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The Distribution of Job Satisfaction Among Young European Graduates: Does the Choice of Study Field Matter?

Investment in education appears to be related to people's success in making many decisions concerning their working life. Higher education, in particular, promotes more efficient decision-making processes related to the labor market through the acquisition of information that has a positive impact on occupational choices (Arrow, 1997). As a consequence, the labor market situation of higher education graduates (HEGs) is better, in general, than that of nongraduates. However, the distribution of job opportunities among HEGs is not homogeneous across fields of study. The degree field is clearly a relevant part of the credentials that graduates bring into the labor market and, consequently, it operates as a screening device when allocating jobs to HEGs. Employers prefer to hire graduates from specific fields with specific requirements of competence to cover vacancies. In fact, graduation from specific fields is a prerequisite, often imposed by the law, to hold and work in certain occupations: a degree in medical sciences is essential to practice as a physician, graduation from a law school is required in order to become an attorney, and so on. The main consequence is that the labor market for HEGs is to some extent segmented by the field of graduation.

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This field-related segmentation is confirmed by indicators such as labor force participation rates, unemployment rates, and the proportions of temporary labor contracts, which vary widely among graduates from different field study. In addition, there are substantial differences both in earnings and in the incidence of skill/job mismatches corresponding to graduates from different fields (García-Aracil, Mora, & Vila, in press). Thus, the field of graduation is likely to influence the distribution of education-related benefits among HEGs through its impact on the distribution of job opportunities. Additionally, the interest leading to, and the specialization derived from, studying in a given field may influence the relative importance individuals attach to diverse labor market outcomes, resulting in net field-related differences in job satisfaction beyond its effects through the distribution of job opportunities. Since job satisfaction indicates how people value their jobs according to their own personal preferences and values, which are, to some extent, developed during their educational experience, the field of study may significantly influence graduates' levels of job satisfaction after the other observable individual-specific and job-specific characteristics are controlled for.

The choice of a field of study, nonetheless, is a personal decision of students that combines individual tastes, inclinations, preferences, and prospects related to the working life with a number of financial and academic constraints. Therefore, the analysis of the effects of degree field on job satisfaction should also address the unobserved heterogeneity among graduates from different fields. The process of choosing a field of study needs to be analyzed before its endogenous influence on graduates' job satisfaction is assessed.

Within this conceptual framework, we aim to clarify two main research questions:

1. What are the elements determining the choice of a given field of study?
2. Whether and how does field of study influence the distribution of job satisfaction among HEGs after controlling for individual heterogeneity?

We used data from CHEERS (*Careers after Higher Education—A European Research Survey*), a major representative survey comparing the situation of young European graduates from higher education institutions (Schomburg & Teichler, 2006). The CHEERS data set contains information about some 36,000 HEGs, who were interviewed 4 years after graduation.

This article is organized as follows. The next section provides summaries of literature both on the elements influencing the choice of degree field and on the determinants of job satisfaction. The third section is the empirical section. First, it establishes a choice of field criterion in

terms of graduates' family background, earlier education, and life goals. Second, it discusses both the direct and instrumental variable estimation results for the effects of field of study and other determinants on the distribution of job satisfaction among HEGs. The final section provides a summary and conclusions.

Literature Review

The Choice of Degree Field

The existing evidence about the main factors influencing the probability of graduating in different fields of study points at cognitive and scholastic ability, social background, and gender. Strenta, Elliott, Adair, Matier, and Scott (1994) found that grades achieved in specific courses taken during the first 2 years of higher education were the most significant predictors of persistence out of all the cognitive factors. Dryler (1999) examined the influence of peer characteristics on the probability of studying a specific branch of science. Hansen (1997) found evidence of a relationship between social background and the field of study chosen. Werfhorst, Kraaykamp, and de Graaf (2000) underlined the importance of family background in terms of the resources available at home, and the roles of father and mother as persons of reference in explaining the scholastic field selection process. Lyon (1996) presented evidence of the influence of one's home background, especially in science-related attitudes and technical hobbies, for science and engineering students. Woolnough (1994) also emphasized the relevance of social origin and parental income on educational track choice in tertiary education. Regarding gender, Whitehead (1996) provided evidence to suggest that pupils associate certain fields of study with males (science) or females (languages and arts) at A-level. Lightbody and Durnell (1996) confirmed these results, pointing out that this gender-related bias was stronger for images of the jobs typically associated with the field of study chosen, rather than on the stereotype of the field itself. Hansen (1993) indicated that gender-related segregation decreases as educational level increases. Additionally, the role of previous personal values and interests of the individual on the field choice has also been examined. The preference leading to a given field and the specialization derived from graduating in it are influenced by the relative priority individuals attach to diverse goals and values. Consequently, the relevance placed on diverse life goals according to personal values is likely to influence the choice of degree field, as reported by Tokar, Fischer, and Subich (1998) and Windolf (1992), among others.

The Distribution of Job Satisfaction

Self-assessments of job satisfaction indicate how people value the whole package of both monetary and nonmonetary returns from their jobs according to their own personal preferences. Therefore, job satisfaction may be used to gain insight into the effects of graduates' choice of field on how utility from work is distributed and, ultimately, on general welfare. Survey responses on job satisfaction have been used in economic analysis as proxy data for utility from work, with job satisfaction being in turn a key determinant of total well-being for working individuals (Van Praag, 1991).

Standard economic theory postulates that utility from work, measured as job satisfaction, depends positively on income and negatively on hours of work, and that it also depends on a set of other job-specific and worker-specific characteristics. Most of the discussion has focused on the effects of observable job/individual attributes such as wages, firm size, trade union membership, age, race, and gender (see, among others, Bartel, 1981; Blanchflower & Oswald, 2002; Borjas, 1979; Hamermesh, 2001; Miller, 1990; Sloane & Williams, 1996; Souza-Poza, A. & Souza-Poza, A. A., 2000; Watson, Storey, Wynarczyk, Keasey, & Short, 1996).

The evidence available on the effects of education on job satisfaction, however, is limited to a number of studies that include workers' level of education among the explanatory variables for job satisfaction (see, among others, Clark, 1996; Clark & Oswald, 1996; Idson, 1990; Meng, 1990). Recently, increasing attention has been paid to the effects of education-related variables other than schooling level on workers' satisfaction. Workers' perceptions about the match between their education and their current jobs are likely to influence self-assessments of job satisfaction. More generally, job satisfaction also depends on the extent to which workers' prospects regarding their working life are actually fulfilled in their current jobs. Satisfaction of HEGs increases when they are able to use at work the qualifications acquired during their studies, as pointed out by Belfield and Harris (2002) and Allen and Van der Velden (2001). Indeed, a number of papers within the general literature on overeducation provide evidence that supports the notion that the fulfillment of job prospects plays a key role in explaining job satisfaction. Using data from manufacturing and warehouse firm employees in Oregon, Hersch (1991) reported that workers who perceive themselves as being overqualified are less satisfied with their jobs than those who have the required qualifications. In a survey of British graduates from two cohort years, Battu, Belfield, and Sloane (1999) showed that both earnings and job satisfaction are adversely affected by overqualification. Belfield and Harris

(2002) found limited evidence about job matching to explain higher job satisfaction for recent British graduates. Johnson and Johnson (2000) reported a negative correlation between qualification mismatches and job satisfaction in a longitudinal analysis. Therefore, the inclusion of variables related to the match between education and employment, along with variables on the fulfillment of job prospects, is needed to estimate accurately the total effects of education on job satisfaction. To date, however, very little attention has been paid to the effects of field choice, although it is clear that the labor market for HEGs is somehow segmented in terms of field of graduation and may influence the distribution of job opportunities. Moreover, studying within and graduating from a given field might also influence graduates' evaluations of their working activity beyond its effects on observable job attributes.

Empirical Analysis

The Data

We used data from CHEERS, a major representative survey comparing the situation of young European graduates from higher education institutions (Schomburg & Teichler, 2006). Graduates from 1995 were surveyed in 1999, 4 years after their graduation. About 3,000 graduates each from nine European Union countries (Italy, Spain, France, Austria, Germany, the Netherlands, United Kingdom, Finland, and Sweden), Norway, the Czech Republic, and Japan provided information through a written questionnaire on the relationship between higher education and employment 4 years after graduation. The respondents answered questions on their sociobiographic background, study paths, transition from higher education to employment, early career, links between study and employment, self-assessment of their life goals and job prospects, as well as their retrospective view of higher education.

For this article, we selected only young graduates between 26 and 35 years of age who worked at least 10 hours per week either as employees or as self-employed workers. To maintain homogeneity, we used data from Italy, Spain, Austria, Germany, the Netherlands, the United Kingdom, and Sweden. For carrying out our analysis, data from each country were weighted by the proportion of higher education students and the population of each country. We separated the fields of study into eight different groups: humanities; education; social sciences; law; natural sciences; engineering; computer sciences (including mathematics); and medical sciences (including nursing). Table 1 presents a general overview of the sample by gender, country, and field of study.

TABLE 1

Sample by gender, country and field of study (percentages)

		Italy	Spain	Austria	Germany	Netherlands	UK	Sweden	Total
Education	Males	0.3	1.7	3.1	1.6	2.2	1.8	2.2	1.8
	Females	1.4	3.9	8.8	5.0	7.7	3.9	10.0	5.7
	Total	1.7	5.6	11.8	6.5	9.9	5.6	12.2	7.5
Humanities	Males	2.6	2.9	1.9	2.7	2.3	5.9	1.1	2.7
	Females	12.7	7.2	5.4	7.6	5.9	15.1	2.3	8.0
	Total	15.3	10.0	7.3	10.3	8.2	21.0	3.5	10.8
Social Sc.	Males	14.4	11.5	13.8	15.3	18.5	11.0	11.0	14.0
	Females	14.0	17.9	13.3	14.6	22.9	17.4	17.6	16.9
	Total	28.5	29.4	27.1	29.9	41.4	28.5	28.5	30.9
Law	Males	6.7	3.4	6.0	3.4	1.8	1.9	1.7	3.5
	Females	7.4	4.1	5.0	3.0	3.5	2.3	2.0	3.9
	Total	14.1	7.4	11.0	6.4	5.3	4.2	3.7	7.4
Natural Sc.	Males	3.2	2.4	2.2	6.0	1.6	5.7	1.3	3.3
	Females	3.9	3.0	1.6	2.8	1.0	4.9	2.1	2.7
	Total	7.1	5.4	3.8	8.8	2.5	10.5	3.4	6.0
Comp. Sc.	Males	2.0	5.1	4.8	3.6	3.8	3.1	2.8	3.5
	Females	1.8	2.8	1.1	1.7	0.6	2.3	1.3	1.6
	Total	3.8	7.9	5.9	5.3	4.4	5.4	4.1	5.2
Engineering	Males	15.2	17.3	17.1	23.0	12.9	10.9	20.5	16.9
	Females	4.6	7.4	2.8	4.1	4.1	3.9	7.3	4.8
	Total	19.8	24.7	19.9	27.1	17.0	14.8	27.8	21.7
Medical Sc.	Males	4.4	3.6	4.9	2.4	2.8	2.0	6.6	3.7
	Females	5.3	6.0	8.2	3.3	8.4	7.9	10.3	6.8
	Total	9.7	9.6	13.0	5.7	11.2	9.9	16.8	10.5
Total	Males	48.8	47.8	53.8	58.0	45.8	42.3	47.2	49.5
	Females	51.2	52.2	46.2	42.0	54.2	57.7	52.8	50.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

A Model for the Choice of Field of Study

To assess the influence of field choice on job satisfaction, we should analyze graduates from different fields in comparable jobs. However, students' choice is guided by a number of both observable and unobservable personal characteristics. In this section, we describe a model for the choice of field that takes in account both type of characteristics.

The dependent variable took the eight fields of study (i.e., education, humanities, law, natural sciences, computer sciences/mathematics, engineering, medical sciences, and social sciences) as outcomes, so maximum likelihood multinomial regression was used for estimation purposes. We included graduates' gender, family educational background,

their age of entry into higher education, the type of secondary education followed, and the entry marks to gain access to higher education as explanatory variables. Additionally, we expected certain fields of study to be chosen according to a range of personal life goals. Life goals included in the data set were social prestige, personal development, varied social life, home/family life, making money, academic inquiry, and the job itself.

The purpose of estimating this model was twofold. First, coefficient estimates reflected the influence of diverse personal characteristics on the probabilities of choosing each field of study. Second, the model was used to predict what field suited best each graduate according to his or her own personal characteristics. Some of the explanatory variables in the choice-of-field model (i.e., family background, age of entry, secondary education, and entry marks) were likely to be otherwise unconnected with graduates' current levels of job satisfaction. Consequently, they were later considered as instrumental variables in the estimation of the effects of field choice on job satisfaction by comparing individuals with similar personal characteristics who graduated from different fields and were working in comparable jobs. Estimation results of the multinomial regression model for the choice of field are reported in Table 2. Descriptive statistics for the variables in the field of study model are reported in Appendix 1.

Significant coefficient estimates revealed that the probability of choosing a particular field was influenced by the corresponding explanatory variable. Every explanatory variable in the model had some significant influence on the probabilities of choosing certain fields. However, the results must be interpreted with care since the signs of estimates in the multinomial regression do not necessarily show the direction of the marginal effects. The estimates need to be translated into predicted probability distributions to assess the direction and size of the effect that a marginal change in each explanatory variable has on the probabilities of graduation from different fields. The first row in Table 3 shows the predicted probability distribution of the choice of field corresponding to a reference individual. The other rows show how this reference distribution changes when the values of the explanatory variables were marginally altered.

Some general patterns emerge from Table 3. Gender is the most influential characteristic regarding the choice of field. Being a woman sharply increases the probabilities of choosing education, humanities, medical sciences, and social sciences, and dramatically decreases those of choosing engineering, computer sciences, and natural sciences. It is clear that in Europe women are still less likely than are men to choose

TABLE 2

Multinomial Regression for the Choice of Field of Study (Reference field is Social Sciences).

	Education		Humanities		Law		Natural Sciences		Computer Sc.		Engineering		Medical Sc.	
	Coeff.	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.
Personal characteristics														
Gender	0.942 *	10.5	0.793 *	12.0	−0.278 *	3.7	−0.586 *	7.9	−0.883 *	10.3	−1.511 *	27.1	0.248 *	3.5
Age of entry	0.055	1.9	−0.024	0.9	−0.061	1.9	−0.019	0.6	−0.201 *	5.9	0.001	0.0	−0.058	2.0
Parents educational background														
Father HEG	−0.139	1.5	0.031	0.4	0.438 *	5.3	0.324 *	3.9	−0.057	0.5	0.172 *	2.8	0.471 *	6.1
Mother HEG	0.228 *	2.0	0.329 *	4.0	0.011	0.1	−0.114	1.1	0.130	1.1	0.043	0.6	0.305 *	3.4
Secondary education (ref. is academic second.)														
Vocational secondary education	−0.159	1.6	−1.232 *	12.1	−1.053 *	8.5	−1.454 *	10.6	−0.505 *	4.3	0.224 *	3.6	−0.733 *	7.1
Other qualifications	−0.578	1.8	−0.345	1.6	−0.932 *	2.6	−0.372	1.3	−0.126	0.4	−0.086	0.5	−0.301	1.2
Entry marks to HE (reference is medium mark)														
High entry mark	−0.392 *	3.9	0.127	1.9	0.225 *	2.7	0.372 *	4.7	0.420 *	4.7	0.213 *	3.7	0.328 *	0.4
Low entry mark	0.258 *	2.8	−0.367 *	4.5	−0.230 *	2.3	−0.516 *	4.9	−0.399 *	3.4	−0.209 *	3.2	−0.442 *	4.5
Interest in life goals														
Social prestige	0.022	0.6	−0.116 *	4.1	0.102 *	2.9	−0.249 *	7.2	−0.059	1.5	−0.124 *	5.0	0.002	0.1
Personal development	−0.082	2.0	0.080	2.0	−0.089	1.8	−0.197 *	4.4	−0.223 *	4.4	−0.086 *	2.6	−0.180 *	4.1
Varied social life	0.070	1.7	0.038	1.2	−0.059	1.6	−0.026	0.7	−0.175 *	4.3	−0.124 *	4.8	−0.015	0.4
Home/family	0.090 *	2.7	0.009	0.4	0.199 *	6.3	−0.062	2.1	0.006	0.2	−0.024	1.1	0.131	4.6
Making money	−0.226 *	5.5	−0.269 *	8.8	−0.123 *	3.1	−0.210 *	5.7	0.032	0.7	0.045	1.7	−0.257 *	7.3
Academic inquiry	−0.068	2.1	0.245 *	9.7	0.071	2.3	0.399 *	12.4	0.159 *	4.5	0.102 *	4.8	0.191 *	6.6
Job itself	0.028	0.6	−0.114 *	3.5	0.029	0.7	−0.042	1.1	−0.028	0.6	0.067	2.3	0.257 *	6.4
Intercept	−2.602 *	4.0	−0.435	0.8	−0.464	0.7	0.681	1.1	3.718	5.0	0.626	1.6	−0.832	1.4
Observations	13.882													
Lr_2(105)	3.983													
Log likelihood	−24.130													

Asymptotic z-statistics in absolute values. (*) denotes p < 0.01.

TABLE 3

Predicted Probabilities for Choice of Field of Study

	Edu	Hum.	Law	Nat. Sc.	Com. Sc.	Engin.	Med. Sc.	Soc. Sc.
Reference Individual	3.2%	7.1%	7.3%	10.8%	9.5%	31.1%	5.4%	25.4%
Female	10.5%	20.0%	7.0%	7.7%	5.0%	8.7%	8.8%	32.2%
Age of entry + 1 std. dev.	n.s.	n.s	n.s.	n.s	7.7%	n.s	n.s	n.s
Father HEG	n.s	n.s	9.7%	12.9%	n.s	31.7%	7.4%	n.s
Mother HEG	n.s.	9.3%	n.s	n.s	n.s	n.s	6.8%	n.s
Vocational secondary	n.s	2.5%	3.1%	3.1%	7.0%	47.1%	3.1%	n.s
Other qualification	n.s.	n.s	0.4%	n.s	n.s	n.s	n.s	n.s
High entry mark	1.8%	n.s.	7.6%	13.0%	12.0%	31.8%	6.2%	n.s
Low entry mark	5.1%	6.0%	7.1%	7.9%	7.8%	30.8%	4.2%	31.0%
Interest in Social prestige + 2	n.s	6.4%	10.2%	7.5%	n.s	27.5%	n.s	n.s
Interest in Personal dev. + 2	n.s	n.s	n.s	n.s	7.1%	30.4%	4.4%	n.s
Interest in Varied social life + 2	n.s.	n.s	n.s	n.s	7.5%	27.0%	n.s	n.s
Interest in Home/ family + 2	3.7%	n.s	10.5%	n.s	n.s	n.s.	6.8%	n.s
Interest in Making money + 2	2.2%	4.5%	6.2%	7.8%	n.s	n.s	3.5%	n.s
Interest in Academic inquiry + 2	n.s.	8.8%	n.s.	18.3%	10.0%	29.0%	6.0%	n.s
Interest in Job itself + 2	n.s	5.4%	n.s	n.s	n.s	n.s	8.5%	n.s

(n.s.) no significant change at 1% level
Reference individual is defined as a male, with entry age at mean value, whose parents are not HEG, has completed academic secondary, has medium entry marks, and is interested in all life goals at level 3

more technical fields. When the age of entry increases by one standard deviation, the probability of choosing computer sciences declines, whereas that of choosing education increases. Family educational background also influences the choice of field of study. Having a highly educated father increases the probabilities of electing fields such as medical sciences, law, and natural sciences. In contrast, having a mother with a degree positively influences the election of medical sciences, humanities, and education. Students with vocational secondary credentials have increased probabilities of choosing engineering and social sciences, and reduced probabilities for the election of natural sciences, humanities, medical sciences, and law. Entry marks are also influential: The lower the marks, the higher the probabilities of choosing education and social sciences, and the lower the probabilities of choosing natural sciences, medical sciences, and computer sciences.

With respect to graduates' interest in diverse life goals, we found a different personal profile associated to the probability of choosing each

field of study. Thus, in relative terms, education is more likely to be chosen by individuals who are highly interested in home/family and in a varied social life and who are less interested in making money or in academic inquiry. Humanities are more likely to be preferred by people who are interested in personal development and in academic inquiry and who are less interested in social prestige, making money, or the job itself. Law is preferred by people who are seeking social prestige, who are highly interested in home/family, and who are less interested in making money or in academic inquiry. Natural sciences are likely to be chosen by individuals whose main interest is academic inquiry and who are not especially interested in social prestige, personal development, or making money. Computer sciences are more likely to be chosen by people interested in academic inquiry and who are not interested in personal development, having a varied social life, or in the job itself. Engineering is the most likely choice for people who are interested in making money and the job itself, and for those who do not seek social prestige, academic inquiry, or a varied social life. Medical sciences are the likely choice for people who are mainly interested in the job itself, home/family life, academic inquiry, and social prestige and who are not particularly interested in making money or in personal development.

Using the results from the multinomial regression model, we predicted the field of study that best suits each individual in the sample according to gender, family background, age of entry, secondary education credentials, entry marks, and the relevance the individual places on diverse life goals. The criterion here is to assign the field with the highest probability emerging from the multinomial model to each individual, which yields 59% of correct predictions. This predicted field of graduation is used in the next section as a regressor to estimate the effects of degree field on job satisfaction after controlling for individual heterogeneity among graduates. (For a more detailed explanation of the model, see Appendix 3.)

The Influence of Field of Study on HEGs' Job Satisfaction

The influence of the choice of degree field on job satisfaction may help to understand better the effects of educational investment on workers' well-being. Responses on job satisfaction were recorded in ordered scales, and, therefore, the analysis of the elements influencing satisfaction was carried out in terms of ordered response models. Maximum likelihood estimation of ordered probit models was carried out using the Newton-Raphson algorithm based on second derivatives.

The explanatory variables included in the model, apart from the field of graduation, were classified into four groups: graduates' perceptions

about the match between education and employment, degree of fulfillment of job prospects, observable individual/job characteristics, and a set of country dummies to account for country differentials.

For the perceptions about the education/job match, we included a set of explanatory variables related to the incidence of mismatches. In the survey, graduates were asked to rate the extent to which they use their qualification in their current jobs on a scale with a five-point order. Additionally, they were asked whether they felt overeducated, whether they felt undereducated, and whether they held jobs within their own educational domain; for estimation purposes, the answers to these three questions were coded into four dummy variables.

The survey addressed graduates' job prospects regarding the following characteristics: independent job; clear and well-ordered tasks; opportunity to use acquired knowledge and skills; job security; opportunity to pursue own ideas; good social environment; chances of political influence; challenging tasks; good career prospects; coordination and management tasks; working in a team; and chances to do something useful for society. Graduates were asked first to reveal to what extent these items were personally important for them and, secondly, to what extent these characteristics were found in their current professional situation. Paired differences between the answers given to both questions, with a reversed sign, provided information about the extent to which graduates' prospects were fulfilled by their current jobs; these differences were included as additional explanatory variables for job satisfaction.

We included the following job observable attributes in the satisfaction equation as explanatory variables: the natural logarithm of the hourly wage, and a dummy variable for those working in firms up to ten workers. Since public sector employment, full-time jobs, and permanent work contracts have some specific characteristics that many people consider desirable, we also included a dummy variable for each one. The graduate's current age was included in the model as a personal characteristic that was likely to influence the distribution of job satisfaction. Definitions and descriptive statistics for the variables in the job satisfaction model are reported in Appendix 2.

In order to assess the effect of unobserved heterogeneity via field of study on job satisfaction scores, we estimated two different specifications of the satisfaction model. The first, direct specification included as regressors those mentioned in the previous paragraphs plus graduates' actual field of graduation. Consequently, the choice of field entered as an exogenous determinant for job satisfaction, and individual heterogeneity regarding background and preferences was not taken into account in this first specification. In the second specification, on the other

hand, the predicted field of study emerging from the criterion model reported in the third section replaced as explanatory the field actually chosen. Therefore, the second specification may be understood as an instrumental variable (IV) estimation of a model for job satisfaction including the choice of field as an endogenous determinant. The IV specification thus allowed the estimation of the influence of degree choice on job satisfaction after controlling for the effects of unobservable heterogeneity among HEGs in terms of background and preferences (Newey, 1990; Robinson, 1976).

Estimation results for both specifications are presented in Table 4. The first panel of the table contains the results obtained from the direct specification, with field choice as the exogenous determinant, whereas the second panel shows the results obtained from the IV specification that included endogenous field choice as the explanatory variable. Estimates for the influence of the other explanatory variables considered, apart from study field (education-job match, fulfillment of job prospects, individual/job specific attributes, and country), are also reported.

The degree field shows some net effects on graduates' job satisfaction, although, as was expected, the estimation method is crucial in how dependent the influence is. When the model is estimated directly, with actual field of graduation as the explanatory variable, graduates in computer sciences and education appear to be more satisfied, whereas graduates in law are significantly less satisfied than are social sciences graduates (the reference field). HEGs from the other fields considered (natural sciences, engineering, and medical sciences) are as satisfied as the reference group. However, these results do not capture the true net effects of degree field on satisfaction, since regression coefficients represent only the observable correlation between job satisfaction and degree field conditional to the field chosen, which emerges from an exogenous choice. Therefore, unobserved heterogeneity among graduates from different fields is not addressed in the model.

The results are significantly different when the IV model is considered. Here the field of study predicted in terms of HEGs' backgrounds and preferences, instead of the actual choice made by individuals, is included in the ordered model, so the choice of field is entered as an endogenous determinant of satisfaction. In this case, a degree in humanities significantly increases job satisfaction and, on the other hand, a degree in computer sciences significantly reduces satisfaction compared to the reference group. It should be noticed that regression coefficients in the IV estimation represent the endogenous influence of degree field on job satisfaction once the effects of unobserved individual heterogeneity among graduates from different fields have been removed. The inter-

pretation is straightforward: Individuals holding a degree in humanities would be more satisfied and those with a degree in computer sciences would be less satisfied than the reference group had all HEGs obtained their degree in the most likely field according to their gender, educational characteristics, family background, and personal life goals.

Graduates' job satisfaction also appears to depend on the other determinants included in the model. The accuracy of the match between education and job as perceived by HEGs has a significant effect on job satisfaction irrespective of the specification considered. Graduate satisfaction increases with the extent to which they are able to use the qualifications acquired during their studies at work. Overeducated graduates are by far less satisfied with their jobs than are those in the right match situation. Overeducation is one of the most influential variables producing dissatisfaction in young graduates: Possibly, they feel dissatisfied because they believe they should be holding more demanding and, consequently, more rewarding jobs. On the other hand, job satisfaction is higher for undereducated graduates than for those whose education matches the requirements of their jobs. It appears that the feeling of being undereducated does not bother young graduates, probably because they work in positions where both the monetary and nonmonetary returns are higher than those they would obtain had they held a job matched to their education. In addition, and perhaps surprisingly, working in a job within the same domain of graduation does not influence significantly HEGs' job satisfaction.

The extent to which graduates' current jobs fulfill certain job prospects has significant effects on job satisfaction, whereas the fulfillment of other prospects does not influence satisfaction. Again, the results hold regardless of model specification. Satisfaction declines when HEGs have lower possibilities of using the acquired knowledge and skills and when they have fewer chances of pursuing their own ideas at work than they expected. The same effect appears when their jobs do not provide HEGs with a good enough social environment, if their tasks are not challenging enough, and if their future career prospects are worse than they anticipated. On the other hand, the fulfillment of the other job prospects considered (independent job, clear tasks, job security, chances of political influence, managerial tasks, teamwork, and the chance to do something useful for society) do not show any significant effects on graduate satisfaction. Thus, higher job satisfaction appears to be related to the fulfillment of some specific job prospects only, whereas fulfillment of others does not influence satisfaction.

Finally, it should be mentioned that all individual-specific and job-specific variables confirm the effects predicted in the conventional

TABLE 4

Ordered Probit Estimates for Job Satisfaction. Direct vs. IV estimation

	Direct Estimation			IV Estimation		
	Coefficient		z-stat.	Coefficient		z-stat.
Field of study (reference Social Sciences)						
Education	0.094	*	2.4	−0.093		1.3
Humanities	0.055		1.9	0.086	*	2.7
Law	−0.089	*	2.4	0.071		0.6
Natural Sciences	0.045		1.3	0.034		0.4
Comp. Sc.	0.152	*	3.7	−1.339	*	2.6
Engineering	0.011		0.4	−0.024		1.1
Medical Sciences	−0.048		1.7	0.030		0.6
Education/job match						
Qualification used at work	0.125	*	12.6	0.119	*	12.5
Under-educated	0.104	*	3.5	0.099	*	3.3
Over-educated	−0.338	*	14.7	−0.334	*	14.6
Job domain	−0.008		0.3	−0.012		0.5
Fulfillment of job prospects						
Highly independent jobs	−0.005		0.6	−0.004		0.4
Clear and well-ordered tasks	−0.001		1.3	−0.004		0.5
Use of acquired knowledge and skills	0.058	*	6.4	0.061	*	6.7
Job security	−0.001		0.1	0.001		0.1
Opportunity to pursue own ideas	0.108	*	11.5	0.110	*	11.7
Good social environment	0.101	*	11.4	0.101	*	11.4
Chances of political influence	0.014		1.6	0.013		1.5
Challenging tasks	0.038	*	4.0	0.039	*	4.1
Good career prospects	0.140	*	16.8	0.140	*	16.7
Co-ordination and management tasks	0.013		1.6	0.013		1.5
Working in a team	−0.005		0.6	−0.007		0.8
Chance to do something useful for society	0.007		0.9	0.008		1.0
Individual-specific and job-specific characteristics						
Age	−0.027	*	6.2	−0.027	*	3.1
Private Sector	−0.055	*	2.6	−0.055	*	2.7
Hourly wage (log)	0.292	*	15.0	0.299	*	15.5
Small firm (up to 10 workers)	0.018		0.8	0.005		0.2
Full-time job	0.190	*	6.5	0.185	*	6.3
Permanent contract	0.106	*	4.5	0.112	*	4.8
Country dummies (reference is Germany)						
Italy	−0.086	*	2.7	−0.102	*	3.3
Spain	0.139	*	4.2	0.141	*	4.3
Austria	0.294	*	3.7	0.289	*	3.7
The Netherlands	0.081	*	2.4	0.077	*	2.3
United Kingdom	−0.213	*	7.5	−0.217	*	7.7
Sweden	−0.043		0.7	−0.048		0.9
Observations	15.555			15.555		
Lr _2 (35)	4,314			4,298		
Log likelihood	−18,948			−18,956		

Asymptotic z-statistics in absolute values. (*) denotes p < 0.01.

literature on job satisfaction, irrespective of the estimation method used. Clearly, graduates' job satisfaction increases with hourly wages; working in a small firm does not influence satisfaction; public sector employees are more satisfied than are private sector ones; HEGs holding permanent contracts are more satisfied than those working on a temporary basis; and full-time workers are more satisfied than part-time ones. Additionally, there is a significant negative effect from age on graduates' job satisfaction, which is consistent with the U-shaped effect of time on job satisfaction found in the literature, since all graduates in the sample are young people.

Table 5 translates the IV estimates into predicted probability distributions to assess the size of the effect that a marginal change in each explanatory variable has on job satisfaction. The first row shows the distribution of job satisfaction corresponding to a reference individual. The other rows show how this distribution changes when the explanatory variables in the model are marginally altered. The table reveals that the net effects of the field of study as an endogenous choice on job satisfac-

TABLE 5

Predicted probability distributions for Job Satisfaction (IV Model)

	Very dissatisfied				Very Satisfied
	1	2	3	4	5
Reference individual	0.7%	6.1%	25.5%	49.3%	18.4%
Humanities	0.6%	5.2%	23.5%	50.0%	20.7%
Computer Sciences	1.3%	17.7%	37.0%	30.4%	13.6%
Qualification used at work + 2	0.4%	3.8%	20.1%	50.4%	25.4%
Under-educated	0.6%	5.0%	23.2%	50.1%	21.2%
Over-educated	1.8%	10.6%	32.6%	44.1%	10.8%
Use of acquired knowledge and skills + 4	0.4%	3.8%	20.0%	50.2%	25.7%
Opportunity to pursue own ideas + 4	0.2%	2.5%	15.7%	49.3%	32.3%
Good social environment + 4	0.2%	2.7%	16.5%	50.0%	31.0%
Challenging tasks + 4	0.5%	4.5%	21.9%	50.3%	22.8%
Good career prospects + 4	0.1%	1.9%	13.4%	47.9%	37.0%
Age + 1 standard deviation	0.9%	6.9%	27.0%	48.6%	16.7%
Private sector	0.9%	6.7%	26.7%	48.8%	17.0%
Income per hour + 1 standard deviation	0.5%	4.5%	22.0%	50.3%	22.7%
Full-time job	0.4%	4.3%	21.3%	50.3%	23.7%
Permanent contract	0.5%	4.9%	22.9%	50.1%	21.5%

Reference individual is defined as a male, with age at mean value, working part time on a temporary basis for the public sector in a firm with more than ten workers, who uses his qualification at work at mean value, is accurately matched in education, works outside his study domain, whose job fulfils exactly his jobs prospects, and holds a degree in Social Science.

tion are substantial compared to those corresponding to the other determinants. The probability of scoring at level 4 or 5 on job satisfaction is 67.7% for the reference individual. A degree in humanities raises this probability to 70.7 %, whereas having a permanent contract increases it to 71.6%, and increasing the hourly wage by one standard deviation raises the probability to 73%. On the other hand, a degree in computer sciences reduces the probability of scoring at level 4 or 5 to a mere 44%, whereas being overeducated reduces it to 54.9% and working for the private sector reduces the probability to 65.8%. Therefore, studying within and graduating from a given field has a substantial net impact on graduate evaluations of their working activity after its effects through the observable job attributes have been removed and individual heterogeneity has been controlled for.

Summary and Concluding Remarks

In this article, we have explored the effects of degree field choice on the distribution of occupational benefits, in terms of job satisfaction, among young European HEGs. To do so, we first analyzed the determinants of the choice of field study in order to assess the degree of unobserved heterogeneity among graduates from different fields. We built a field choice criterion through a multinomial regression model that includes graduates' family educational background, gender, age of entry to higher education, secondary education qualification, entry marks, and subjective relevance attached to diverse life goals as explanatory variables. Results show that all explanatory variables in the model significantly influenced the probability of choosing at least some fields. We also found a different personal profile on life goals linked to the probability of choosing each field of study. Following the multinomial model, we computed the predicted field of study for each graduate to use it later as an explanatory variable in the job satisfaction equation, thus allowing for consideration of endogenous choice in order to control for unobserved heterogeneity among HEGs from different fields.

The field of study does influence job satisfaction scores after we control for income and other observable job attributes. When the choice of a given field is considered as exogenous, graduates from education and computer sciences report themselves as more satisfied and law graduates as less satisfied than graduates from the other fields. The specification controls for the degree of fulfillment of job prospects, the match between education and employment, and other individual/job specific characteristics. Coefficient estimates here show the influence of degree field conditional to actual choice, so they describe the observable

distribution of job satisfaction in terms of the observable distribution of fields of graduation. However, the results change when the model is estimated through the two-step IV method. In the IV model, the choice of a given field is entered as an endogenous determinant, and coefficient estimates reflect the influence of degree field on job satisfaction conditional to graduates' backgrounds and preferences, but unconditional regarding actual choice. Consequently, estimates describe the predicted distribution of satisfaction in terms of field of study after controlling for individual heterogeneity among HEGs. When the predicted field emerging from the choice of field model (endogenous choice) replaces the actual field of graduation (exogenous choice), graduates in humanities would be more satisfied whereas graduates in computer sciences would be much less satisfied compared to the reference group. Additionally, we found that graduates' perceptions about both the education/job match and the fulfillment of their expectations regarding working life generate strong impacts on the distribution of job satisfaction among young European HEGs. Finally, the effects corresponding to all job-specific and individual-specific characteristics confirm those found in conventional literature.

To summarize, graduation from certain fields does influence graduates' job satisfaction scores, which also depend strongly on graduates' perceptions about the education/job match and on the extent to which some of their expectations are fulfilled. Consequently, the field of graduation, which is the result of a personal choice, appears to be a relevant characteristic influencing the distribution of work-related benefits among graduates, even after we control for unobservable heterogeneity and observable individual/job specific characteristics.

APPENDIX 1

Descriptive Statistics for Choice-of-Field Analysis

Variables	Mean	Std. Dev.	Minimum	Maximum
Field of graduation				
Education	0.07	0.26	0	1
Humanities	0.10	0.30	0	1
Law	0.07	0.26	0	1
Natural Sciences	0.06	0.24	0	1
Computer Sciences	0.05	0.22	0	1
Engineering	0.24	0.41	0	1
Medical Sciences	0.10	0.30	0	1
Social Sciences	0.31	0.46	0	1
Personal characteristics				
Female	0.50	0.50	0	1
Age of entry to HE (years)	19.07	1.30	17	28
Parents educational background				
Father HEG	0.32	0.47	0	1
Mother HEG	0.19	0.39	0	1
Secondary education				
Academic secondary education	0.76	0.43	0	1
Vocational secondary education	0.21	0.40	0	1
Other qualifications	0.03	0.18	0	1
Entry marks to higher education				
High entry mark	0.36	0.48	0	1
Medium entry mark	0.46	0.50	0	1
Low entry mark	0.18	0.38	0	1
Interest in life goals (a)				
Social prestige	3.05	1.10	1	5
Personal development	4.25	0.81	1	5
Varied social life	3.81	1.00	1	5
Home/family	3.39	1.22	1	5
Making money	3.47	1.04	1	5
Academic inquiry	3.44	1.23	1	5
Job itself	3.96	0.95	1	5

(a) The question was: *Please indicate the importance you placed on each of the following life goals at time of graduation.*

APPENDIX 2

Descriptive Statistics for Job Satisfaction Analysis

Variables	Mean	Std. Dev.	Minimum
Job satisfaction scores			
1 = Very dissatisfied	0.02	0.16	0
2	0.09	0.28	0
3	0.25	0.43	0
4	0.44	0.49	0
5 = Very satisfied	0.20	0.39	0
Field of study (predicted from choice-of-field criterion)			
Education	0.02	0.09	0
Humanities	0.11	0.22	0
Law	0.02	0.06	0
Natural Sciences	0.02	0.08	0
Computer Sciences	0.04	0.01	0
Engineering	0.33	0.37	0
Medical Sciences	0.04	0.14	0
Social Sciences	0.42	0.49	0
Education/job match			
Qualification use at work	3.48	1.07	1
Under-educated	0.10	0.30	0
Over-educated	0.22	0.42	0
Job domain	0.77	0.42	0
Fulfilment of job prospects (a)			
Highly independent jobs	−0.32	1.19	−4
Clear and well-ordered tasks	−0.23	1.23	−4
Use of acquired knowledge and skills	−0.42	1.21	−4
Job security	−0.45	1.47	−4
Opportunity to pursue own ideas	−0.59	1.25	−4
Good social environment	−0.56	1.20	−4
Chances of political influence	−0.30	1.14	−4
Challenging tasks	−0.38	1.22	−4
Good career prospects	−0.75	1.31	−4
Co-ordination and management tasks	−0.38	1.28	−4
Working in a team	−0.13	1.22	−4
Chance to do something useful for society	−0.45	1.26	−4
Individual-specific and job-specific characteristics			
Age (years)	29.73	2.35	26
Private sector	0.70	0.46	0
Hourly wage (∈)	15.17	10.25	0.3
Small firm (up to 10 workers)	0.23	0.42	0
Full-time job	0.88	0.33	0
Permanent contract	0.76	0.42	0
Country dummies			
Italy	0.14	0.35	0
Spain	0.12	0.32	0
Austria	0.12	0.32	0
The Netherlands	0.17	0.38	0
United Kingdom	0.14	0.34	0
Sweden	0.12	0.33	0
Germany	0.19	0.39	0

(a) The question was: *How important are the following characteristics of an occupation for you personally and to what extent do they apply to your current professional situation?*
The values for the variables in this block have been calculated as differences between the extent to which an item applies to the current job and the importance personally attached to that item.

APPENDIX 3

The Statistical Model

The analysis of the effects of study field choice on job satisfaction needs to address first the process behind the choice of field in terms of heterogeneity among graduates. That is, to isolate the satisfaction effects of the choice itself, we should compare satisfaction of graduates from different fields who are working on similar jobs and who also have similar personal characteristics. Otherwise, the estimated coefficients should be interpreted as mere correlations between field of graduation and satisfaction rather than as causal effects of field choice on job satisfaction. This is so because students choose a field of study according to their background, tastes, inclinations, preferences, and prospects. Accordingly, graduates from a given field are likely to share some personal characteristics that may have their own influence on job satisfaction beyond the effect generated by the educational choice itself.

Therefore, the rationale for having two specifications of the job satisfaction model consists of allowing comparison between the coefficient of study field considered as an exogenous determinant of satisfaction (statistical correlation) and its coefficient when it is included as an endogenous determinant (causal effect). Under the first specification, we analyze satisfaction of graduates from different fields with comparable jobs (exogenous choice); under the second, we analyze graduates from different fields but with similar personal characteristics and working on comparable jobs (endogenous choice).

The so-called direct specification of the model may be represented as

$$JS = F (F, X) + u \tag{1}$$

where JS is job satisfaction, F is actual field of graduation, X are the other observable determinants of satisfaction, and u is a disturbance term. Here, the field of study is included as an exogenous determinant for JS. The estimate coefficient for F captures only the statistical correlation between field of graduation and job satisfaction because the process behind the choice of field is not addressed.

However, we argue that the choice of field should be considered as an endogenous process that may be represented as

$$F = J (Z) + v \tag{2}$$

where F is once again field of study, Z are individual-specific characteristics (observed heterogeneity) guiding the choice , and v stands for a disturbance term representing unobserved heterogeneity among graduates. Substituting Equation 2 into Equation 1 yields

$$JS = F [J (Z) + v, X] + u$$

So, when the choice of field is endogenous, the coefficient of F estimated from Equation 1 reflects in reality the influence of the term $J(Z)+v$. Obviously, this includes as well the influence of unobserved heterogeneity among graduates from different fields, v, which in turn is correlated with u. This is the case of a regressor correlated with the disturbance term of the model, so the coefficient estimate would represent correlation but not causal effect.

This problem can be fixed by estimating Equation 2 first, thus obtaining a prediction for "field of study" in terms of the individual-specific observable characteristics and discarding unobserved heterogeneity. This is equivalent to assign to each graduate the field of study that would suit him or her best according to his or her own personal observable characteristics.

$$F^* = J^* (Z) = F - v^*$$

where (*) indicates estimates.

By including the predicted field $F^* = J^* (Z)$ as a regressor in Equation 1 instead of the observed F, the so-called instrumental variable (IV) specification emerges

$$JS = F (J^* (Z) , X) + u \tag{3}$$

Under this specification $J^* (Z) = F^*$ is not correlated with the disturbance term u. Consequently, the coefficient estimate from Equation 3 captures the causal effect of field choice once the effects of heterogeneity among graduates from different fields have been removed through the two-step estimation procedure.

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