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Higher technological education specialties and graduates' vocational status and prospects

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Acknowledgments:
This research has been implemented through the Operational Program "Education and Lifelong Learning" which is co-financed by the European Union (European Social Fund) and Greek national funds. Project title: "Digital map of higher technological education professions".

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Structured Abstract:

Purpose – This work focuses on the thorough comparison of the broader specialties and subspecialties provided by the Greek higher technological education, regarding the employment status and the vocational prospects of the corresponding graduates, and aims to identify and analyze the relevant existing differences.

Design/methodology/approach – Original empirical data was collected from 5,183 graduates of Technological Educational Institutes of higher education through a national survey using telephone interviews and a structured questionnaire. The stratified sample consisted of graduates originating from all nine different broader specialties (faculties) and forty five subspecialties (departments). Descriptive, bivariate and multivariate statistical analysis was used for the elaboration of the collected information.

Findings – The results showed that there are significant differences among the graduates of different specialties regarding some employment characteristics, such as professional status, type of employment, relevance between present work and bachelor studies, and satisfaction from employment and wages. Additionally, the results identify distinguished clusters among certain broader specialties and subspecialties regarding graduates' employment status and characteristics.

Practical implications – The revealed existence of strong relationships between broader specialties / subspecialties and their graduates' vocational prospects can offer justified advice / guidelines to secondary education graduates for applying to specialties presenting promising employment prospects.

Originality/value – This work, being one of the very few nation-wide studies, reveals and highlights the most important higher education specialties regarding the vocational status and prospects of the corresponding graduates, providing a guideline for the selection of the subject of studies that leads to a more promising career.

Keywords: Higher technological education; Specialty of studies; Employment; Labour market

Article Classification: Research paper

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Running Heads:

Higher technological education specialties and graduates' vocational status and prospects

Unemployment is a social phenomenon causing serious socioeconomic problems at personal, family and national levels. The current economic crisis raises the need of connecting more strongly higher education to the production process and economy. Additionally, at a national level the long term confrontation of public debt is related to raising the competitiveness of the related national economy. To an extent, this can be achieved by reducing expenses and depressing wages. However, the real challenge is raising productivity, which is closely related to the professional qualifications of employees (Blundell et al. 1999).

Greek higher education is constituted of Universities and Technological Educational Institutes (TEIs). In general, the educational process in Universities primarily focuses on scientific knowledge, while in TEIs on professional qualifications. In University education, there are more theoretic courses and fewer lab courses, in many departments / disciplines a graduation thesis is not obligatory and industrial placement is optional and lasts only two months, while in TEIs, a significant number of courses have a theory and a lab part, a graduation thesis is obligatory, which, in most cases, is related to professional applications / activities and, most importantly, a six month industrial placement is obligatory (Kalamatianou et al. 1988). These characteristics create a stronger link between Greek higher technological education and the labour market.

However, this stronger connection is, in many cases, not sufficient. The status of the Greek economy, the new demanding globalized economic and work setting, the discrepancy between the labour market needs and the qualifications acquired through higher technological education impede the entrance of graduates into the labour market and affect their professional prospects. Graduates of different educational specialties (faculties), or subspecialties (departments) encounter significantly different difficulties regarding their successful entrance in the labour market.

The research objective of the present study is dual: a) to provide insight into the existing relationships between certain demographic, educational and employment variables of higher technological education, and b) to identify the existing differences among graduates' broader specialties and subspecialties, regarding their job placement and career prospects. Achieving this objective is particularly important for facilitating the entrance of graduates to the labour market and getting an adequate return on the high investment of providing specialized knowledge and employability skills in higher education.

For this purpose, we comparatively study the relations between Greek higher technological education specialties to the employability and the career prospects of the corresponding graduates. The study of these relationships is based on descriptive, bivariate and multivariate statistical analysis of the responses of a large-scale representative national sample of graduates of five consecutive years, originating from nine broader specialties and forty five subspecialties.

Regarding the structure of this paper, the next section reviews related international literature, section three presents the methodology adopted for the collection and analysis of first born data, section four reports the results of the analysis performed, while the last section summarizes the main results and suggests future research possibilities.

Related literature

The entrance of higher education graduates into the labour market and their career prospects can be studied and analyzed regarding numerous factors, like: (i) personal characteristics (gender, age, area of residence, family status, physical characteristics), (ii) educational qualifications (years of study, degree grade, degree level, postgraduate studies, degree specialty/major supplementary qualifications), (iii) macro-economic conditions, and (iv) employment characteristics (employment status, time from graduation to first job, relation of work to studies, self-employment, satisfaction from job / income, income level). Numerous studies that examine the relation between these factors have appeared in the literature. Some representative ones are reported in the following.

Several studies focus on graduates' employability (Forrier and Sels 2003; Fugate and Kinicki 2008; Rothwell and Arnold 1997; Van der Heijde and Van der Heijden 2006), or their income distribution (Psacharopoulos and Patrinos 2004). Others focus on broader outcome measures, including measures of graduates' satisfaction with their jobs (Coates and Edwards 2011; Garćia-Aracil and Van der Velden 2008), or the alignment between the level of knowledge and the specific requirements the intended job calls for (Wilton 2008). Others examine the factors hindering and the ways used for getting a job and the required skills (Mortensen and Pissarides, 1998; Raffe 2003), or the amount of time that is needed to complete a successful incorporation process in the labour market (Kogan and Unt, 2005).

Nevertheless, there are only a few published research efforts that study the effect of degree specialty to graduates' employment. Robst (2007) considers the relationship between college majors and occupations, using data from the US national survey of college graduates. He examines the extent to which employed graduates consider that their work activities are unrelated to their college major and which degree specialties

lead to greater mismatch. Freeman and Hirsch (2008) relate a census of US degrees and specialties (fields) of study, with measures of the knowledge content of jobs. Roksa and Levey (2010) examine occupational specificity of college majors and its relation to the entrance into the labour market and the subsequent occupational prospects. They conclude that specific degrees are advantageous for entering the labour market, however have only a small impact in occupational status in the course of time.

Greece is faced with a high unemployment rate of 23,6% in the second quarter of 2012 (Hellenic Statistical Authority 2012). The vocational training system in Greece has been rather complex and reforms attempting to deal with this issue have recently taken place. In Greece, TEIs career offices and private human capital companies promote higher technological education graduates to the labour market. Moreover, Innovation and Entrepreneurship Units has been established in all higher education institutions to strengthen self-employment and graduates networking with labour market. At national or institutional level, few researchers have addressed higher education graduates vocational socialization, so far. Karamesini (2008) presented the first national survey on the incorporation of university graduates in the labour market, while Kostoglou et al. (2007) and Koilias et al. (2010) presented the first surveys, regarding TEIs graduates (the first survey in institutional and the second survey in national level).

Following these efforts, Koilias et al. (2011) studied the incorporation of graduates from higher technological education in the labour market by utilizing descriptive statistics and inference tests for the examination of the statistical dependence between selected variables. Their outcomes indicate that gender, specialty of bachelor degree and postgraduate education are the most important factors affecting significantly the status and quality of graduates' incorporation into the labour market. Next, Kostoglou et al. (2011), studied how education and demography characteristics affect employability, by making use of logistic and ordinal regression. Their findings indicate that male gender and postgraduate studies have a positive effect on employment, the time interval between graduation and first employment is inversely affected by the duration of bachelor studies, as well as having children, and appears to depend significantly on graduate's specialty. Moreover, males, parents, postgraduate degree holders, and IT graduates enjoy higher wages, and the match between studies and work is higher for graduates who have children, who have a high or very high bachelor degree mark, for graduates of specialties related to health, as well as for postgraduate degree holders.

Recently, based on a large survey of business and management graduates Wilton (2011) maintains that the first priority of employers regarding recruitment of graduates is their origin institution; they would recruit from reputable institutions before

anything else. The analysis of relevant data also suggests that the relation between employability and actual employment is far from being straightforward. Moreover, the current labour market disadvantages appears to be often the main obstacle regardless of the extent to which graduates have developed employability skills during their undergraduate studies.

In this paper, like Robst (2007), Freeman and Hirsch (2008) and Roksa and Levey (2010), we focus on the role that the higher technological education degree speciality has on employment. We build on the first national survey of the professional status of Greek TEIs graduates, conducted as a project of the Horizontal Support Actions of the Career Offices of the Greek TEIs (Koilias et al. 2010), and draw conclusions regarding the existing differences among the provided broader specialties and subspecialties in the work placement and professional prospects of the graduates. The comparison is based on descriptive and bivariate statistics of all main variables, as well as cluster analysis.

Methodology

This section focuses on a short description of the characteristics of this research study including the sample size and composition, the statistical methods used, as well as the measurement and coding of the examined variables.

Sample

A nation-wide survey addressed to a large representative sample of higher technological education graduates who completed their bachelor studies during a five-year time interval (1997-2001) was carried out in the second semester of 2009. A structured questionnaire specially designed for this purpose was administered to the graduates of all existing broader specialties (corresponding to equal in number faculties) through scheduled telephonic interviews. Particular attention has been paid to the creation of a random and unbiased representative sample. The participating graduates were randomly selected from existing files kept by the institutional Career Offices and were jointly stratified according to institution, gender, broader specialty and subspecialty (corresponding to department of graduation). Graduates of 11 (70% of the total number) institutions of higher technological education, representing over 90% of the number of graduates at national level, were interviewed. The original data analyzed in this study consisted of a sample of 5,183 valid questionnaires. The examined sample corresponds to about 30% of the total graduates' population of the examined institutions. The sample includes all existing broader specialties (faculties) and the vast majority of subspecialties (different departments) offered at national level.

Table I presents the examined specialties and subspecialties, the sample sizes and the codes used in the analyses.

[Table I near here]

Methods used

The statistical package for the social sciences (SPSS) was used for the elaboration of the original data and the statistical analyses. Descriptive analysis provides information on graduates' educational characteristics, as well as on the main employment characteristics for each broader specialty. The X^2 test is used for the investigation of statistically significant differences between two variables.

Multivariate statistical techniques are applied for the comparison of broader specialties and subspecialties. For the analysis of the differentiations among the broader specialties, correspondence analysis is used in order to provide interpretation of the existing relationships. For the identification of existing groups among the broader specialties and subspecialties Agglomerative Hierarchical Clustering, displayed graphically using a dendrogram is applied (see Chapter 10 of Han et al. 2011). The dendrograms show how the clusters (groups) of the examined broader specialties and subspecialties are merged. This type of cluster analysis is used for two types of grouping; according to graduates' general characteristics and according to graduates' employment characteristics.

Measurement

The selection of independent variables was based on the reasoning of representing both sides of graduates' activation: educational and professional. The following independent variables were considered as the ones most significantly affecting the transition from higher education to the labour market and were included in the analysis: (1) gender, (2) broader specialty or subspecialty, (3) degree mark, (4) postgraduate studies, (5) relevance between studies and employment, (6) satisfaction from present employment, (7) wages and (8) satisfaction from wages. The first four of them are related to graduates' general characteristics and the last four to their employment focusing more on relevance with education and satisfaction.

The measurement of independent variables (1), (2), (3), (4) and (7) is based on their existing categories. For the measurement of the remaining three variables ((5), (6) and (7)), three relevant indexes have been introduced (c_i, i = 1, 2, 3)

$$c_i = \sum_{i=1}^{5} P_i * i / \sum_{i=1}^{5} P_i$$

where P_i (i = 1, 2, 3) is the number of working graduates reporting the relevance between work and studies, the satisfaction from employment and the satisfaction from wages in a five-point rating scale (1 = minimal, 2 = small, 3 = modest, 4 = high and 5 = very high) respectively.

Based on the above analysis the independent variables are measured as following:

Gender is represented by two points; men and women.

Broader specialty is represented by the nine existing faculties, namely 'Agriculture', 'Graphics and Arts', 'Management and Economics', 'Care and Welfare', 'Health Technology', 'Health', 'Food and Nutrition', 'Engineering' (ENG), and 'Information and Communications Technologies' (ICT).

Degree mark, following the relevant national classification for higher education, takes one among the three values: 'good' corresponding to degree marks between 5.0 and 6.4 in a 0 – 10 scale, 'very good' corresponding to marks between 6.5 and 8.4 and 'honors' corresponding to marks between 8.5 and 10.0.

Postgraduate studies are represented by two values: acquisition of a postgraduate degree, and without a postgraduate degree.

Relevance between studies and employment has five values corresponding to minimal, small, modest, high and very high relevance.

Satisfaction from present employment has five values corresponding to minimal, small, modest, high and very high degree of satisfaction.

Wages is considered as employee's net monthly payment and represented by four values: less than € 800, between € 801 and € 1500, between € 1501 and € 2500, and over € 2500.

Satisfaction from wages is represented by five values corresponding to minimal, small, modest, high and very high satisfaction.

The detailed measurement values, abbreviations and codes used in the analysis of the independent variables are presented in Table II.

[Table II near here]

Analysis and main results

This section includes the analysis carried out and the corresponding results and is divided in four parts. The first part gives descriptive comparative information about the nine existing broader specialties. The second part focuses on their differentiations regarding eight selected employment variables. The third and the fourth parts concentrate on the clustering of broader specialties and subspecialties respectively.

Descriptive analysis of broader specialties

The descriptive statistics presented in the next paragraphs, as well as, in the corresponding tables and figures include useful self-explained information for the stakeholders of higher education. For example, senior (last year) students of upper secondary education (who will apply for entering higher education) will find useful information that will assist them in deciding the higher education specialties that are more suitable for them and approach their vocational expectations.

Women are the majority of Greek higher technological education graduates of the years 1997-2001 constituting 58% of the examined sample. However, their proportion differentiates significantly among the broader–specialties. The number of women graduates surpasses that of men in all specialties except in 'Engineering' and 'ICT'.

Although the typical length of bachelor studies for all specialties is eight semesters, the actual average duration is much higher (5.5 years) and varies significantly among them, implying considerable delay for the completion of studies and quite different degree of difficulty. This difference is also confirmed by the distribution of degree marks. The observed differences among specialties are statistically significant ($X^2 = 517.40 > 26.30$), that is the distribution of graduates' degree marks depends significantly on their specialty of bachelor studies, implying different degree of difficulty of studies among different specialties. Analogous conclusions about the dependency of other variables to broader specialty of graduates apply for the observed statistically significant differences quoted in the next paragraphs.

The interest for postgraduate studies among the graduates of the various specialties is also quite varying. The percentage of postgraduate degree holders (being on average 11%) varies from 6% to 25% among the specialties. The noticed differences are significant ($X^2 = 131.72 > 26.30$), meaning that attending postgraduate studies depends significantly on the broader specialty of studies.

The professional status of all broader specialties' graduates is presented in Table III. Graduates of 'Agriculture' suffer the highest unemployment rate; this being double than the average (14% versus 7%). In contrary, nearly all 'ICT' graduates are employed; just 1% of them are unemployed. A notable percentage (8%) of graduates of specialties related to 'Care' remain idle (not interested in getting a working position at the time of the study). This phenomenon is related to the gender composition of these specialties' graduates. The overall differences in the professional status are also statistically significant ($X^2 = 241.26 > 36.42$), meaning that the professional status of graduates depends significantly on the broader specialty of studies.

[Table III near here]

The distribution of working graduates regarding the type of their employment, as well as the reported average net monthly wages are presented in Table IV. The discrepancies among graduates of the different broader specialties regarding their type of employment are also significant ($X^2 = 209.03 > 36.42$), meaning that the type of employment and level of income of graduates depend significantly on the broader specialty of studies.

[Table IV near here]

The income of 'ICT' and 'Engineering' graduates is substantially higher. It is also noted that the unemployment rates affect the level of income, as 'Agriculture' and 'Management and Economics' graduates earn on average less than those of the other specialties. Moreover, the graduates of the three specialties related to health services turn significantly less to self-employment.

The results of the calculated indexes regarding the relevance between work and studies, the satisfaction from employment, and the satisfaction from wages are presented in Table V.

[Table V near here]

The degree of relevance between present employment and bachelor studies present significant differences, ranging from 2.7 to 4.4. On the contrary, the satisfaction from present employment and wages does not differentiate significantly among the graduates of different specialties. The highest relevance is reported by the three specialties related to health; however these graduates are not satisfied with their wages. ICT professionals are comparatively in the best position, as all their indexes have values above average.

Differentiations among broader specialties

Correspondence analysis was used for the interpretation and understanding of the existing relationships, using all main variables together. The factorial level of the graduates is illustrated in Figure I, where every abbreviation depicted (coded title) represents the rating of each qualitative variable.

The eigenvalue of the first factorial axis (horizontal) comes up to 13.3 and that of the second axis (vertical) to 10.8. Thus, the first factorial level interprets 24% of the total information; a non trivial percentage due to the large number of variables'

ratings. Neighbouring points of different variables indicate higher correlation between them.

[Figure I near here]

Interpreting the results of Figure I, it can be observed that the points of the relevance between studies and employment, those of satisfaction from employment and those of the satisfaction from wages are extended from left to right of the horizontal axis. Similarly, the first two points of the wages follow the same route, whereas the other two points which correspond to high or very high wages deviate from the horizontal axis. Thus, it can be considered that this axis is characterized by the variables related to graduates' employment. The two points representing graduates' gender are placed exactly on the vertical axis, therefore it can be considered that this axis is characterized by graduates' gender. The point representing lack of postgraduate studies is located on the axes intersection, while the point representing acquisition of a postgraduate degree deviates on the bottom right quadrant. The three points representing the degree mark follow a diagonal layout from bottom left to top right.

Regarding the points representing the provided broader specialties, it is noted that 'Agriculture' is located on the bottom left quadrant near the low satisfaction and relevance between studies and employment points. 'Management and Economics' and 'Food and Nutrition' specialties are located very near the axis intersection, being thus characterized by medium values of the employment variables. "Care', 'Health', 'Health Technologies" and 'Graphics and Arts' are close each other and compose a group in the top right quadrant. Also, their points are adjacent to those of women and of graduates with an honours degree, as the vast majority of them are women and most graduates with an honour degree belong to these specialties. The 'Engineering' and 'ICT' broader specialties are located in the bottom right quadrant near the point representing men, as they are the only specialties where men surpass women. In the same quadrant are also located the points representing higher wages and higher satisfaction from employment, confirming that these graduates appear more satisfied and earn on average more than the others.

These observations can be helpful for higher education stakeholders, who (like higher education candidates) might use them to plan their personal career, or (like state, or institutional authorities) form educational policy.

Clustering of broader specialties

The grouping of TEI graduates' broader specialties and subspecialties is accomplished with the use of cluster analysis. The use of this technique aims to reveal and highlight non apparent existing relationships (similarities and differences) among the examined variables on both the general characteristics and the employment characteristics of the corresponding graduates.

Clustering based on graduates' general characteristics

This grouping of broader specialties is based on their comparison regarding five independent variables: (1) gender, (2) type of secondary education (lyceum), (3) duration of bachelor studies, (4) obtainment of a postgraduate degree, and (5) professional status. Table VI contains the values of these variables for each broader specialty.

[Table VI near here]

The clustering results are presented in Figure II; the dendrogram has been created using average linkage between the groups.

[Figure II near here]

In the dendrogram a single specialty (single member group) or group of specialties is represented by an horizontal line. Two such lines are joined by a vertical line, creating a larger group, if the distance (difference of general characteristics) between them is below the corresponding threshold appearing on the vertical axis.

Interpreting the outcome of Figure II, two clearly distinct groups of broader specialties are identified; the fist consisting of 'Engineering' and 'ICT' specialties and the second of all the others. 'Engineering' and 'ICT' specialties join first and present considerable similarity, consisting mainly of men and being characterized by high employment rates. From the remaining specialties, 'Care', 'Health' and 'Health Technology' form another rather expected cluster as they belong to the health group of professions.

Conclusively, this analysis leads to three specialties' groups:

1st group: Engineering and ICT

2nd group: Care, Heath and Health Technologies

3rd group: The remaining specialties; namely 'Agriculture', 'Management and Economics', 'Graphics and Arts' and 'Food and Nutrition'.

Since the graduates of the broader specialties of the same cluster (group) present quite similar general characteristics, it is indicated that the broader specialties of the same group mainly attract candidates (upper secondary education graduates) with similar characteristics.

Clustering based on graduates' employment characteristics

Broader specialties' clustering is based on the following seven variables: (1) gender, (2) degree mark, (3) postgraduate studies, (4) relevance between studies and employment, (5) satisfaction from employment, (6) wages, and (7) satisfaction from wages. The values of the categorical variables were calculated as the mean values of the coded numbers corresponding to each of their categories. The values of the variables for every broader specialty are presented in Table VII.

[Table VII near here]

Broader specialties' clustering results are imprinted in the dendrogram of Figure III. Three groups of specialties are identified. The first group consists of 'Engineering', 'ICT', 'Management & Economics' and 'Food & Nutrition', forming two subgroups both joining first at the lowest level. The second group includes only 'Agriculture', implying that this specialty differentiates from all the others. The third group consists from the remaining four specialties; the first three of them forming a subgroup, confirming thus the results of Figure II. It is noted that the graduates of the broader specialties belonging to the same group present similar employment characteristics.

[Figure III near here]

Clustering of subspecialties

This clustering is based on the seven selected employment characteristics. The cluster analysis indicates the existence of five main groups. The corresponding results are illustrated in the dendrogram of Figure IV.

[Figure IV near here]

The first group is composed by the first 10 subspecialties of Figure IV. It can be noted that includes five subspecialties belonging to 'Agriculture', subspecialties belonging to 'Management and Economics', as well as two specialties belonging to 'Engineering'.

‘Librarianship’ and ‘Farm Management’ compose by themselves two distinct groups; the second and the third. The former corresponds to a particular field of study and it is expected to differentiate from all the others. The latter is actually represented by only one department at national level, and there was an ambiguity whether it should be included in ‘Agriculture’ or in ‘Management and Economics’. However, the analysis shows that it differentiates substantially from the other subspecialties of both the above broader specialties. The fourth group is formed by the all the subspecialties related to ‘Care’, ‘Health’ and ‘Health Technologies’.

Finally, the fifth group is composed by the remaining nine subspecialties, divided in distinct sub-groups. The first three specialties, all related to Engineering form a clear sub-group. Another distinct sub-group is formed by the two subspecialties belonging to ‘Management and Economics’, as well as the subspecialties related to ‘Graphics’ and the broader specialty ‘Food and Nutrition’. It is also noted that the two groups of subspecialties (‘Graphics’ and ‘Arts’) of ‘Graphics and Arts’ broader specialty do not belong in the same sub-group.

The basic overall clustering of the analyzed subspecialties and the broader specialties from which they emerge is illustrated in Figure V. The dotted lines express either broader specialities / faculties (FAC-AGRIC, FAC-MANEC, FAC-FOODNUT, FAC-GRARTS), or unions (according to the current administrative structure of TEIs) of similar broader specialities / faculties (FAC-HEALTH which unites the broader specialties CARE, HEALTHTEC and HEALTH and FAC-ENG which unites the broader specialties ENG and ICT).

[Figure V near here]

Interpreting further the outcome of subspecialties’ clustering, it can be noted that there are many subspecialties quite similar in their graduates’ employment characteristics, although they do not belong to the same broader specialty (faculty). This implies that candidates for one of these subspecialties that do not succeed to enter a related department in the introductory exams could aim at entering a department offering a ‘neighbouring’ subspecialty of the same group, even if it does not belong to the same faculty.

Discussion and conclusion

This work focused on the thorough comparison of the broader specialties and subspecialties provided by the Greek higher technological education regarding the employment status and the vocational prospects of the corresponding graduates in the labour market. A nation-wide survey was carried out yielding 5,183 valid

questionnaires corresponding to randomly selected, though stratified according to gender, institution and specialty, graduates of the nine existing broader specialties (faculties) and forty five subspecialties (departments). Descriptive, bivariate and multivariate statistical analysis was used for the elaboration and the interpretation of the collected information.

We find that there are significant differences among the graduates of different specialties regarding their major employment characteristics, such as professional status, type of employment, and moreover the relevance between present work and bachelor studies and the satisfaction from employment and wages. 'ICT' and 'Engineering' graduates appear to be in a better position in the labour market regarding the above employment variables. On the other hand 'Agriculture', 'Management and Economics' and 'Graphics and Arts' graduates suffer higher unemployment rates than all other specialties. The specialties related to health services being dominated by women present the highest relevance between work and studies and high employment rates; however their wages and the satisfaction from them are significantly lower than all the others. The above findings are confirmed by both descriptive and correspondence analysis.

Clustering of broader specialties based on graduates' general characteristics indicates the existence of three distinguished groups: (1) 'ICT' and 'Engineering', (2) the specialties related to health, and (3) all remaining specialties. Clustering of broader specialties regarding working graduates and based on their employment characteristics reveals the existence of three groups: (1) 'ICT', 'Engineering', 'Management and Economics' and 'Food and Nutrition', (2) 'Agriculture', and (3) the three related to health broader specialties and 'Graphics and Arts'.

The contribution of this work lies on the determination of the existing relationships among the higher technological education's professions, and more importantly on the identification of the most attractive specialties regarding the vocational status and prospects of the corresponding graduates.

The descriptive statistics presented in this paper provide a comprehensive (ready to use) information source to the stakeholders of upper secondary and higher technological education (senior students and graduates of upper secondary education and their families, vocational orientation counselors, students and graduates of higher education, educators of secondary and higher education, ministry of education and institutional administration, as well as, potential employers), who could utilize this information for several purposes, like (senior students and graduates of upper secondary education) planning their personal career, or (institutional administration)

organizing higher education, or (ministry of education) forming plans for the evolution of higher education in a changing economic environment.

The findings of correspondence analysis and clustering, as interpreted in the respective sections of the paper, provide additional sources of information to stakeholders of upper secondary and higher technological education, as they give a justified indication for the selection of a more promising profession requiring higher technological education studies. Furthermore, as the number of available study positions in popular specialties (departments) is limited, the findings of this work are also related to the vocational orientation of secondary education graduates; it is therefore also addressed to them and their families. The revealed existence of distinguished groups can offer advice / guidelines to these graduates for applying to subspecialties (departments) which are easier to enter (succeed in the entry national exams) but present 'neighbouring' employment prospects.

Repetition of this type of survey in frequent time intervals (we suggest every three years) would be useful for the identification of any changes in labour market's dynamics, landscape of graduates' employment, as well as in the interrelationships among broader specialties and subspecialties. Collection and analysis of international data would reveal the existing differences among graduates' professional status and prospects in different countries. Moreover, beyond statistical analysis, data mining techniques (Han et al. 2011) can be applied on graduates employment, demographic and educational data to reveal hidden knowledge, in terms of advanced clustering analysis, association rules, or sequential patterns discovery.

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Table I. Broader specialties and subspecialties, codes used and sample sizes

Broader specialty / Code used	Analyzed subspecialty	Code used	Sample size	Sample (%)
Agriculture / AGRIC	▪ Animal Production (n=59) ▪ Farm Management (n=51) ▪ Fisheries and Aquaculture Technology (n=121) ▪ Floristry and Greenhouse Technology (n=56) ▪ Forestry (n=118) ▪ Plant production (n=129)	ANIMPROD FARMMAN FISH FLOR FOREST PLANTPROD	534	10.3
Care and Welfare / CARE	▪ All subspecialties together: Occupational Therapy (n=9) - Public Health (n=14) - Social Work (n=72)	CARE	95	1.9
Engineering / ENG	▪ Civil Engineering (n=224) ▪ Electrical Engineering (n=222) ▪ Medical Instruments Techn. (n=25) ▪ Mine Engineering (n=30) ▪ Other Engineering Specialties (n=578)	CIVENG ELECTRENG MEDINSTEC MINEENG MISCENG	1079	20.8
Food and Nutrition / FOODNUT	▪ All subspecialties together: Food Technology (n=83) - Nutrition and Dietetics (n=55) - Oenology and Spirits Technology (n=19)	FOODNUT	157	3.0
Graphics and Arts / GRARTS	▪ All graphics subspecialties together: Graphic Design (n=26) - Graphical Arts Technologies (n=20) - Interial Architecture and Decoration (n=71) ▪ All arts subspecialties together: Conservation of Antiquities & Works of Art (n=26) - Photography (n=23)	GRAPH ART	167	3.2
Health / HEALTH	▪ All subspecialties together: Aesthetics and Cosmetology (n=76) - Early Childhood Care and Education (n=118) - Health Visitors (n=18) - Midwifery (n=96) - Nursery (n=418) - Physiotherapy (n=147)	HEALTH	873	16.8
Health Technology / HEALTHTEC	▪ All subspecialties together: Dental Technologies (n=26) - Medical Laboratories Technology (n=83) - Optics and Optometry (n=8) Optometry - Radiology	HEALTHTEC	149	2.9
Information & Communications Technologies / ICT	▪ All subspecialties together: Automation (n=52) – Electronics (n=227) – Informatics (n=141)	IT	420	8.1

Management & Economics / MANEC	▪ Accounting (n=713) ▪ Business Administration (n=392) ▪ Librarianship (n=79) ▪ Marketing (n=205) ▪ Other Management and Economics Specialties (n=103) ▪ Tourism Management (n=217)	ACCOUNT BUSADM LIBR MARK MISCMANEC TOURMAN	1709	33.0
Total			5183	100

Table II. Values and coding of independent variables

Independent variable	Values	Abbreviation	Code used
Gender	Men	MEN	1
	Women	WOMEN	2
Broader specialty	Agriculture	AGRIC	1
	Graphics and Arts	GRARTS	2
	Management and Economics	MANEC	3
	Care and Welfare	CARE	4
	Health Technology	HEALTHTEC	5
	Health	HEALTH	6
	Food and Nutrition	FOODNUT	7
	Engineering	ENG	8
	Information & Communications Technologies	ICT	9
Degree mark	Good	DM-G	1
	Very good	DM-VG	2
	Honors	DM-HON	3
Postgraduate studies	Yes	MSC-YES	1
	No	MSC-NO	2
Relevance between studies and employment	Minimal	REL-1	1
	Small	REL-2	2
	Modest	REL-3	3
	High	REL-4	4
	Very high	REL-5	5
Satisfaction from present employment	Minimal	SATJOB-1	1
	Small	SATJOB-2	2
	Modest	SATJOB-3	3
	High	SATJOB-4	4
	Very high	SATJOB-5	5
Wages	Less than € 800	WAGE-1	1
	Between € 800 and € 1500	WAGE-2	2
	Between € 1501 and € 2500	WAGE-3	3
	Over € 2500	WAGE-4	4
Satisfaction from wages	Minimal	SATWAGE-1	1
	Small	SATWAGE-2	2
	Modest	SATWAGE-3	3
	High	SATWAGE-4	4
	Very high	SATWAGE-5	5

Table III. Professional status for graduates of each broader specialty

Broader specialty	Employed	Self-employed	Unemployed	Idle
Agriculture	71%	11%	14%	4%
Graphics and Arts	59%	29%	8%	5%
Management & Economics	75%	11%	9%	5%
Care	92%	4%	3%	1%
Health Technology	72%	12%	7%	8%
Health	80%	10%	6%	4%
Food & Nutrition	68%	20%	7%	4%
Engineering	70%	22%	5%	3%
ICT	89%	8%	1%	2%
Total	75%	14%	7%	4%

Table IV. Type of employment and average monthly wages per broader specialty

Broader specialty	Full time employee	Mean wage	Part time employee	Self-employed with employees	Self-employed without employees
Agriculture	81%	1093	6%	8%	5%
Graphics and Arts	62%	1193	6%	5%	27%
Management & Economics	83%	1108	4%	6%	7%
Care	96%	1117	0%	1%	3%
Health Technology	82%	1113	4%	5%	9%
Health	85%	1139	4%	4%	7%
Food & Nutrition	71%	1139	6%	6%	17%
Engineering	73%	1212	3%	9%	15%
ICT	89%	1258	2%	5%	4%
Mean values	80.2%	1150	3.9%	5.4%	10.4%

Table V. Relevance and satisfaction indexes from each broader specialty

Broader specialty	Relevance work-studies	Satisfaction from employment	Satisfaction from wages
Agriculture	2.7	3.2	3.1
Graphics and Arts	3.8	3.7	2.8
Management & Economics	3.3	3.6	3.1
Care	4.2	3.5	2.6
Health Technology	4.3	3.3	2.6
Health	4.4	3.8	2.8
Food & Nutrition	3.4	3.5	2.9
Engineering	3.6	3.6	3.1
ICT	3.7	3.7	3.1
Mean value	3.6	3.6	3.0
Min	2.7	3.2	2.6
Max	4.4	3.8	3.1
Range (max - min)	1.7	0.6	0.5

Table VI. Independent variables' values (%) for each broader specialty

Broader specialty	Gender	Type of lyceum	Duration of studies	Postgraduate degree	Professional status
Agriculture	47%	59%	40%	12%	83%
Graphics and Arts	23%	59%	40%	22%	87%
Management & Economics	32%	61%	31%	9%	86%
Care	12%	65%	16%	12%	96%
Health Technology	43%	52%	8%	6%	85%
Health	17%	62%	15%	10%	90%
Food & Nutrition	33%	75%	47%	24%	89%
Engineering	69%	59%	47%	11%	92%
ICT	75%	62%	51%	18%	97%

Notes: Values of variables noted in the table: Gender - men; Type of lyceum - general lyceum graduates; Duration of studies - graduates needed over five years to graduate; Postgraduate degree - graduates that acquired a postgraduate degree; Professional status - working graduates at the time of the study.

Table VII. Values of variables for every main specialty

Main specialty	Gender	Degree mark	Postgraduate degree	Relevance work-studies	Satisfaction from employment	Wage	Satisfaction from wage
Agriculture	1.48	1.55	1.86	2.79	3.27	1.79	3.08
Graphics & Arts	1.83	1.87	1.81	3.91	3.85	1.96	2.80
Management & Economics	1.67	1.57	1.90	3.39	3.60	1.82	3.15
Care	1.90	1.76	1.87	4.31	3.48	1.84	2.55
Health Technology	1.62	1.93	1.94	4.31	3.30	1.92	2.67
Health	1.87	1.93	1.90	4.49	3.80	1.94	2.77
Food & Nutrition	1.67	1.63	1.72	3.34	3.63	1.92	3.00
Engineering	1.31	1.53	1.89	3.62	3.68	2.02	3.16
ICT	1.26	1.40	1.80	3.66	3.68	2.11	3.13

Figure I. Factorial level 1x2 of graduates

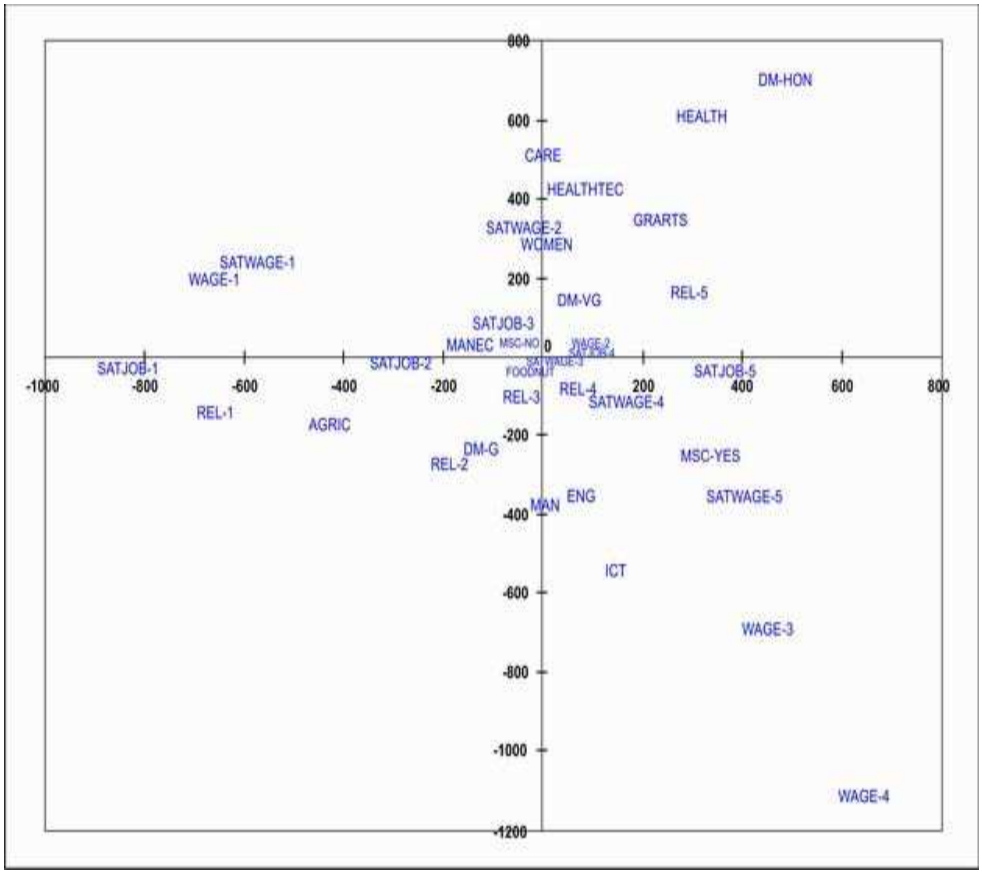

Figure II. Broader specialties' cluster dendrogram based on general characteristics

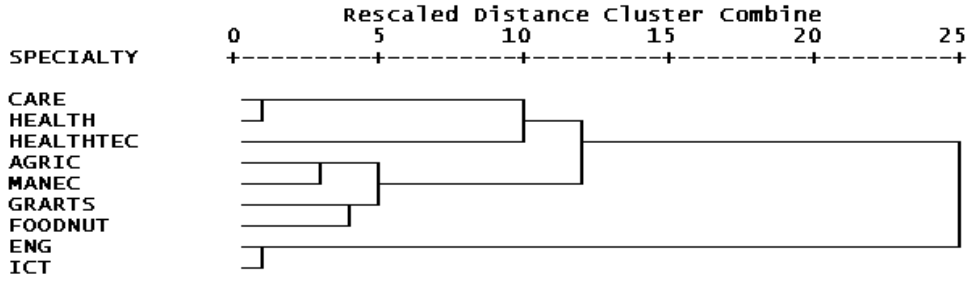

Figure III. Broader specialties' cluster dendrogram based on employment characteristics

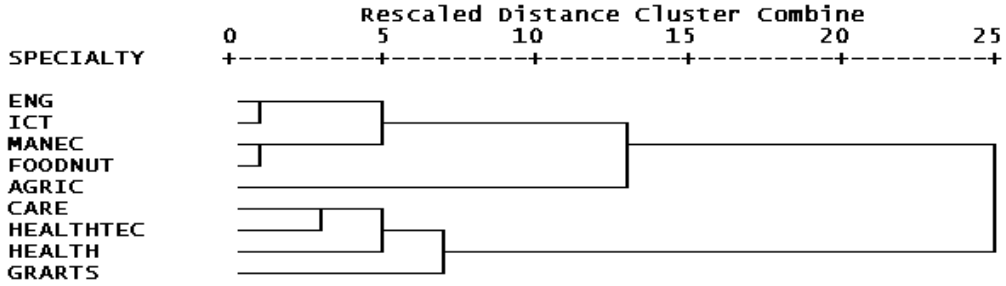

Figure IV. Subspecialties' cluster dendrogram based on employment characteristics

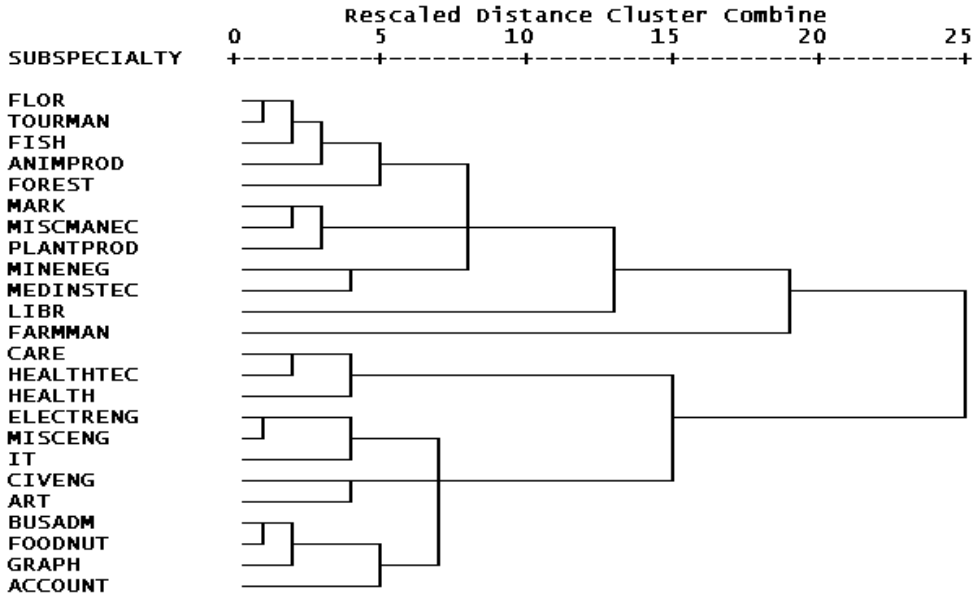

Figure V: Overall clustering of subspecialties