

# *Curricular Design and Labour Market Demand: Comparing Three Carlos III University of Madrid Curricula*

CARMEN MARTÍN-MORENO, CARLOS GARCÍA-ZORITA,  
MARIA LUISA LASCURAIN-SÁNCHEZ Y ELÍAS SANZ-CASADO  
Universidad Carlos III de Madrid, Spain

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The purpose of this paper is to analyze the role that the degree of curricular specialization in academic disciplines plays in connection with labour market demand for graduates in the respective areas. The curricula of three conventional social science disciplines for which degrees are awarded by the Carlos III University of Madrid: the general degree in Library Science, the Bachelor of Arts degree in Information Science and the Bachelor of Science degree in Economics are compared and analyzed in terms of the job

offers received for their respective graduates from a series of industries. The results of the multivariate analysis conducted, based on the multidimensional indicators identified, reveal greater subject variability in the former two. In other words, the curricula for these two degrees are of a broader nature, whereas the curriculum for the degree in Economics is more specialized, with content covering a smaller number of areas. The outcome is a wider diversity of job offers for graduates in Economics.

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## *Introduction*

In the European Union member signatories of the Bologna Accords on higher education in particular, but in other countries as well, university curricula are undergoing substantial change to adapt to new social standards and needs. In this context, the heads of many university departments are debating between a more generalized or a more specialized curricular design (Khoo and Ramaiah 2004). Their decisions in this regard will have an indisputable impact on the employability and future scientific endeavours of university graduates.

The relationship between scientific, industrial and social needs on the one hand and the education delivered by universities on the other adopts many forms, which among other things affect the training offered students to prepare them for different occupations (Goulding et al. 1999). Since university education pursues a number of pro-

fessional as well as scientific objectives, the curricula adopted by these institutions, in addition to honouring their commitment to the latter, must qualify graduates for jobs related to their area of training. For these reasons, universities should attach primary importance to adjusting the education offered students to existing labour market needs (Sanz Casado et al. 2002).

Intuitively, a more interdisciplinary curriculum would seem to provide students access to a more varied employment offering, although at the risk that the concomitant lack of specialization might afford graduates vaguer professional profiles not readily understood by the labour market. For these reasons, the present paper seeks to ascertain how the greater or lesser specialization of curricula in academic disciplines might affect graduate employability. The analysis focuses on the number of electives allowed and the interdisciplinarity of the subjects taught under three conventional academic disciplines delivered at this time at Carlos III Uni-

versity of Madrid and the job offers received by graduates earning the three types of degrees. The reply to the question posed may question the role of subjects from other disciplines in academic curricula; our objective, however, is to analyze a specific case and to determine whether there may be lessons to be learnt respecting curricular design in the framework of the European Higher Education Area.

Three curricula were chosen for the analysis, each leading to a different kind of degree at the Carlos III University of Madrid: two Bachelor of Science and Arts degrees – in Economics and Information Science – and a general degree in Library Science. These three degrees, like all others that can be earned in Spanish universities, are established by the Ministry of Education and Science's University Council, which also lays down a series of guidelines specific to each degree. Therefore, the academic requirements to be met are identical in all the areas covered. University enrolment to opt for any degree is subject to passing an admissions exam.

In Spain, Economics has long been taught in universities, whereas Library Science and Information Science are relatively new disciplines. The guidelines for the degree in Library Science in Spanish universities were approved in 1981. The first academic curriculum was defined by the University of Granada in 1982 (Abadal Falgueras 1994). At the Carlos III University, however, the two areas of learning were instituted at practically the same time. Moreover, as both are social science disciplines, their graduates are able to perform similar tasks, a trend first identified by Rowley (1995) and later confirmed by Gorman (1999) and Kinnell (2000). The latter author sustains that although much has changed in recent years, still greater change can be expected as the age of industrial technology gives way to the age of information and communication technology.

After analyzing these curricula, the findings were compared to the information provided by the Professional Guidance and Planning Service (abbreviated in Spanish as SOPP) on Spanish labour market demand for graduates with these degrees. We are fully aware that the results obtained in this study are partial and they provide only a fractional view of the problem. We nonetheless believe that the objectives pursued are of cardinal importance at a time when the so-called "informa-

tion society" is bringing changes in the roles played by different professionals on the labour market, and professionals with different types of degrees compete for the same jobs (Brittain 1989; Johnson 1998; Gorman 1999). University departments therefore need to be kept abreast of the developments taking place in the working world to adapt their curricula accordingly and to train students in new specialities as they arise.

### *Methodology*

This study was conducted using multi-dimensional indicators, a method permitting the simultaneous consideration of the different variables or multiple relationships observed in the documents used in the study (Sanz Casado and Martin Moreno 1998). In this case, in addition to the many characteristics that may be taken into account in the curricula analyzed, the variables examined included the credit distribution across the various subject categories (core, requisite and elective) as well as the subjects taught under each curriculum and the areas of learning with which they were associated. The formulation of such indicators required the use of multivariate analysis techniques. To plot maps graphically depicting the relationships between the academic institutions delivering the respective courses and the other variables considered.

The results of multivariate analysis can be converted into a number of different types of graphic images. In this case, the multi-dimensional indicators used were the maps plotted with correspondence analysis techniques to graphically depict the nature of the relationships between the variables compared, analyze the existence of associations among them and convert a table with numeric information into a graphic image that facilitates the interpretation of such information (Greenacre 1993, 1994).

The first step in conducting this study was to compile the resolutions – published in the *Boletín Oficial del Estado* (Official State Journal – B.O.E.) – containing the curricula required by the Carlos III University of Madrid to earn the degrees analyzed. One of these degrees was the general degree awarded after successful completion of a three-year course in Library Science. The second was the Bachelor of Arts degree in Information Science, earned in a two-year course open to anyone

Table 1. Credit distribution in the three degrees

	TR	%	OB	%	OP	%	LE	%	TOTAL
Library Science	101	50.00	53	26.24	27	13.37	21	10.40	202
Information Science	53	37.86	61	43.57	12	8.57	14	10.00	140
Economics	144	45.71	52	16.51	84	26.67	35	11.11	315

with a three-year general degree, be it in Library Science or any other discipline. This is the rationale for separating these two types of degrees in the analysis, since part of the training and, in theory, the labour market for the skills involved, differ. Finally, the third object of review was the Bachelor of Science degree in Economics awarded after four years of study; no interim general degree is offered in this area.

The bibliometric method was used to process data and to formulate indicators (Sanz Casado et al. 2002). A documentary database was created in Procite 5® from the information drawn from the BOE on the subjects included in the three curricula and the credits allocated to each. One record was created per subject and included the subject name, number and type of credits and area of knowledge to which it pertained. Since neither requisites nor electives were ascribed to any specific area of learning, they were assigned to one on the basis of the description of the syllabus. Core subjects are subjects that must be delivered in all Spanish universities offering degrees in these disciplines, whereas requisites are the subjects required by a given university. Electives, in turn, are subjects that diversify students' learning, since they can be chosen from among a series of subjects offered by the university in question. Finally, free electives are subjects chosen by students from the university's entire curriculum, regardless of department, but as these subjects are not defined in the curricula analyzed they are extremely difficult to identify.

Information was then gathered on graduate employability by consulting the reports published annually by the Professional Guidance and Planning Service (SOPP), a vehicle for enhancing alumni employability and professional development created by the *Fundación Universidad Carlos III de Madrid*. This information included company job offerings as well as the professional profiles in greatest demand; i.e., the qualifications that students earning the degrees analyzed should have to find employment.

XLSTAT® was the software used for statistical processing of the contingency tables showing the distribution of the values for each category of variables to be studied. This same program was used to conduct the correspondence analyses needed to obtain the multi-dimensional indicators discussed here.

### *Results and discussion*

The data drawn from the analyses indicate whether the education delivered under the Economics, Library Science and Information Science curricula enables graduates to acquire the qualifications demanded by companies, in other words, whether curricular design is adapted to the needs of the existing labour market.

#### *Results of the curricular analysis*

The first aim was to determine the diversity or flexibility of the three curricula, measured by finding the number of core (TR), requisite (OB), elective (OP) and free elective (LE) credits offered in each. Table 1 gives the credit requirements, by subject type, to be met to earn the three degrees analyzed, in absolute numbers and percentages that each type represents of the total.

Assuming that the most flexible curricula are the ones offering a greater number of electives, since these subjects are chosen by students themselves, it may be deduced from Table 1 that students enrolled in Economics are afforded much more flexibility than those enrolled in Library Science and Information Science. Indeed, the percentage of elective credits in Economics doubles the number in Library Science and triples the elective credits in Information Science. The larger number of electives allowed very likely provides economics students with a broader knowledge of matters relating to their area of study, enabling them to choose from among different lines of specialization.

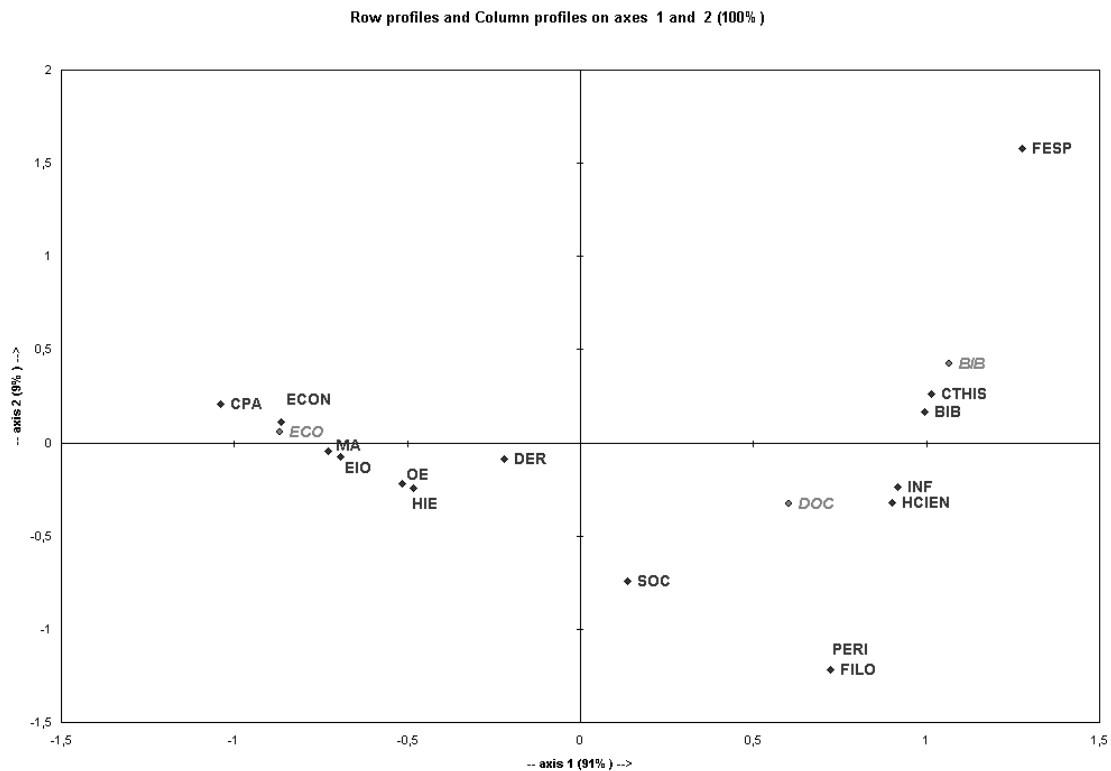


Figure 1. Correspondence analysis of areas of knowledge covered in the curricula for the degrees studied.

Another question of considerable interest in this type of studies is to ascertain the extent of interdisciplinarity, a characteristic defining the level of exchange with other areas of knowledge. Greater interdisciplinarity affords students wider and more diverse knowledge and, as Carstens-Wickham (2001) notes, a broader education that draws from different spheres of learning. A correspondence analysis was conducted between the three curricula on the basis of the areas of knowledge to which the subjects delivered under each pertain. This analysis, designed to determine the respective interdisciplinary profiles of the curricula, as well as the existence of similarities among them in terms of credit loads, considered all the credits offered as a whole, regardless of whether they corresponded to core, requisite or elective subjects. The result of the analysis is shown in Figure 1.

As the figure shows, the abscissa axis, which accounts for 91% of the total data variability, illustrates the differences between the three types of degrees considered with respect to the areas of knowledge to which the subjects on their curricula pertain. The degree in Economics (ECO), located on the left side of the graph, can be clearly distinguished from the degree in Library Science

(BIB) and the degree in Information Science (DOC), both of which are located on the right side of the map. The three areas associated with economics, namely economics (ECON), statistics (EIO) and applied mathematics (MA) are positioned close to the degree in economics (ECO).

The degrees in Library Science (BIB) and Information Science (DOC), in turn, each located in a separate quadrant, owe their positions to the links between the subjects in their respective curricula, as well as to the existence of subjects shared with the Economics curriculum (ECO). These circumstances place the degree in Information Science (DOC) in between the general degree in Economics (ECO) and the degree in Library Science (BIB), inasmuch as its curriculum contains subjects also offered on the other two curricula, such as: Economics (ECON), Law (DER), Business Organization (OE), and Statistics (EIO), areas also covered in Economics (ECO), or History of Science (HCIEN) and Information Technology (INF), in which Library Science students (BIB) likewise enrol. For this reason, areas such as Law (DER) and Sociology (SOC) are positioned in the central area of the map, since subjects pertaining to these disciplines are included in all three of the

Table 2. Job offers by type of degree and industry

Industry	Abbrev.	Econ	%	IS	%	LS	%
Agri-food	AGRO	20	3.15	4	1.10	3	0.38
Automobile	AUTO	15	2.37	0	0.00	1	0.13
Banking and finance	BANC	165	26.03	2	0.55	3	0.38
Business services	SERV	96	15.14	26	7.14	123	15.38
Chemicals	QUIM	7	1.10	1	0.27	0	0.00
Construction	CON	17	2.68	1	0.27	0	0.00
Consultancy	CONSU	31	4.89	78	21.43	212	26.50
Distribution	DIST	18	2.84	1	0.27	0	0.00
Educ. & research	EDUC	3	0.47	8	2.20	54	6.75
Education	ENSE	9	1.42	1	0.27	9	1.13
Electric material	ELEC	1	0.16	0	0.00	0	0.00
Electronic material	MELE	7	1.10	1	0.27	0	0.00
Energy & water	ENER	26	4.10	9	2.47	18	2.25
Food	ALI	11	1.74	0	0.00	0	0.00
Government	ADP	9	1.42	33	9.07	51	6.38
Graphic arts	ARTG	11	1.74	48	13.19	92	11.50
Health	SAN	7	1.10	0	0.00	21	2.63
Hotel business	HOST	13	2.05	0	0.00	0	0.00
Information technology	INFOR	54	8.52	18	4.95	60	7.50
Insurance	SEG	13	2.05	18	4.95	1	0.13
Leisure & culture	OCIO	0	0.00	3	0.82	4	0.50
Machinery	MAQ	6	0.95	0	0.00	0	0.00
Manufacturing	IND	3	0.47	0	0.00	4	0.50
Metal	MET	4	0.63	2	0.55	2	0.25
Precision mechanics	MEC	0	0.00	1	0.27	1	0.13
Retailing	COM	3	0.47	3	0.82	6	0.75
Telecommunications	TELEC	45	7.10	44	12.09	45	5.63
Textile	TEX	1	0.16	0	0.00	0	0.00
Trans. & Communic.	TRANS	24	3.79	16	4.40	31	3.88
Wood	MAD	1	0.16	0	0.00	0	0.00
Miscellaneous	VAR	14	2.21	46	12.64	59	7.38
Total		634	100.00	364	100.00	800	100.00

curricula analyzed. The fact that Law (DER) is closer to Economics (ECO) is indicative of a closer association with this discipline, whereas Sociology (SOC) is closer to the curriculum for Information Science (DOC), which offers a larger number of sociological subjects.

The map likewise shows greater interdisciplinarity in the Information Science (DOC) than in the other two curricula. For in addition to the Law (DER)- and Sociology (SOC)-related subjects noted above, this curriculum contains subjects in areas such as Journalism (PERI), Philosophy of Science (FILO), Information Technology (INF) or History of Science (HCIEN). Conversely, the Library Science curriculum is the least interdisciplinary, since besides Law (DER) it only offers subjects relating to Historiographic Science and Techniques (CTHIS),

Information Technology (INF) and Spanish Language and Literature (FESP).

The findings in this analysis contradict the idea that a higher proportion of electives must mean greater interdisciplinarity. A larger number of elective credits only makes a curriculum more interdisciplinary when the subjects in question pertain to other areas of knowledge. This is the case of the curriculum for the degree in Information Science, where there is more diversity, a fact identified in a previous study of the curricular design for this discipline in all the Spanish universities where it is offered (Sanz Casado et al. 2001). By the same token, although there is also a high proportion of electives in the Economics curriculum, it is not interdisciplinary because the subjects offered all pertain to the same area of learning.

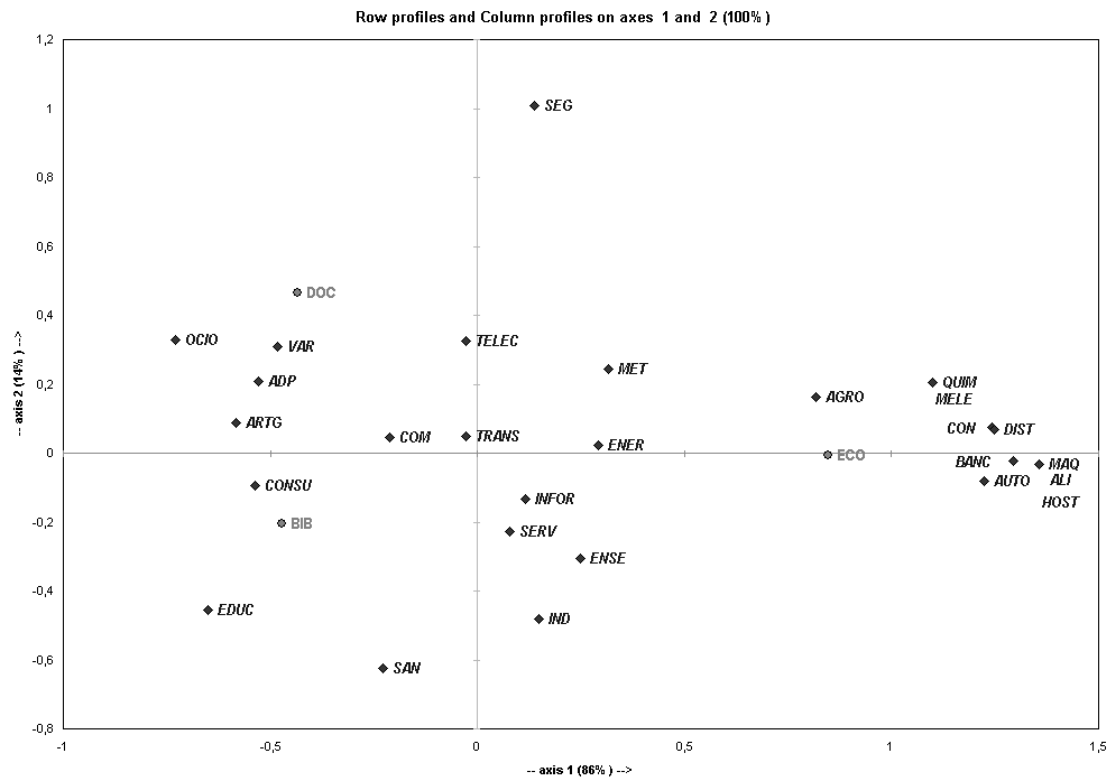


Figure 2. Correspondence analysis between degrees and industries employing graduates.

### Results of the labour market analysis

These data were compiled from the SOPP reports on the industries employing graduates with the three types of degrees. Table 2 shows the total number of jobs offered by type of degree and industry in the four years covered by the study (1998–2001). The first column lists the industries offering jobs, and the following columns the total number of jobs offered to each of the three types of graduates in the four years mentioned.

The table shows that with a total of 800 job offers, library science graduates were in greatest demand, followed by graduates in economics, with 634 offers and finally Information Science graduates, who were offered 364 jobs. The distribution of offers by industry shows that banking and finance and business services accounted for 26% and 15.1% of the offers targeting economics graduates, respectively, while the bulk of the jobs offered to Information Science graduates came from consultancy (21.4%), graphic arts (13.2%) and telecommunications companies (12.1%). Consultancy with 26.5%, business services with 15.4% and

graphic arts with 11.5% were the industries with the greatest need for library science graduates.

Another issue addressed in this analysis was to determine whether there was a correlation between the job offers made by the different industries and the three types of curricula analyzed. A Pearson chi-square test was run to this end; the highly significant value obtained ( $\chi^2=819.12$ ,  $p<0.01$ ; 60 d.f.) was proof of the existence of such a correlation between curricula and job offerings. The highly significant value ( $\chi^2=114.79$ ,  $p<0.01$ ; 24 d.f.) likewise found when the same test was conducted to determine whether offers were correlated with degrees in Information Science and Library Science furnished proof of the existence of different professional profiles for the two types of graduates. It is interesting to note that these results confirm Khoo and Ramaiah's (2004) findings in this regard.

Figure 2 contains the map resulting from the correspondence analysis for the three types of degrees analyzed and different industrial sectors. The latter included the industries offering five or more jobs for graduates with any of these three types of degrees in 1998, 1999, 2000 and 2001.

As the map shows, the position of the degrees along the abscissa axis (accounting for 86% of the total variability) is determined by the various industries offering jobs to the three types of graduates. As in Figure 1, Economics (ECO), Library Science (BIB) and Information Science (DOC) are positioned in different quadrants, although in this case the latter two are quite close in the direction of the abscissa axis, indicating, as might be expected, a greater similarity in terms of the industries employing their respective graduates. Economics, on the contrary, is positioned on the opposite end of the axis, since many of the job offers received by these graduates are specific to such studies. The position of the degrees with respect to the industries indicates that students earning a degree in Library Science (BIB) or Information Science (DOC) can access jobs shared by the three types of graduates in areas such as Information Technology (INFOR), Business Services (SERV) or Telecommunications (TELEC). Economics graduates, however, have access to job offers in industries that are essentially closed to the other two types of graduates, such as Banking and Finance (BANC), Distribution (DIST) or the Hotel Trade (HOST).

The industries located close to the origin, such as Information Technology (INFO), Business Services (SERV) or Telecommunications (TELEC), are the ones offering employment to all three types of graduates, although the fact that most of them are positioned closer to Library Science and Information Science is indicative of their greater inclination to hire such graduates.

Results similar to ours respecting the employability of Library Science and Information Science graduates were reported three years ago by Moreira (2001), in a paper on jobs held by Carlos III University of Madrid alumni between 1996 and 1999. This, however, is the first comparative study of this nature in which various types of degrees and their respective curricula are related to the labour market demand for graduates.

Our findings concur in part with the information published by SOPP (1998, 1999, 2000, 2001) on the qualifications sought by companies offering employment to Carlos III University graduates. The qualifications listed in the profile in highest demand for Information Science students suggested a certain diversity of requirements, as they included knowledge of the English language and information technology, the latter with respect to

the use of documentary databases and specific Internet-related tools. For Economics graduates, the profile in highest demand was related to positions requiring a specific background in economics, i.e., areas such as accounting, finance or bank management. Finally, Library Science graduates are expected to have knowledge of the English language, IT tools and a command of both database and Internet-related software. It may be deduced from the information provided by the SOPP and the results of the present paper that whilst Information Science graduates have a more interdisciplinary background than Economics alumni, the latter receive job offerings from a wider variety of industries.

### Conclusions

Some of the conclusions of this paper are related to the flexibility of academic curricula. The most flexible ones, i.e., the ones offering a larger number of electives, such as in economics, afford their graduates a broader diversity of knowledge on questions directly related to their branch of learning, enabling them to specialize.

Another aspect of great interest in this paper is the determination of interdisciplinarity, which defines the level of exchange among different areas of knowledge, since greater interdisciplinarity may provide graduates with a broader and more diverse education. In this regard, based on the indicators obtained, the curriculum for Information Science is the one with the highest degree of interdisciplinarity. The curriculum for Library Science, in turn, is the least interdisciplinary.

The results obtained contradict the idea that a higher proportion of elective credits is directly related to greater interdisciplinarity, since offering a larger numbers of elective credits can be a way of enhancing the content related to the branch of learning in question. This approach leads to a more specialized curriculum, instead of broadening students' knowledge to include other areas in a more interdisciplinary and general curricular design. An example of the latter would be Information Science, where a larger number of credits is offered.

In terms of the employability of the graduates holding the degrees analyzed here, the results of this study show that library science graduates received the largest number of job offers, 800, fol-

lowed by economists with 634 and Information Science graduates with 364. Another interesting finding is the high correlation between the industries making job offers and the three types of curricula analyzed, which is evidence that the labour market perceives that a distinction can be drawn between the educational backgrounds acquired by graduates holding the three degrees. A similar differentiation was observed between the degrees in Information Science and Library Science, proving that the professional profiles for these two types of graduates differ.

When multi-dimensional indicators are used to draw the inter-relationships between labour market offers and the curricula for the three types of degrees analyzed, the positions of the latter on the map are found to be quite distant from one another. This follows from the foregoing, i.e., the existence of different profiles for each. Even so, graduates with degrees in Library Science and those with degrees in Information Science are located slightly closer to one another, which is indicative of greater similarity in the types of industries demanding their services. Economics graduates, on the contrary, receive many job offers that are specific to their educational backgrounds in industries such as banking and finance, distribution and the hotel trade. Finally, certain industries such as information technology, business services or telecommunications, call for more general qualifications that can be met by graduates holding any of the three types of degrees.

The results obtained in this analysis confirm that curricula with a broader or more interdisciplinary approach and greater subject diversity, such as the ones governing the degree in Information Science and the degree in Library Science, do not enable students to access a greater variety of jobs. More specific curricular, in turn, such as the one designed for economics degrees, broaden the job offers reaching graduates, since employers have a fuller understanding of the type of tasks that such graduates can perform. These results support the notion that the most competitive curricula are the ones that focus on the discipline in question, as opposed to those that cover a wider area of knowledge. The question to be posed now is whether there is a need to make Library and Information Science curricula more competitive by reducing the amount of content from other disciplines. According to the results reported in this

paper, it would appear that a lack of specialization blurs graduates' professional profiles to the detriment of a clear perception by employers of their qualifications.

Finally, another conclusion drawn from this study refers to the utility of methodologies based on indicators, primarily multi-variables, for the analysis of university curricula and graduate employability. The ability of such methodology to relate different variables, providing an objective and precise understanding of issues around graduate training and employment both, makes it an extremely useful tool for the future development of academic curricula.

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