e.g. Cholezas and Tsakloglou, 1999; Magoula and Psacharopoulos, 1999; Kanellopoulos et al., 2003; Prodromidis and Prodromidis, 2007) but there is no study to date of the returns to different academic disciplines. Of course, failure to differentiate amongst the returns to *types* as opposed to the *level* of education in the past is likely to have been a consequence of the lack of appropriate information in most available Greek labour force datasets.

It is now well documented, with few notable exceptions (Prodromidis and Prodromidis, 2007), that the returns to tertiary education have diminished over the last few decades in Greece due to the large expansion of the educational sector. For instance, Labropoulos and Psacharopoulos (1992), using data on male employees of the private sector with higher education qualifications, find that the annual marginal private returns to higher education in Greece dropped from 15.1% in 1975 to 10.2% in 1985. Kanellopoulos (1997) estimates logarithmic wage equations and finds that the ‘returns on higher education are not higher than those on secondary education’ as was the case in the 1960s. In addition, the studies of Magoula and Psacharopoulos (1999) and Cholezas and Tsakloglou (1999) show that even though there has been a decline in wage premiums offered to tertiary education in recent decades, they have been surprisingly resilient presumably in the face of a strong demand side of the market. For instance, Cholezas and Tsakloglou (1999, p. 8) argue that ‘private returns to

education in Greece are not a linear function of years/levels of education' and unveil that over the period 1974-2004 they fell from 9.3% in 1974 to 8.7% in 1994 for males and from 11.9% to 10.4% for females.

3.2 The returns to subject of degree

Given the increasing interest in the non-linearity of the returns to a university education, there now exist a limited number of studies that have examined the role of the field of qualification primarily in the US and UK context. The studies of Grubb (1992) and Rumberger and Thomas (1993) in the US, Finnie and Frenette (2003) in Canada, and those of Blundell et al. (2000), Walker and Zhu (2003), O'Leary and Sloane (2005) and Kelly et al. (2008) for the UK, all show substantial variation in the wage returns to different fields of study. In most cases it is shown that the rates of return to courses such as Law, Engineering and Business are significantly higher than those of Arts, Education, Humanities and other Social Sciences. Significant gender differences in the rates of return are also reported, with women tending to select the latter disciplines which offer lower lifetime earnings.

Recently, O'Leary and Sloane (2005) have also attempted to correct for the fact that part of the return to particular disciplines may reflect a positive quality effect. Using Leslie's (2003) index of student quality as control, they find that the inclusion of the index has a substantial yet not dramatic effect on their estimates. Overall their results demonstrate that men enjoy greater rewards from programmes which are of a more quantitative nature than women. Kelly et al. (2008) have also dealt with the potential selectivity bias that arises when students choose among alternative disciplines by conducting quantile regressions that (arguably) control for the inherent ability differences among individuals within the various wage quantiles (McGuinness and Bennett, 2007).

4. Data and Descriptive Statistics

The analysis draws on micro-data from the Greek Labour Force Survey (LFS) for the second quarter of the years 2000-2004. The Greek LFS is administered by the National Statistical Service of

Greece (ESYE). Since 1998, the LFS is being conducted four times per year in order to meet the standards set by Eurostat. The yearly sample of the survey consists of 30,000 households and includes approximately 80,000 observations. The questionnaire used is comprised of approximately 100 questions and both the questions and the definitions are based on the European LFS.

Employed are considered those individuals that during the reference week worked at least one hour, or those that have a job even if they were absent in the reference period for reasons of illness/leave/strike etc. In the years 2000-2004, in which wage data are available, the employed amounted to 150,309 observations, of which 49,763 were self-employed (33%) and 87,677 were salaried employees (58%). The remaining 12,869 (8.6%) were classified as assistants of the family business. For the purposes of this study a sample of paid employees only who have completed their studies and who are aged 15 years and above is retained, resulting in a total of 86,066 observations.

Table 1 illustrates the distribution of the sample observations across the different levels and types of educational attainment, as well as the dispersion of real graduate earnings over the various academic disciplines. Earnings are calculated as the net monthly wage that the respondents receive from their main employment inclusive of any extraneous payments (such as Christmas and Easter bonus, annual leave remuneration and other irregular bonuses).³ It is clear from the table that approximately 22% of the whole sample is comprised of university graduates, and that their mean wage of €1040 significantly exceeds that of the entire population of employees (€872). In addition, there are marked variations in the subject of degree from which graduates have matriculated, with Economics and Business (15%), Humanities (15%) and Education (14%) occupying the lion's share of degrees. These are followed by the fields of Polytechnics (9%), Physics and Maths (9%), and Medicine (6%) or Medical-related sciences (7%). One can also observe a strikingly low proportion of graduates from Computing Science (0.8%), which is indicative of the lagging progress of Greece in keeping pace with the rapid speed of the information technology era. Differences in the average level of pay by field of study are also observed, with mean monthly earnings being highest for Medical degrees (€1272), followed by Law (€1113) and Polytechnic (€1122) degrees. A notable feature of the data is the lower average earnings of graduates from the TEIs compared to those from AEIs.

[INSERT TABLE 1 HERE]

Table 2 also presents descriptive statistics of the most important variables that may contribute to the above discrepancy in pay amongst the degree holders. Important phenomena that characterize the Greek labour market emerge, such as a substantial gender pay gap (Papapetrou, 2004; Cholezas and Tsakloglou, 2006; Pouliakas and Livanos, 2008), higher average wages received by workers in the public relative to the private sector (Kanellopoulos, 1997; Papapetrou, 2006), and a very low (high) proportion of workers employed in part-time (temporary contract) jobs (Pouliakas and Theodossiou, 2005). One can also observe that the sample of university graduates only consists of equiporportionate shares of male and female employees, who are mostly employed in permanent, full-time, public sector jobs.

[INSERT TABLE 2 HERE]

5. Econometric Methodology

The empirical analysis of the paper employs a slight modification of the Mincerian human capital earnings function that seeks to identify the impact of different subjects of degree on graduate earnings, after controlling for a standard set of demographic and workplace characteristics of the employees in the sample. The Mincer-type earnings functions that are fitted are defined as follows:

$$\ln E_{ij} = \sum_{j=1}^J S_{ij} \alpha_j + X_i \beta + \varepsilon_i \quad (1)$$

where E_{ij} are the monthly earnings of individual i who graduated in subject j ($j = 1, \dots, J$), S_{ij} is a dummy variable taking the value 1 if individual i graduated in that subject and 0 otherwise, X_i is a vector of personal and job characteristics which affect occupational earnings and ε_i is a random error term where it is assumed that $E(\varepsilon_i | S_{ij}) = 0$. The coefficient α_j is subsequently the earnings premium that graduating from subject j imparts relative to the default case (usually the subject which has the lowest return), while β is the vector of the marginal returns of the characteristics in X .

In addition to investigating the mean return to distinct fields of study, quantile regressions (QR) are also performed that identify the wage premium offered to degree subjects at different segments of the wage distribution. As discussed above, this is done in order to tackle the potential selectivity bias problem that may plague the average estimates of the subject of degree, given that lower/higher ability students are likely to select dissimilar subject areas. Ideally, one would require pre-university entry test scores or other background socio-economic information (O’Leary and Sloane, 2005; McGuinness, 2003), but given the unavailability of such variables in the LFS dataset the QR technique is a second-best approach.

As formalized by Buchinsky (1994), the linear quantile regression function

$$Q_{\tau}(\ln w | x_i) = x_i' \beta_{\tau} \quad (2)$$

can be estimated by solving the optimization problem

$$\hat{\beta}_{\tau} = \arg \min_{\beta \in \mathfrak{R}^K} \sum_{i=1}^N \rho_{\tau}(\ln w - x_i' \beta_{\tau}) \quad (3)$$

where $\tau \in (0,1)$ denotes the τ_{th} quantile of the wage distribution, ρ_{τ} is known as the piecewise linear “check function” and x_i is a vector of exogenous control variables. As is standard, the QR estimates found by solution to (3) indicate the marginal change in the τ_{th} quantile due to a marginal change in the j -th regressor x_{ij} .

6. The Returns to Subject of Degree in Greece

6.1 Returns to Educational Qualifications in Greece

Prior to describing the influence of the type of university degree on earnings in Greece, Table 3 outlines the empirical estimates of Mincerian earnings equations that are computed based on the entire sample of the dataset and including the *levels* of educational attainment as controls (as is typically performed in the literature).⁴ The findings are in agreement with previous studies

confirming the positive contribution of higher education to productivity in Greece (Magoula and Psacharopoulos, 1999; Cholezas and Tsakloglou, 1999; Prodrromidis and Prodrromidis, 2007), as well as the fact that the private rates of return to education are higher for women than for men (Papapetrou, 2004; Cholezas and Tsakloglou, 2006; Pouliakas and Livanos, 2008) and in the public rather than the private sector (Papapetrou, 2006). For instance, an undergraduate university degree (AEI) is associated with a monthly earnings premium of 29% relative to the omitted primary level qualification, with women (36%) and public sector (34%) workers experiencing a much higher earnings boost compared to comparable men (25%) or employees in the private sector (26%). An interesting observation is that the labour market seems to offer lower rewards to those degrees that are obtained by TEIs. This reflects the fact that entry requirements are generally lower in TEI Schools, and signifies that there is a long way to go until the degrees awarded by these institutions are of an equivalent standing to those offered by AEIs. In fact, the private rates of return to a TEI degree are found to be similar to those of individuals who have graduated from the so-called Institutes of Professional Orientation (IEK) and other Colleges. The latter constitute the primary candidates for being recognized as privately-run non-profit university institutions should the state monopoly of tertiary education be repealed. Finally, marked returns to post-graduate qualifications are also found, confirming that in an country with a rapidly expanding supply of highly educated labour, merely holding an undergraduate university degree may not serve as a sufficient distinguishing mark for students any longer.

[INSERT TABLE 3 HERE]

The effect of the remaining variables that are included in the wage equation conforms to the familiar patterns that have been reported in the literature, namely upward-sloping age-earnings profiles; marriage yielding an wage premium over other marital states; immigrants receiving substantially lower wages compared to natives; full-time and permanent work enjoying higher remuneration relative to part-time or temporary jobs; the average wage being higher in the public than in the private sector; larger firms offering a compensating wage differential; and wage rates varying substantially among regions. The year dummies also indicate substantial wage gains over the period

2000-2004, which is not surprising given that during that time Greece was enjoying a long period of sustained economic growth as a result of the huge construction and housing boom that preceded the hosting of the Athens 2004 Olympic Games.⁵

6.2 Returns to Subject of Degree in Greece

Although there are significant rewards to a university education, the substantial diversity in the returns to particular degree programmes is masked in Table 3. This is evident from Table 4, which displays the estimates of equation (1) for a pooled sample of *university graduates* only and disaggregated by gender and public/private sector. In this Table the returns to broad types of degrees at undergraduate university level are compared to the subject that yields the lowest wage premium relative to a secondary level education, namely “TEI Agricultural Sciences”.⁶

It is evident that the financial returns vary according to the type of academic School that individuals attend, all other things equal. Specifically, the estimates reveal that the subject that commands the largest monetary mark-up in Greece is Medicine (28%), followed by Computer Science (24%), Law (20%) and Polytechnics (19%). Graduates of Economics and Business courses, as well as Education, Social Sciences, Physics and Mathematics are in the middle of the discipline rankings, commanding wage premiums of around 14-18%. At the end of the spectrum are the subjects of Humanities (13%), Agricultural Science (12%) and Physical Education (7%), while the TEI courses also feature quite low in the rankings. It is noticeable that with the exception of TEI Polytechnics (10%), Applied Arts (8%) and Medical-related Sciences (5%), the remaining Technical Education degrees do not offer superior rewards relative to the base category of TEI Agricultural Studies (and hence secondary education).

[INSERT TABLE 4 HERE]

The general conclusion that women and public sector workers have more to gain from a university education arises once again when comparing the returns to different types of degrees between the two sexes and sectors. However, although Medicine, Computer Science and Law come up first in the discipline rankings for both men and women (see Table 5), clear differences in the

rankings of some subjects emerge. Specifically, Economics and Business, Social Sciences and Applied Arts degrees are found to be more lucrative for male rather than female employees. On the other hand, Education and Humanities are stronger performers in the case of women, as are Medical-Related diplomas obtained from TEIs. In addition, AEI Polytechnics and Computer Science constitute the only two subjects in which the financial returns in the private sector outweigh those of the public sector. In fact, the latter two degrees come up top in the rankings of the wage returns in the private sector as opposed to Medicine and Law in the public sector.

[INSERT TABLE 5 HERE]

As mentioned before, the OLS estimates reported in Table 4 are likely to suffer from selectivity bias given the differential distribution of tastes and abilities among human beings. Thus, in order to test for the robustness of the field effects that are found via OLS regressions, QRs are also estimated on the assumption that workers located in similar rungs of the wage distribution are likely to be “similar”. If this assumption is true, it follows that the QR estimates shown in Table 6 controls for any potential unobserved heterogeneity in the sample. Based on this hypothesis, it is interesting to notice that within quantiles the ranking of the field effects remains largely unaffected. Nevertheless, an interesting pattern emerges given that for some of the fields with are closely associated with the public sector, such as Education, Humanities, Physical Education and Medical-related Sciences, the impact of a degree on a graduate’s earnings is strong at the bottom quantiles, yet declines as one moves up the ability/wage distribution. To examine whether this pattern can be attributed to the workings of administrative public sector pay scales, the QR for the lowest category (0.05) was repeated but only for the private sector of the economy. As expected, the coefficients of the fields Education, Physical Education and Humanities become significantly smaller and in some cases statistically insignificant.⁷ This constitutes evidence of the influential role that the Greek state can play in influencing the wage level of individuals who would otherwise command low wages if only market forces were at play.

[INSERT TABLE 6 HERE]

7. Discussion

From the above rankings one can draw the conclusion that fears regarding the saturated job market prospects of the fields of Medicine and Law, following an “overflow” of physicians and lawyers in the Greek labour market, have not materialized in terms of lower overall wage returns to these occupations. This is presumably the case because the public sector has offered a shield against market forces. Indeed, once one takes into consideration the evidence of Livanos (2000[a]), which shows that the aforementioned fields enjoy comparatively low chances of employment and high chances of unemployment duration in Greece, the logical conclusion is that these professions are characterized by a dual labour market. In other words, even though the port of entry may be difficult, the prospects are quite bright in terms of earnings once individuals succeed in getting on the job ladder.⁸ Moreover, the bright prospects of Computer Science, in terms of both the high financial returns and low probability of unemployment (Livanos, 2008[a]), is evidence of the fact that the demand for skills associated with new technologies in Greece has outpaced the available supply of such graduates.⁹ Indeed, the lower wage premium offered to IT graduates by the Greek public sector relative to the private economy is evidence of potential misalignment in the price signals offered by the state in an era of rapidly expanding information technologies within a competitive global economic system. The low wage and employment prospects of graduates of Social Sciences, Humanities, Physical Education, Food Technology and Librarianship is indicative of the fact that these fields have a marginal role to play in the rising service sector of the Greek economy and in the face of a shrinking public sector which has traditionally employed this group of graduates. The low returns of Agricultural Studies is also a consequence of an expanding supply of graduates despite the fact that the share of the agricultural sector, which for many decades constituted the core activity of the Greek economy, has been contracting in the last 2-3 decades. Finally, for graduates of most TEIs no significant compensation in the labour market is predicted for their human capital investment, which is a consequence of the relatively low ability pool of graduates entering these Schools, as well as of the generally lower standards of education provided for subjects which the market economy does not place much value.

Given the weak link between the education system and labour market outcomes that is observed in the Greek economy, efficient career counselling that emphasizes the wage and employment prospects of the various disciplines as suggested in this paper is paramount. There is also a need for future educational reforms. First of all, the higher education system needs to be restructured in order to correspond more closely to the changing needs of the labour market and offer more courses that guarantee promising employment prospects to graduates in the future, such as Computer and IT sciences. Second, the numbers of entrants into courses that are mostly related to the public sector, such as Humanities, Education and Social Sciences, and for which there is an apparent oversupply in the labour market, need to be reduced, thus ensuring a better match between graduate demand and supply. Third, further development and strengthening of vocational and technological education in Greece could be of considerable importance as it could provide a crucial alternative to those students whose aptitudes lie in technical rather than academic areas, but who are at present discouraged from attending the existing TEIs.

To that end, several features of the higher education system need to be taken into account as they are inhibiting the aforementioned reforms. First of all, the fact that higher education is free implies a very low opportunity cost for students. This encourages students to study courses on which they were accepted to based on their performance in the national exams, but which often do not comprise their first choice. However, in many instances these courses have poor employment prospects or do not closely match the interests of the students. The introduction of suitable university fees could initiate a mechanism which would allocate students to the various Schools more efficiently, as students will have an extra incentive (i.e. financial cost) to choose disciplines more carefully. The success of such a scheme would depend crucially on the provision of effective financial support to those students whose financial means do not permit them to study their preferred degree.

Moreover, since an individual has to undertake national exams immediately after graduating from high school in order to enrol to a university, the period following graduation from high school seems to be the only chance that individuals have to acquire a degree in a public university. This might be another factor that influences student choice and leads to enrolment to courses that are not of

principal choice. Thus, changes in the system that will allow individuals to enrol to courses at later stages of their life will also improve the matching process.

Another crucial rigidity of the Greek higher education system is that it permits undergraduate students to take exams as many times as they need until they pass. Therefore, there is no need for them to drop out from courses which might have proved unsuitable for their particular set of tastes/abilities *ex post*. This fact increases the supply of graduates and obscures the allocation process, thereby imposing heavy financial burdens not only to universities but also to the larger part of society by blocking access to those who might have otherwise taken advantage of the opportunity to study at a higher level. Thus, changes in the higher education system that would impose limitations to the numbers of years that an individual can remain in university will reduce the costs to the universities and allow them to use their resources more effectively.

Though to a large extent controversial with the Greek public opinion, the foundation of non-profit privately-run universities in Greece alongside public sector ones could also result in a better future distribution of university graduates across fields, with the private Schools most likely focussing on the provision of degrees which are market-oriented, and the public ones ensuring an adequate supply of graduates from other less financially-rewarding disciplines which are, nevertheless, vital for the operation any economy and society. It might also be the case that such an arrangement will stem the ‘haemorrhage’ of young Greek students to foreign universities.

8. Conclusion

This study estimates rates of return to different academic disciplines within the context of the Greek labour market using the most recently available data from the Greek LFS. The estimated returns are found to vary considerably across the various degree subjects examined, while important gender and public/private sector differences are detected. This suggests that graduates of specific educational attainment levels cannot be treated as perfect substitutes in the spirit of the traditional human capital theory.

Indeed, it is found that in Greece disciplines that are more closely associated with the needs of the private sector, such as Computer Science, Polytechnics and Economics and Business, command higher wage premiums in the labour market. Instead, graduates of subjects that have traditionally been absorbed within the public sector (e.g. Education, Humanities, Physical Education) receive lower premiums, which can be attributed to the fact given that the share of the Greek state in national output has been declining steadily in the past decade. Disciplines that enjoy high status in the Greek society and for which an apparent oversupply exists in the labour market, i.e. Law and Medicine, are nevertheless found to enjoy persistently high aggregate rates of return, yet some evidence exists that the private sector is eventually responding to market forces within these occupations.

Confirmation of the above conclusions, in particular of any trends in the wage returns of the various disciplines, requires further investigation with additional years of data added to the analysis. In general, there is a lack of appropriate educational-specific datasets in Greece that may permit the study of potential selectivity issues or the interaction among socio-economic background variables and wage outcomes of recent cohorts of graduates, so there is clearly a need for the development of such sources of data. Within the existing constraints, though, a number of important issues remain unexplored. For example, the empirical estimates of the paper reveal significant gender discrepancies in the selection and in the wage returns of different types of university degrees. Further analysis that would introduce fields of study into standard gender wage decompositions might therefore shed further light into the determinants of the gender wage gap (Machin and Puhani, 2003; O'Leary and Sloane, 2005; Pouliakas and Livanos, 2008). Another issue of recent concern in the literature is to explore the implications of the different levels of uncertainty and risk between the various fields of study for the wage premiums received by graduates (Hartog, 2006).

What emerges clearly from the analysis of this paper, though, is that there is a need for future educational reforms in Greece that will heed to the signals of the labour market and promote those courses that have brighter future prospects.

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Table 1				
Descriptive statistics of educational attainment by level and academic discipline, Greece, LFS, 2000-2004				
			Wage	
	N	%	Mean (€)	s.d
All sample				
PhD	331	0.41	1427	465.79
Masters	527	0.65	1223	476.05
AEI	15,165	18.6	1060	382.1
TEI	3,181	3.9	949	336.93
Tertiary non-uni	8,435	10.35	854	370.78
Other	1,688	2.07	1137	360.37
Secondary	38,451	47.17	817	323.63
Primary	13,736	16.85	752	285.1
Total	86,066	100	872	357.93
Univ. graduates				
AEI				
Polytechnic	1675	9.13	1122	424.83
Computing Science	147	0.8	1099	388.43
Agricultural Science	507	2.76	1059	356.26
Physics and Maths	1690	9.21	1052	345.69
Medicine	1125	6.13	1272	429.64
Law	681	3.71	1113	452.43
Economics & Business	2820	15.37	1076	406.03
Sociology	315	1.72	1029	422.06
Humanities	2822	15.38	974	344.86
Physical Education	730	3.98	924	336.12
Education	2652	14.46	1041	313.23
TEI				
Polytechnic	1414	7.71	1011	359.76
Agricultural Science	214	1.17	852	304.03
Food Technology	83	0.45	888	320.57
Librarianship	37	0.2	840	217.21
Medical-related	1353	7.38	911	311.82
Applied Arts	80	0.44	865	285.2
Total	18,345	100%	1040	376.93

Table 2 Descriptive statistics of employee characteristics, Greece, LFS, 2000-2004						
	All sample			Univ. graduates		
	N	%	Mean Wage (€)	N	%	Mean Wage (€)
Gender						
Male	51,974	60.39	927	9010	49.11	1116
Female	34,092	39.61	788	9336	50.89	969
Marital status						
Married	54,739	63.6	932	12456	67.89	1102
Single	31,327	36.4	765	5890	32.11	908
Age group						
15-24	6,779	8.05	677	331	1.81	710
25-34	25,927	30.8	780	5891	32.25	864
35-44	24,994	29.69	919	6222	34.07	1065
45-54	19,536	23.21	992	4395	24.06	1192
>55	6,941	8.25	985	1426	7.81	1286
Sector						
Private	54,818	63.69	782	6857	37.38	918
Public	31,248	36.31	1024	11,489	62.62	1109
Hours status						
Part-time	3,030	3.52	499	629	3.43	583
Full-time	83,036	96.48	885	17717	96.57	1056
Contract status						
Temporary	10,567	12.28	661	1699	9.26	730
Permanent	75,499	87.72	901	16647	90.74	1072
Occupation						
Legislators/managers	916	1.83	1139	461	4.31	1229
Professionals	7,655	15.32	1011	6735	63.04	1016
Technicians/associates	4,719	9.44	903	1573	14.72	915
Clerks	8,700	17.41	807	913	8.55	853
Services and Sales	8,270	16.55	716	433	4.05	724
Skilled agriculture etc.	436	0.87	702	15	0.14	778
Craft/trade	9,277	18.56	759	292	2.73	795
Plant/machine operators	4,863	9.73	820	91	0.85	787
Elementary	5,141	10.29	639	171	1.60	560

Table 3
Wage equations, all sample and by gender and sector,
Greece, LFS, 2000-2004

	(1)	(2)	(3)	(4)	(5)
<i>Variables</i>	All	Male	Female	Public	Private
Education					
PhD	0.434*** (0.018)	0.401*** (0.021)	0.519*** (0.032)	0.489*** (0.019)	0.445*** (0.051)
Masters	0.383*** (0.016)	0.339*** (0.021)	0.462*** (0.023)	0.401*** (0.020)	0.385*** (0.024)
AEI	0.293*** (0.004)	0.247*** (0.005)	0.361*** (0.007)	0.344*** (0.006)	0.260*** (0.006)
TEI	0.195*** (0.006)	0.161*** (0.008)	0.248*** (0.009)	0.242*** (0.008)	0.166*** (0.010)
Tertiary non-uni (e.g. IEK/Colleges)	0.167*** (0.005)	0.158*** (0.007)	0.210*** (0.008)	0.216*** (0.008)	0.146*** (0.006)
Other (e.g. military schools)	0.235*** (0.008)	0.231*** (0.008)	0.292*** (0.026)	0.323*** (0.009)	0.183*** (0.033)
Secondary	0.098*** (0.003)	0.078*** (0.004)	0.152*** (0.006)	0.181*** (0.006)	0.064*** (0.004)
Female	-0.130*** (0.003)	0.000 (0.000)	0.000 (0.000)	-0.061*** (0.005)	-0.166*** (0.004)
Age Group					
25-34	0.076*** (0.005)	0.081*** (0.007)	0.068*** (0.007)	0.093*** (0.012)	0.072*** (0.005)
35-44	0.162*** (0.005)	0.172*** (0.007)	0.149*** (0.008)	0.167*** (0.012)	0.154*** (0.006)
45-54	0.216*** (0.006)	0.228*** (0.008)	0.206*** (0.009)	0.238*** (0.013)	0.191*** (0.007)
>55	0.209*** (0.007)	0.219*** (0.009)	0.207*** (0.011)	0.245*** (0.014)	0.178*** (0.009)
Married	0.059*** (0.003)	0.064*** (0.005)	0.052*** (0.005)	0.062*** (0.004)	0.054*** (0.004)
Head Household	0.054*** (0.003)	0.053*** (0.005)	0.052*** (0.006)	0.051*** (0.005)	0.067*** (0.004)
Immigrant	-0.093*** (0.004)	-0.097*** (0.006)	-0.088*** (0.007)	-0.072*** (0.015)	-0.093*** (0.005)
Full time	0.388*** (0.008)	0.344*** (0.016)	0.388*** (0.009)	0.433*** (0.021)	0.362*** (0.008)
Permanent	0.142*** (0.004)	0.136*** (0.006)	0.149*** (0.006)	0.252*** (0.008)	0.104*** (0.005)
Public	0.120*** (0.003)	0.085*** (0.003)	0.171*** (0.004)	0.000 (0.000)	0.000 (0.000)
Firm Size					
11-19	0.057*** (0.003)	0.051*** (0.004)	0.067*** (0.005)	0.029*** (0.005)	0.068*** (0.004)
20-49	0.087*** (0.004)	0.090*** (0.005)	0.087*** (0.006)	0.062*** (0.005)	0.100*** (0.005)
>50	0.134*** (0.003)	0.138*** (0.004)	0.135*** (0.005)	0.101*** (0.005)	0.161*** (0.005)
Unknown >10	0.076***	0.078***	0.079***	0.053***	0.087***

	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)
Constant	5.670***	5.734***	5.485***	5.536***	5.781***
	(0.010)	(0.017)	(0.013)	(0.024)	(0.011)
N	70649	42609	28040	27100	43549
R-squared	0.47	0.42	0.50	0.48	0.38
<p>Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Omitted variables include: Education: primary level qualification; Age: 15-24; Firm Size: <10. Regional and Yearly dummies have also been included as controls.</p>					

Table 4					
Returns to University Degrees					
Greece, LFS, 2000-2004					
	(1)	(2)	(3)	(4)	(5)
Disciplines	All	Male	Female	Public	Private
AEI					
Polytechnic	0.188***	0.174***	0.195***	0.159***	0.198***
	(0.022)	(0.027)	(0.040)	(0.029)	(0.032)
Computer Science	0.237***	0.224***	0.238***	0.172***	0.232***
	(0.034)	(0.043)	(0.054)	(0.047)	(0.046)
Agricultural Science	0.125***	0.112***	0.148***	0.126***	0.113***
	(0.024)	(0.029)	(0.042)	(0.031)	(0.037)
Physics Maths	0.144***	0.121***	0.189***	0.147***	0.133***
	(0.022)	(0.026)	(0.038)	(0.028)	(0.032)
Medicine	0.277***	0.267***	0.300***	0.300***	0.203***
	(0.023)	(0.028)	(0.039)	(0.029)	(0.041)
Law	0.199***	0.193***	0.221***	0.246***	0.128***
	(0.025)	(0.034)	(0.040)	(0.031)	(0.039)
Economics & Business	0.178***	0.180***	0.180***	0.175***	0.167***
	(0.021)	(0.026)	(0.037)	(0.028)	(0.031)
Social Sciences	0.141***	0.140***	0.158***	0.157***	0.099**
	(0.028)	(0.040)	(0.044)	(0.035)	(0.043)
Humanities	0.133***	0.089***	0.165***	0.135***	0.105***
	(0.021)	(0.027)	(0.037)	(0.028)	(0.031)
Physical Education	0.070***	0.059**	0.086**	0.082***	0.041
	(0.023)	(0.028)	(0.041)	(0.029)	(0.037)
Education	0.159***	0.119***	0.190***	0.154***	0.076**
	(0.021)	(0.026)	(0.037)	(0.028)	(0.034)
TEI					
Polytechnic	0.097***	0.085***	0.094**	0.098***	0.078**
	(0.022)	(0.026)	(0.040)	(0.029)	(0.031)
Food Technology	0.030	-0.004	0.069	-0.063	0.041
	(0.040)	(0.058)	(0.059)	(0.073)	(0.048)
Librarianship	0.000	-0.057	0.031	-0.014	-0.057
	(0.039)	(0.106)	(0.050)	(0.047)	(0.065)
Medical-related	0.048**	0.026	0.071*	0.054*	0.023
	(0.022)	(0.032)	(0.037)	(0.028)	(0.034)
Applied Arts	0.081**	0.096*	0.087	0.050	0.077
	(0.038)	(0.051)	(0.057)	(0.050)	(0.052)
Constant	5.674***	5.818***	5.551***	5.710***	5.810***
	(0.033)	(0.065)	(0.046)	(0.058)	(0.044)
N	16304	7940	8364	10447	5857
R-squared	0.47	0.42	0.49	0.46	0.43
Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. All returns are measured relative to a "TEI Agricultural Sciences" degree. The remaining regression output is available from the authors upon request.					

Table 5					
Ranking of University Degrees in terms of Financial Returns, Greece, LFS, 2000-2004					
<i>Degrees</i>	All	Male	Female	Public	Private
AEI					
Polytechnic	4	5	4	5	3
Computer Science	2	2	2	4	1
Agricultural Science	10	9	10	10	7
Physics Maths	7	7	6	8	5
Medicine	1	1	1	1	2
Law	3	3	3	2	6
Economics & Business	5	4	7	3	4
Social Sciences	8	6	9	6	9
Humanities	9	11	8	9	8
Physical Education	13	13	13	12	13
Education	6	8	5	7	11
TEI					
Polytechnic	11	12	11	11	10
Food Technology	15	16	15	17	14
Librarianship	16	14	16	16	17
Medical-related	14	15	14	13	15
Applied Arts	12	10	12	14	12
Agricultural Science	17	17	17	15	16

Table 6					
Returns to University Degrees, Quantile Regressions					
Greece, LFS, 2000-2004					
	(1)	(2)	(3)	(4)	(5)
Disciplines	0.05	0.25	0.5	0.75	0.95
AEI					
Polytechnic	0.163***	0.197***	0.170***	0.200***	0.227***
	(0.031)	(0.029)	(0.018)	(0.017)	(0.033)
Computer Science	0.227***	0.266***	0.224***	0.232***	0.223***
	(0.044)	(0.042)	(0.027)	(0.024)	(0.049)
Agricultural Science	0.172***	0.180***	0.124***	0.095***	0.078**
	(0.034)	(0.032)	(0.020)	(0.018)	(0.037)
Physics Maths	0.199***	0.194***	0.129***	0.089***	0.105***
	(0.030)	(0.028)	(0.018)	(0.017)	(0.033)
Medicine	0.202***	0.279***	0.289***	0.289***	0.286***
	(0.032)	(0.030)	(0.019)	(0.017)	(0.034)
Law	0.202***	0.196***	0.181***	0.198***	0.297***
	(0.034)	(0.031)	(0.020)	(0.018)	(0.036)
Economics & Business	0.201***	0.197***	0.149***	0.139***	0.219***
	(0.030)	(0.028)	(0.018)	(0.016)	(0.032)
Social Sciences	0.141***	0.132***	0.116***	0.125***	0.205***
	(0.038)	(0.035)	(0.022)	(0.020)	(0.041)
Humanities	0.186***	0.167***	0.129***	0.089***	0.081**
	(0.030)	(0.028)	(0.018)	(0.016)	(0.032)
Physical Education	0.150***	0.096***	0.092***	0.052***	0.005
	(0.033)	(0.031)	(0.019)	(0.018)	(0.036)
Education	0.215***	0.197***	0.153***	0.103***	0.082**
	(0.030)	(0.028)	(0.018)	(0.016)	(0.032)
TEI					
Polytechnic	0.172***	0.121***	0.095***	0.059***	0.078**
	(0.031)	(0.029)	(0.018)	(0.017)	(0.033)
Food Technology	0.043	0.083*	0.024	-0.026	0.091
	(0.051)	(0.050)	(0.032)	(0.029)	(0.057)
Librarianship	0.160**	0.053	-0.058	-0.088**	-0.045
	(0.064)	(0.070)	(0.044)	(0.041)	(0.072)
Medical-related	0.067**	0.095***	0.022	-0.000	0.033
	(0.031)	(0.029)	(0.018)	(0.017)	(0.034)
Applied Arts	0.183***	0.067	0.058*	0.019	-0.008
	(0.054)	(0.052)	(0.033)	(0.030)	(0.061)
Constant	4.798***	5.294***	5.649***	6.028***	6.418***
	(0.042)	(0.039)	(0.025)	(0.023)	(0.046)
N	16304	16304	16304	16304	16304

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. All returns are measured relative to a "TEI Agricultural Sciences" degree. The remaining regression output is available from the authors upon request.

Endnotes

¹ As noted by Katsanevas (2002), Greece has by far the largest ratio of doctors or lawyers per head in the EU. In the year 2000 one lawyer corresponded to every 338 residents, compared to the average EU ratio of 1:850, while the ratio of doctors per residents in the whole country stands at 1/185 (in Athens it is 1/150), compared to 1/350-400 in the EU (Fyntanidou, 2001).

² These negative prospects have been confirmed by Katsanevas (2002), who studied “the balance of supply and demand of professions.” In this research the data concerning the supply and demand of 14 extended groups of professions, including therein 700 partial specialties, were considered and their future prospects predicted. Clearly, the conventional fields of medicine, law, and education were classified as having very negative prospects for the future. At the same time the fields of IT, telecommunications and of new technologies, in general, presented very promising opportunities.

³ Specifically, the level of individual income is measured at the midpoint of the respective income range specified by the Greek LFS. Individual earnings are then deflated to 2000 prices using the information on inflation provided by the Greek National Statistical Service (ESYE). Given the lack of individually-specific wage information, the empirical analysis has been repeated using interval regression techniques. No significant differences in the estimates reported in section 6 were found.

⁴ In order to accurately capture the rates of return to the different types of educational investments, a relatively robust set of explanatory variables has been selected. This follows the suggestion of Pereira and Martins (2004), who argue that to obtain the full effect of education on earnings one should avoid the inclusion in the wage equation of covariates that reflect post-schooling decisions that are correlated with the level of educational attainment, such as the attributes of an individual’s job.

⁵ Inclusion of the variables “hours of work” and “job tenure” in the regressions also illustrates a positive relationship between hours and wages and positive yet decreasing returns to tenure for both genders. However, these variables have not been used in the main analysis due to missing data for the years 2000, 2001 and 2003.

⁶ “TEI Agricultural Sciences” are chosen as the comparator group as this degree is found to yield no statistically significant benefit in terms of higher wages in comparison to secondary school graduates. The choice of using the secondary school dummy as benchmark was motivated by the desire to compare the returns to degrees with those who *could* have pursued further education but did not do so. The relevant regression output is available from the authors upon request.

⁷ Other interesting observations include the fact that the field of Law has a zero and insignificant effect on the earnings of workers at the lower rungs of the wage distribution, yet that of Librarianship is found to yield a significant 22% premium over the base category.

⁸ It needs to be pointed out, though, that graduates of law and medicine usually turn to self-employment as a safety net against unemployment, which is an issue that is not addressed in this study.

⁹ Pouliakas (2003) has built a model that attempts to explain the reluctance of students to opt for courses associated with new technologies on the basis of the intensified risk and uncertainty that is associated with investments in such high-tech skills. According to his model, computer science skills face a higher probability of becoming obsolete due to the continuously changing technical infrastructure, relative to more conventional subjects whose core practices have been more insulated from the invasion of technology throughout time. He also illustrates in the spirit of ‘new growth theory’ that due to the asymmetrical effect that high-tech skills exert on technology, underinvestment in high-tech skills in Greece may have a detrimental effect on the long-run growth potential of that economy.