

Assembling the research profile of Greek Economic Departments

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Abstract: The publications of 298 faculty members of thirteen Greek Economic Departments and one Economics research institute was retrieved and analyzed together with other information like the institution and the date that they received their PhD diploma. We progressively assembly the research profile of each department providing detailed statistics on various research indices, like the number of publications and citations, h and g-index, the Gini coefficient of the distribution of publications and the co-authoring links with domestic and foreign economic departments. We finally apply hierarchical cluster analysis to derive the research profiles of those departments.

Keywords: Greek Economic Departments, Universities Ranking, Cluster analysis

JEL codes: A10, A20

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1 Introduction

In the last ten years the institutional and financial environment of the Greek Universities has radically changed. The reform of 2007 and 2011 have introduced several changes to the regulatory framework. Among others, Quality Accreditation offices were established in every university and a national Assurance and Accreditation Agency (Hellenic Quality Assurance and Accreditation Agency, HQA) was formed. In general there is an active interest on the quality of services provided by the academic institutions, including their research performance.

In 2010, Lazaridis ranked Greek Chemistry, Chemical Engineering, Materials Science, and Physics departments using the mean faculty Hirsch (h) index. In 2011, Vaxevanidis et al. presented the research output of seven Engineering Departments (4 AEI, 3 TEI). In 2012, Altanopoulou et al. evaluated ninety three major Greek university departments using Google scholar, in 2014 Kazakis

evaluated the research performance of Greek civil engineering departments and Kazakis et al. evaluated Greek medical schools. Also in 2014, Katranidis et al. evaluated Greek economics departments through the use of bibliometric information. In 2015 the Greek civil engineering departments and the medical schools were benchmarked against foreign equivalent departments (Kazakis 2015 and Kazakis et al 2015). Also since 2010 the Greek National Documentation Center (EKT) provides an online interactive application with the bibliometric indices of Greek public institutions, including universities departments (Sachini et al, 2015).

The use of bibliometric indices to rank universities exhibit certain advantages but have also been actively criticized. From the administrative point of view the use of such indicators ease the burden of making funding allocation decisions since they can replace the possibly subjective judgment of an expert panel with quantitative and tangible measures. The reliability of ranking based blindly on those indices has been questioned. For example Leydesdorff (2008) provides evidence that there exist significant variation on citation indices between disciplines. He also argues that the national and institutional level is not the correct analytical unit for making comparisons and that those indices tend to underestimate individuals that may be innovative in terms of research, e.g. inter-disciplinary research, but naturally less prolific in terms of publication impact. Weingart (2005) questions what could be the side effects if the bibliometric indicators, when used for funding allocation decisions, could become reactive measures, i.e. altering the behavior of researchers, for example by fragmenting their work to minimum “publishable” units, focusing all their effort to publishing on few top journals or compromising quality for quantity.

Nevertheless, while the use of quantitative indicators, like bibliometric indices, is reasonable to be the foundation for evaluating research performance, in this paper we take the analysis a step further by constructing a profile of the Greek Economic Departments (GEDs), using hierarchical cluster analysis on a wide breadth of information including bibliometric indices. In this way policy makers can identify department groups and act accordingly and furthermore the application of the method in the case of a larger number of departments can assist on focusing on the interesting groups.

In section 2 we give some information on the data collection process and we discuss some inherent weakness of the data, and on the following sections we provide details on the Greek economic departments on demographics, publications, citations and research links. On the last section we present the hierarchical clustering method and the results.

2 Data Collection

The faculty of thirteen Greek Economic Departments and one Economics research institute was

retrieved from their web pages on April 2015. For all 321 faculty members we looked for the corresponding SCOPUS Author unique identifier (SCOPUS-id) and for those we could not find one we queried them by email. Finally 298 faculty members were discovered to have a SCOPUS author-id (Table 3). For this last category we reviewed their curriculum and extracted the institution and the date that they received their PhD diploma.

Then for each faculty member the related records of his / her publications were extracted from the SCOPUS database from 1995 and onwards. In order to do so a JAVA application was crafted to communicate with the SCOPUS Application Interface (API). A total of 4019 items (3468 unique) were retrieved, including articles from journals, books and conference proceedings.

The raw data was further transformed to tabular data and two distinct datasets were formed. The ARTICLES_METADATA where several metadata were recorded and calculated (see Table 16) and the COAUTHORS_METADATA where information for every co-author of every retrieved paper was saved (see

Table 17). The statistical analysis was performed with the R and STATA software packages.

We should note two shortcomings of the data collection process: (a) the retired professors were not included in the dataset and (b) the publications of the included professors are cumulatively attributed to their department, although there is the possibility that they authored them at a time that they have not yet joined the department.

The first shortcoming might distort the data analysis only if for some departments the majority of prolific professors have retired, i.e. the inter-temporal distribution of prolific professors is skewed. The second shortcoming is almost impossible to remedy, since there is no publicly available information on the entrance year of the faculty staff and obtaining it would probably fail due to administration privacy concerns. We overcome this difficulty, wherever we consider we need to, by focusing on the 2010-2014 period, thus increasing the probability for counting only the publications that were published when the author was a faculty member.

Table 1, Greek Economic Departments Overview¹

University	Department / Institute	Short Name (EN)	Year Founded	Number of Faculty ²
Athens University of Economics and Business	Department of International and European Economic Studies	AUEB-DEOS	1990	26
Athens University of Economics and Business	Department of Economics	AUEB-ECON	1971	24
Aristotle University of Thessaloniki	School of Economics	AUTH-ECON	1999	25
Democritus University of Thrace	Department of Economics	DUTH-ECON	2003	19
-	Centre of Planning and Economic Research	KEPE	1959	27
Panteion University of Social and Political Sciences	Department of Economic and Regional Development	PANTEIO-OPA	1987	31
University of Athens	Faculty of Economics	UOA-ECON	1955	46
University of Crete	Department of Economics	UOC-ECON	1971	21
University of Ioannina	Department of Economics	UOI-ECON	1998	22
University of Macedonia	Department of Economics	UOM-ECON	1971	23
University of Patras	Department of Economics	UPATRAS-ECON	1989	10
University of Peloponnese	Department of Economics	UOPEL-ECON	1972	9
University of Piraeus	Department of Economics	UOPIR-ECON	1996	20
University of Thessaly	Department of Economics	UOTH-ECON	1999	18

¹ In this and all subsequent tables the order of the departments is based on the alphabetical order of their short name
² only faculty with a found SCOPUS author-id is included. That accounts for the 93% of the total faculty staff.

3 Demographics

[+ number of students, number of lessons, number of postgraduate programs/students]

[+number and amount of research grants (from εκθέσεις εσωτερικής αξιολόγησης)]

The average number of faculty members is almost 21 (mean=21.3, sd=8.49). UOA-ECON with 46 members and UOPEL-ECON and UOPATRAS-ECON with 9 and 10 members respectively deviate, the latter two departments located in a very close area. Almost 80% of the total faculty staff is male but KEPE and AUTH-ECON have only 60%.

As far as the composition of the faculty positions, 38.9% are Professors, 19.1% are Associate Professors, 31.9% are Assistant Professors and 10.1% are Lecturers. On Table 3 the detailed composition of all departments faculty is provided. UOM-ECON with 83%, UOPATRAS-ECON with 60% and UOI-ECON with 5% of their faculty being full professors seem to be distinct cases. Nevertheless the norm is that the majority of the faculty are Professors and Assistant Professors (71%).

Since the 2009 financial crisis very few faculty positions are opened and this situation will probably be the same for several more years. So it is interesting to see how the current situation in the faculty positions allocation will affect the near future departments faculty number. Thus, considering that we have collected the PhD acquisition year for 215 faculty members (Table 4), assuming that the average age of acquiring a PhD is 30 and that professors are retired on the age of 67 (i.e. 37 years of service), we calculate that on 2020 about 10% of the faculty will have retired, on 2025 this will be 24% and on 2030 will rise to 47%. The calculations are more dramatic for certain departments (Table 6). Consequently if the effects of the financial crisis are not reversed soon, during the next decade the departments will suffer a major decline of their faculty.

We also reviewed the PhD acquisition country (Table 5). The majority of professors have obtained their PhD from a British (44%) or from a American (22%) University. A total of 75% of full Professors have received their PhD outside Greece. On the other side, Lecturers and Assistant Professors have completed their PhD mainly in Greece (60% and 52% respectively) while UK is still more important than USA. The above evidence are confirmed by the average year of PhD acquisitions from British and American Universities (1993 and 1991) versus that of Greek ones (2000). The story behind those findings could be that Greek economic departments were initially staffed with Greeks that followed postgraduate studies abroad and about a decade later, their PhD students, studied domestic postgraduate programs and entered the Greek academia.

Also, one can consider the entrance mark of the secondary school national examinations as a proxy for the popularity of a department. Students rank their choices and depending on their exam scores they are allocated to the limited number of vacancies. Thus if a department has a

higher entrance level than another it can be safely considered that it was a more popular. In Table 2 one can see this ranking of the various departments for 2007, 2011 and 2014. There is a clear distinction between central and regional departments. AUEB-ECON, UOM-ECON, UOPIR-ECON, AUEB-DEOS, AUTH-ECON and UOA-ECON are the most popular departments among prospective Greek students.

Table 2, National Examinations Mark Entrance Level Ranking

	AUEB-ECON	UOM-ECON	UOPIR-ECON	AUEB-DEOS	AUTH-ECON	UOA-ECON	UOTH-ECON	PANTEIO-OPA	UOI-ECON	UOPATRAS-ECON	DUTH-ECON	UOC-ECON	UOPEL-ECON
2007	1	2	3	4	6	5	8	10	9	7	-	12	11
2011	1	2	3	4	5	6	7	10	8	9	13	11	12
2014	1	2	3	4	5	6	7	8	9	10	11	12	13

Table 3, Greek Economic Departments Faculty

	Number of Faculty	Professors	Associate Professors	Assistant Professors	Lecturers	Faculty with SCOPUS record
AUEB-ECON	26	50%	27%	15%	8%	24
AUEB-DEOS	24	54%	13%	25%	8%	23
AUTH-ECON	25	28%	20%	52%	0%	24
DUTH-ECON	19	11%	26%	26%	37%	16
KEPE ¹	27	22%	22%	52%	4%	25
PANTEIO-OPA	31	42%	13%	39%	6%	26
UOA-ECON	46	39%	30%	20%	11%	44
UOC-ECON	21	43%	10%	43%	5%	18
UOI-ECON	22	5%	23%	41%	32%	21
UOM-ECON	23	83%	4%	9%	4%	23
UOPATRAS-ECON	10	60%	30%	10%	0%	9
UOPEL-ECON	9	33%	0%	56%	11%	9
UOPIR-ECON	20	50%	20%	30%	0%	19
UTH-ECON	18	28%	11%	39%	22%	17
<i>All Departments</i>	<i>321</i>	<i>39%</i>	<i>19%</i>	<i>32%</i>	<i>10%</i>	<i>298</i>

¹ for KEPE, Researcher A,B,C,D corresponds to Professor, Associate Prof., Assistant Prof. and Lecturer accordingly

Table 4, Faculty PhD Acquisition Date

#faculty members	Faculty with SCOPUS record	1983 and before (more than 31 yrs)	1984 – 1994 (21-30 yrs ago)	1995 – 2004 (11-20 yrs ago)	2005 – 2014 (last 10 yrs)	No information found
AUEB-ECON	24	4	7	11	1	1
AUEB-DEOS	23	7	12	3	1	0
AUTH-ECON	24	3	8	10	0	3
DUTH-ECON	16	0	0	6	6	4
KEPE	25	0	6	8	11	0
PANTEIO-OPA	26	2	7	11	2	4
UOA-ECON	44	11	16	6	3	8
UOC-ECON	18	2	2	5	2	7
UOI-ECON	21	0	4	6	10	1
UOM-ECON	23	2	17	3	1	0
UOPATRAS-ECON	9	2	5	2	0	0
UOPEL-ECON	9	0	2	3	4	0
UOPIR-ECON	19	3	7	6	0	3
UTH-ECON	17	0	5	4	4	4
<i>All Departments</i>	298	36	98	84	45	35

Table 5, Phd Country

% of faculty members	Greece	UK	USA	Other	No information found
Lecturers	60%	17%	10%	7%	7%
Assis. Prof.	52%	24%	11%	11%	3%
Assoc. Prof.	30%	32%	16%	19%	4%
Prof.	15%	44%	22%	17%	2%

Table 6, Faculty members retirement projection (own calculations)

Department	Year		
	2020	2025	2030
AUEB-DEOS	9%	35%	48%

Department	Year		
	2020	2025	2030
AUEB-ECON	26%	43%	70%
AUTH-ECON	10%	14%	48%
DUTH-ECON	0%	0%	0%
KEPE	0%	8%	16%
PANTEIO-OPA	9%	18%	36%
UOA-ECON	25%	50%	75%
UOC-ECON	9%	18%	36%
UOI-ECON	0%	0%	15%
UOM-ECON	9%	35%	83%
UOPATRAS-ECON	22%	33%	67%
UOPEL-ECON	0%	0%	22%
UOPIR-ECON	13%	19%	63%
UOTH-ECON	0%	15%	38%

4 Publications

Regarding the 1995-2014 period and the total number of publications (Table 7), the top-25% departments are UOA-ECON, UOM-ECON, AUEB-DEOS, AUEB-ECON and AUTH-ECON. Since there are several departments that were founded in the 90s, it is more fair to refer to the 2005-2014 period. The new ranking is UOA-ECON, UOM-ECON, AUEB-DEOS, AUTH-ECON and UOTH-ECON.

The evolution of the number of publications for 5-year periods is given in Table 8 and the corresponding ranking is summarized in Figure 1. UOA-ECON constantly excels while UOM-ECON and AUEB-DEOS are at all times at the first places. UOTH-ECON follows a remarkable path, going from rank 8 at the 2005/9 period to rank 2 for 2010/14, being the only regional departments that is ranked in the first 7 places. AUEB-ECON and UOPATRAS-ECON have fallen several places during the 1995/99 – 2010/14 period.

As far as the number of publication per faculty member is concerned the ranking is UOM-ECON, AUEB-DEOS, UOTH-ECON, AUEB-ECON, UOPEL-ECON and UOA-ECON. Over the faculty categories, and focusing on the 2010-2014 for the full professors exhibit 6.09 publications, associate professors 4.93, assistant professors 5.39 and lecturers 2.5. Within certain departments the findings are different. For example in UOM-ECON and in UTH-ECON the assistant and associate professors are far more prolific than full professors and in AUEB-DEOS this holds for lecturers and associate professors.

In any case we should note that there seems to be a clear gap between central (Athens, Thessaloniki) and regional departments. If we focus on the ranking of publications per faculty member for the 2005-2014 period (last column of Table 7), 5 out of 8 (~60%) central departments are in the top 50% while only 2 out of 6 (~30%) regional departments.

Next we try to answer the question of how evenly is the number of publications distributed among the faculty members of different departments.. We are confining ourselves to the 2010 – 2014 range in order to avoid counting publications that were possibly published before faculty members joined the department. We calculated the quartiles of the number of publications of all faculty in all universities and found that the top 25% starts from 6 and the top 10% from 11 publications, i.e. 25% of faculty has 6 or more publications on the selected time range. Then we calculated the distribution of that faculty members that have more than 6 publications in the 2010/14 period to the various departments. We also calculated a corresponding Gini index as an indicator of the inequality of publication prolificacy (Table 10).

So, regarding the presence of prolific faculty members, half of UTH-ECON, AUEB-DEOS and AUTH-ECON faculty is on the top 25% prolific faculty, while 35% of UTH-ECON faculty 26% of AUEB-DEOS, 21% of AUTH-ECON and 22% of UOM-ECON and UOPEL-ECON is in the top 10% prolific faculty. AUEB-ECON (0.585), UTH-ECON (0.542), UOA-ECON (0.532) and UOM-ECON (0.502) have the most unequal distribution of publication prolificacy while UPATRAS-ECON has the most equal one (0.222). The combination of the above measures can provide an insight of the structure of the overall publication productivity. For example the fact that only 9% of UOA-ECON are at the top 10% and there is a high Gini index (0.532), combined with the fact that the department is ranked first regarding the overall number of publications, supports the argument that those prolific professors are literally driving the department to the top.

Table 7, Number of Publications

Department	# Publications, 1995-2014	Average #Publications per Faculty member, 1995 – 2014	# Publications, 2005-2014	Average #Publications per Faculty member, 2005 – 2014
AUEB-DEOS	400 [3]	15.4 [2]	265 [3]	10.2 [3]
AUEB-ECON	334 [4]	13.9 [4]	170 [7]	7.1 [9]
AUTH-ECON	304 [5]	12.2 [7]	223 [4]	8.9 [5]
DUTH-ECON	121 [12]	6.4 [13]	99 [12]	5.2 [13]
KEPE	134 [11]	5 [14]	114 [11]	4.2 [14]
PANTEIO-OPA	271 [6]	8.7 [11]	209 [6]	6.7 [10]
UOA-ECON	565 [1]	12.3 [6]	370 [1]	8 [6]
UOC-ECON	221 [9]	10.5 [9]	156 [8]	7.4 [8]
UOI-ECON	153 [10]	7 [12]	123 [10]	5.6 [12]
UOM-ECON	420 [2]	18.3 [1]	286 [2]	12.4 [1]
UOPATRAS-ECON	103 [14]	10.3 [10]	63 [14]	6.3 [11]

Department	# Publications, 1995-2014	Average #Publications per Faculty member, 1995 – 2014	# Publications, 2005-2014	Average #Publications per Faculty member, 2005 – 2014
UOPEL-ECON	121 [13]	13.4 [5]	91 [13]	10.1 [4]
UOPIR-ECON	228 [8]	11.4 [8]	153 [9]	7.7 [7]
UOTH-ECON	267 [7]	14.8 [3]	220 [5]	12.2 [2]

In brackets is the ranking of each department
We count Journal papers, Books, Book chapters and Conference proceedings
Papers that were co-authored by two or more faculty members of the same departments, were counted as one.
Papers that were co-authored by members of different departments were attributed to both departments.

Table 8, Number of Publications as evolved through Time

Department	1995-1999	2000-2004	2005-2009	2010-2014
AUEB-DEOS	51	84 +65%	128 +52%	137 +7%
AUEB-ECON	58	106 +83%	69 -35%	101 +46%
AUTH-ECON	31	50 +61%	96 +92%	127 +32%
DUTH-ECON	3	19 +533%	43 +126%	56 +30%
KEPE	8	12 +50%	54 +350%	60 +11%
PANTEIO-OPA	21	41 +95%	82 +100%	127 +55%
UOA-ECON	79	116 +47%	183 +58%	187 +2%
UOC-ECON	22	43 +95%	62 +44%	94 +52%
UOI-ECON	13	17 +31%	59 +247%	64 +8%
UOM-ECON	65	69 +6%	140 +103%	146 +4%
UOPATRAS-ECON	15	25 +67%	37 +48%	26 -30%
UOPEL-ECON	11	19 +73%	43 +126%	48 +12%
UOPIR-ECON	37	38 +3%	76 +100%	77 +1%
UOTH-ECON	17	30 +76%	68 +127%	152 +124%

The rate of change from previous year is also presented. The notes of Table 7 hold.

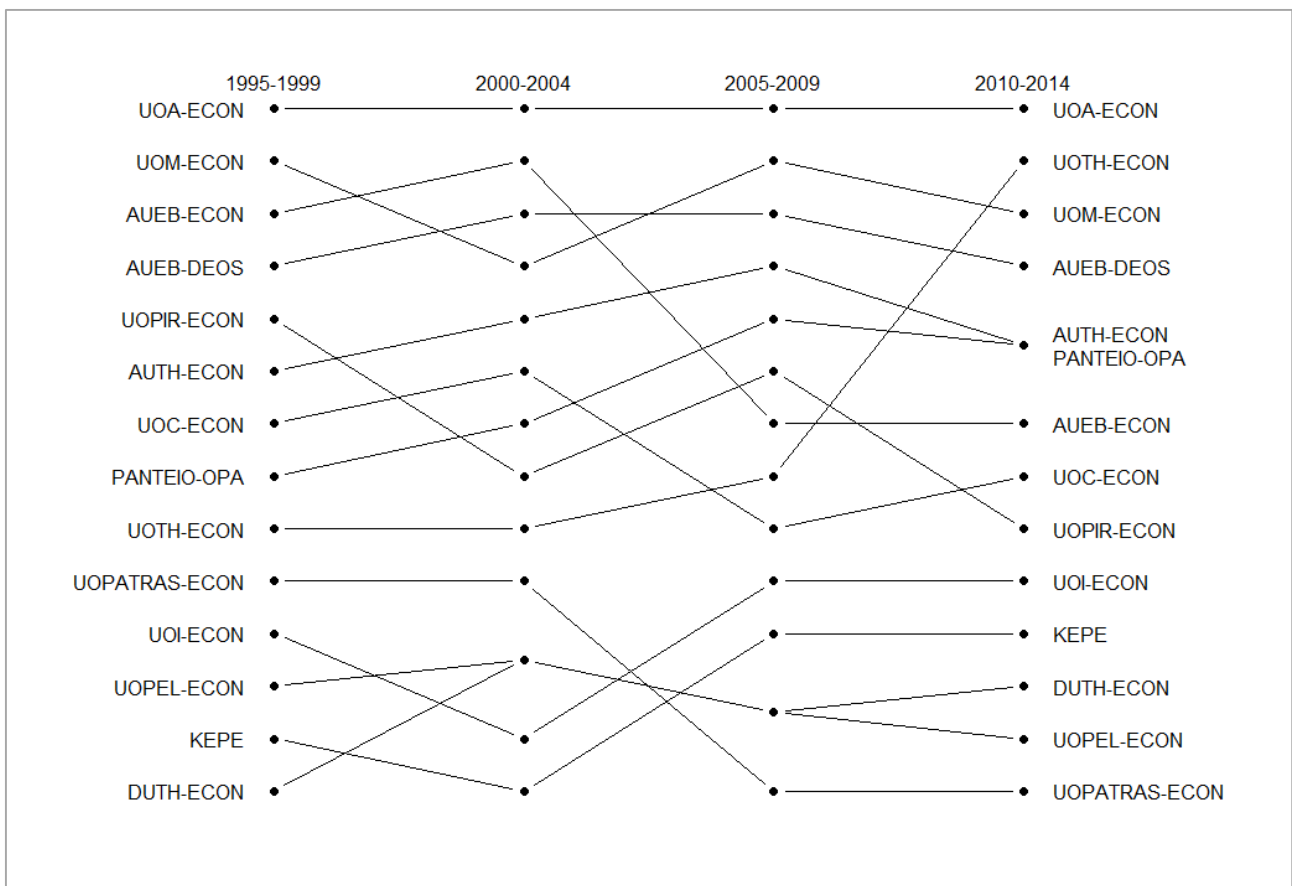


Figure 1, The evolution of ranking regarding the overall number of publications

Table 9, Average number of publications for 2010-2014 per faculty position

#publications	Lecturers	Assis. Prof.	Assoc. Prof.	Prof.
AUEB-ECON	2.5	5.0	7.7	5.5
AUEB-DEOS	7.0	1.7	13.0	3.5
AUTH-ECON	-	4.7	3.8	7.4
DUTH-ECON	3.2	5.7	3.0	2.5
KEPE	0.0	2.4	2.7	2.6
PANTEIO-OPA	2.0	6.2	2.3	4.7
UOA-ECON	1.8	4.1	3.6	5.3
UOC-ECON	2.0	5.6	4.0	5.6
UOI-ECON	2.0	4.4	2.6	2.0
UOM-ECON	0.0	12.5	11.0	5.8
UOPATRAS-ECON	-	-	2.3	3.2

#publications	Lecturers	Assis. Prof.	Assoc. Prof.	Prof.
UOPEL-ECON	0.0	4.0	-	9.3
UOPIR-ECON	-	4.8	2.8	4.1
UTH-ECON	3.0	10.3	21.0	9.4
All departments	2.5	5.39	4.93	6.09

Table 10, How evenly is the number of publication per faculty distributed ? (2010-14)

	% Faculty on the top 25%	% Faculty on the top 10%	Gini Index
AUEB-ECON	21%	13%	0.585
AUEB-DEOS	48%	26%	0.356
AUTH-ECON	46%	21%	0.416
DUTH-ECON	19%	13%	0.463
KEPE ¹	16%	4%	0.389
PANTEIO-OPA	38%	15%	0.461
UOA-ECON	25%	9%	0.532
UOC-ECON	50%	17%	0.327
UOI-ECON	19%	0%	0.354
UOM-ECON	30%	22%	0.502
UOPATRAS-ECON	33%	0%	0.222
UOPEL-ECON	44%	22%	0.377
UOPIR-ECON	26%	11%	0.352
UTH-ECON	53%	35%	0.542
For the calculation of Gini Index, we considered instead of "income" the "number of publications" for the selected period			

5 Citations and Citation Indices

In Table 11, we present the citation profiles of the Greek economic departments. In addition to examining the number of citations that have accrued to each department by their publications, we also calculate two additional indices:

- h-index. It is calculated as in Hirsch (2005); a researcher with h index equals to an integer x means that out of his total papers, x of his/her each paper has at least x citations.
- g-index. This is calculated according to Egghe (2006) and gives more weight to more cited papers. A researcher has a g-index of x if his/her top x papers have at least x^2 citations.

Overall, UOA-ECON has the highest number of citations both over the entire sample and the last 10 years. However, when we weight by the number of faculty, the picture changes. AUEB-ECON and UOM-ECON appear to have high number of citations per faculty. With respect to h and g indices weighted by the number of faculty, both departments of AUEB (ECON and DEOS) still appear to score the highest with UOM-ECON and other regional universities coming in close seconds.

In Table 12, we examine the aforementioned citation indices by department and by rank. While such an analysis can provide insights, we should interpret such results cautiously as for certain cases the number of a specific rank in a university can be small and therefore bias the results. At the lecturer position, regional universities such UOTH and UOPEL appear to score highest either with respect to citations or h- and g-index. With respect to assistant professors, it appears again that regional universities, appear to score highest. In particular, UOM has both the highest average h- and g-index. However, once we switch to associated professors, AUEB appears to have high number of citations and the impact indices. Even still UOM has a high number of g-index. With respect to full professors, we observe a more even picture. Both AUEB and AUTH, UOA, UOPEL and UOPATRAS score high in the citation indices.

Overall, we observe that the citations and the citation metrics, reveal that AUEB scores the highest with certain regional universities score highly as well (e.g. UOM). In addition, there are significant variations across the professor ranks and departments. This analysis reveals that department's performance is differentially driven by its faculty. For this reason, the next section digs deeper at the faculty level.

Table 11, Citation and Citation Indexes Totals

Dept	AUEB-DEOS	AUEB-ECON	AUTH-ECON	DUTH-ECON	KEPE	PANTEIO-OPA	UOA-ECON	UOC-ECON	UOI-ECON	UOM-ECON	UOPATRAS-ECON	UOPEL-ECON	UOPIR-ECON	UOTH-ECON
Citations	3282	3359	2226	575	703	2090	3716	2006	676	2629	851	744	2260	1396
h-index														
g-index														
Citations/Faculty	126.2	140	89	30.3	26	67.4	80.8	95.5	30.7	114.3	85.1	82.7	113	77.6
H_Ave	5.5	5.3	4.1	1.9	1.9	3.1	4	3.9	2.4	5.3	4.9	4.3	4.4	4.1
G_Ave	8.8	8.7	7.4	3.4	2.8	5	6.5	6.4	3.5	8.3	7.3	7.1	7	6.2
We examine the 1995-2014 period														

Table 12, Citations per Faculty rank

Dept	AUEB-DEOS	AUEB-ECON	AUTH-ECON	DUTH-ECON	KEPE	PANTEIO-OPA	UOA-ECON	UOC-ECON	UOI-ECON	UOM-ECON	UOPATRAS-ECON	UOPEL-ECON	UOPIR-ECON	UOTH-ECON
C_Lect	12	64	0	37.0	11	11	120	2	35.0	16	0	43	0	241
C_Lect_Ave	6	32		5.3	11	5.5	24	2	5.0	16		43		60.25
H_Lect_Ave	1.5	2		0.7	1	1	2	1	1.0	2		3		2.25
G_Lect_Ave	2	3.5		1.1	1	1.5	3	1	1.4	2		5		4.25
C_Asst	289	168	911.0	248	244	585.0	648.0	527.0	420.0	284	0	219	338	309
C_Asst_Ave	72.25	28.0	70.1	49.6	17.4	48.8	72.0	58.6	46.7	142	0	43.8	56.3	44.1
H_Asst_Ave	4.25	2.3	3.2	2.4	1.6	3.2	4.3	2.9	3.1	6	0	3	3.7	4.0
G_Asst_Ave	7.5	3.5	6.2	4.6	2.4	4.7	6.3	4.6	4.4	11	0	4.8	5.7	5.4
C_Asso	1342.0	1108.0	242	0	335.0	121.0	1142.0	171	0	240	156.0	0	899	112
C_Asso_Ave	223.7	369.3	48.4		55.8	30.3	81.6	85.5		240	52.0		224.75	56
H_Asso_Ave	7.5	8.3	3.2		2.5	1.8	3.1	4.5		8	3.7		6	3
G_Asso_Ave	12.0	12.3	5.6		3.8	2.5	5.6	7		15	5.7		9.5	4.5

Dept	AUEB- DEOS	AUEB- ECON	AUTH- ECON	DUTH- ECON	KEPE	PANTEIO- OPA	UOA- ECON	UOC- ECON	UOI- ECON	UOM- ECON	UOPATRAS- ECON	UOPEL- ECON	UOPIR- ECON	UOTH- ECON
C_Full	1639.0	2019.0	1073.0	59.0	113.0	1373.0	1806.0	1306.0	44.0	2089.0	695.0	482.0	1023.0	734.0
C_Full_Ave	126.1	155.3	153.3	29.5	18.8	105.6	100.3	145.1	44.0	109.9	115.8	160.7	102.3	146.8
H_Full_Ave	6.1	6.5	6.4	3.5	2.2	3.8	5.2	5.1	2.0	5.3	6.3	7.0	4.1	6.0
G_Full_Ave	9.5	11.1	10.7	5.0	3.2	6.5	8.3	8.7	5.0	8.1	9.3	11.7	6.8	9.6

6 The relationship between faculty profile and output

Out of 321 faculty, we have managed to obtain information on 215 faculty with respect to where and when they earned their PhD. In the spirit of Katranidis et al (2014) and Katranidis and Panagiotidis (2015) we examine the relationship between the country that the faculty earned his/her PhD and his/her productivity. We classify into four groups: faculty that earned their PhD from US or Canada, earned their PhD from UK, earned their PhD from Greece, earned their PhD from other country. The latter group will be the control group in our specifications.

Table shows our baseline results. In column 1 the dependent variable is the number of publications of faculty i divided by the number of authors in each publications. Column 2 is the number of citations of faculty i divided again by the number of authors in each publications. In these first columns results clearly show that faculty with Greek PhD are more productive than faculty with a foreign PhD except UK, US and Canada. Further, faculty with a UK PhD have are more productive than faculty with a Greek PhD and faculty with a PhD from US or Canada are the most productive. These simple results accord with the findings by Katranidis et al (2014) where they argue that a main driver behind departments' productivity differences is the institution that faculty earned their PhD. However, a notable difference between their findings and ours is the difference between Greek PhD holders and Other PhD holders. In their study they find Other PhD holders are more productive than Greek PhD holders, a result opposite to ours. This difference is perhaps attributed to the more recent data in our study.

We dig further by examining the h-index and g-index of each faculty, and the picture remains the same.

VARIABLES	(1) Pubs/Authors	(2) Cites/Author s	(3) h_index	(4) g_index
Other x t	0.815*** (0.264)	7.264*** (2.479)	0.379*** (0.0989)	0.698*** (0.151)
Greek x t	0.931*** (0.258)	8.198*** (2.418)	0.434*** (0.0972)	0.784*** (0.152)
UK x t	1.018*** (0.260)	9.347*** (2.343)	0.474*** (0.0945)	0.842*** (0.145)
USCA x t	1.123*** (0.311)	9.935*** (2.931)	0.504*** (0.102)	0.889*** (0.158)
Time2	-0.0221***	-0.194***	-0.0102***	-0.0179***

	(0.00739)	(0.0710)	(0.00262)	(0.00400)
Constant	-1.446	-33.04**	0.312	-0.770
	(1.728)	(14.90)	(0.680)	(1.067)
Observations	215	215	202	215
R-squared	0.119	0.115	0.151	0.162

Notes: column 1's dependent variable is the number of publications each faculty divided by the number of authors in each publication. Column 2's dependent variable is the number of citations each faculty has accrued divided by the number of faculty. Column 3's dependent variable is the h-index of each faculty and Column 4's the g-index.

Other takes the value of 1 if the faculty has been awarded a PhD in country other than Greece, UK, US and Canada and zero otherwise.

Greece takes the value of 1 if the faculty has been awarded a PhD in Greece.

Other takes the value of 1 if the faculty has been awarded a PhD in UK and zero otherwise.

Other takes the value of 1 if the faculty has been awarded a PhD in US or Canada and zero otherwise.

t is the years since PhD

robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

7 Research Links

Regarding the number of authors of the Greek departments publications, most often is between 2 and 3 and there are no significant deviations between departments (Figure 2) or between faculty rank (Figure 3).

We then reviewed the affiliation country of publications co-authors (Table 13) and focused on the 2010/14 period in order to avoid including publications that were possibly produced in the past, possibly outside of the department. AUEB-DEOS and AUEB-ECON have 72% and 66% of their papers co-authored with academics that are affiliated with a foreign institution. On the other side, UOTH-ECON (8%) UOPEL-ECON (7%) and PANTEIO-OPA (9%) are more domestic co-authoring oriented. In all other departments about 25% of papers are co-authored with outside Greece academia. UK co-authors are present in 13 departments, US in 10, followed by Germany (6), Cyprus (5), Italy, France and Australia (4). A possible explanation of the UK prominence is that as already mentioned many full Professors have received their PhD from UK, thus establishing research links between the domestic and the UK institution.

We finally proceed to examining the domestic co-authoring links between the departments of

economics (Table 14). UOA-ECON, UOM-ECON, UIO-ECON and AUEB-ECON have at least one publication co-authored with 6 or more different departments, exhibiting the highest degree of collaboration. The above information and the strength of the inter-departments links (number of co-authored publications) is depicted on Figure 4 and presented in detail on Table 15. AUEB-DEOS, PANTEIO-OPA and UOC-ECON has a relatively high number of articles that was co-authored with intra-departmental colleagues. Finally UIO-ECON, UPATRAS-ECON and UOTH-ECON have over 40% of their publication co-authored with other faculty of the Greek economics departments and this accounts for over 30% for DUTH-ECON and UOC-ECON. With the exception of UOTH-ECON, and taking into account that regional departments perform relatively low in terms of the number of publications, the assumption that the driving force behind the regional departments publication prolificacy is intra-department collaboration seems plausible. Finally UOTH-ECON stands out with 46 publications that are co-authored by at least another one intra-department faculty member.

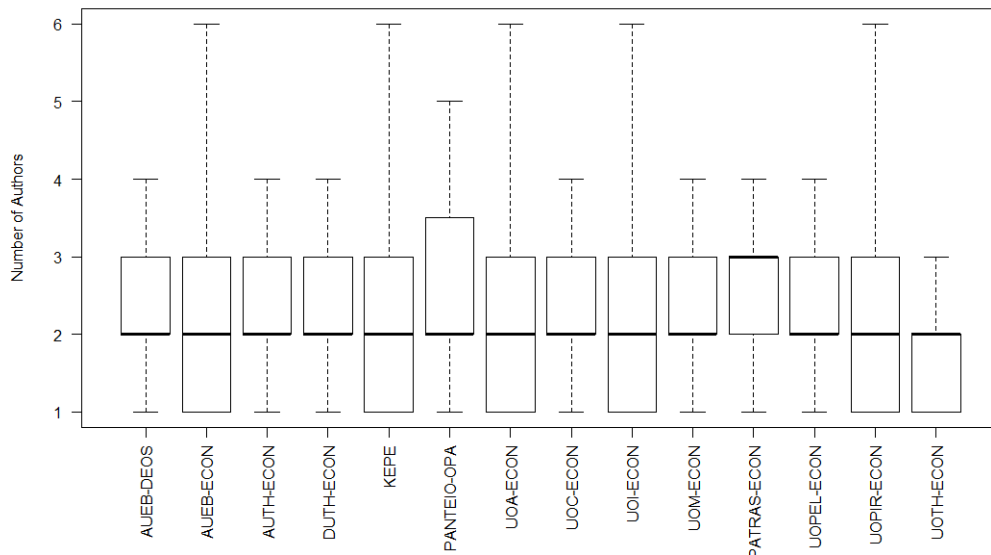


Figure 2, Number of Authors for each department (after removing outliers)

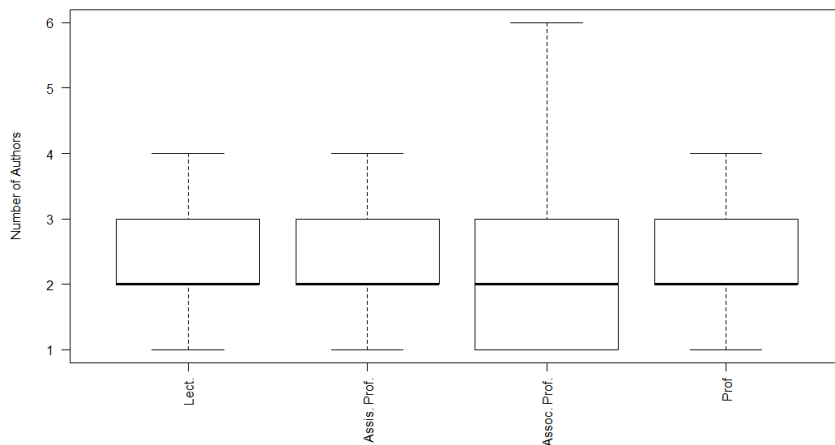


Figure 3, Number of Authors for each faculty rank (after removing outliers)

Table 13, Coauthors Affiliation Country for the 2010-2014 period

AUEB-DEOS	AUEB-ECON	AUTH-ECON	DUTH-ECON	KEPE	PANTEIO-OPA	UOA-ECON	UOC-ECON	UOI-ECON	UOM-ECON	UOPATRAS-ECON	UOPEL-ECON	UOPIR-ECON	UOTH-ECON
GR 28%	GR 54%	GR 76%	GR 77%	GR 76%	GR 91%	GR 63%	GR 78%	GR 78%	GR 78%	GR 58%	GR 93%	GR 54%	GR 92%
UK 15%	US 17%	UK 7%	FR 7%	UK 13%	PR 2%	IT 10%	UK 5%	UK 8%	FR 5%	UK 24%	UK 3%	NZ 8%	UK 6%
ES 10%	UK 14%	FI 6%	US 6%	DE 4%	NL 1%	UK 8%	NL 2%	DE 5%	NL 3%	ES 7%	FR 3%	NL 8%	SE 1%
IT 6%	IT 14%	FR 4%	CA 4%	FR 1%	DE 1%	RS 8%	CY 2%	IT 2%	UK 3%	CZ 5%	AT 0%	AE 6%	NL 1%
DE 6%		US 3%	AU 2%	BE 1%	BE 1%	DE 3%	JP 2%	HU 2%	CY 3%	DE 2%	AU 0%	CY 4%	
FR 6%		AU 3%	BR 1%	IT 1%	AT 1%	MK 2%	AU 1%	AU 1%	IE 3%	NL 2%	BE 0%	HR 4%	

We counted unique articles by department

AE: United Arab Emirates, AT: Austria, AU: Australia, BE: Belgium, BR: Brazil, CA: Canada, CZ: Czech Republic, DE: Germany, ES: Spain, FI: Finland, FR: France, GR: Greece, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, JP: Japan, MK: F.Y.R.O.M., NL: Netherlands, PR: Portugal, RS: Serbia, SE: Sweden, UK: United Kingdom, ZN: New Zealand

Table 14, Domestic research links (2010-14)

Department	Number of other departments that have at least one common co-author	Number of articles co-authored with other departments (1)	Number of intra-department coauthoring articles (2)	% (1)+(2) to the total number of articles
AUEB-DEOS	4	19	19	28%
AUEB-ECON	7	20	7	27%
AUTH-ECON	6	23	10	26%
DUTH-ECON	4	7	13	36%
KEPE	5	9	4	22%
PANTEIO-OPA	1	3	18	17%
UOA-ECON	8	12	4	9%
UOC-ECON	5	15	15	32%
UOI-ECON	7	23	9	50%
UOM-ECON	8	17	5	15%
UOPATRAS-ECON	2	3	10	50%

Department	Number of other departments that have at least one common co-author	Number of articles co-authored with other departments (1)	Number of intra-department coauthoring articles (2)	% (1)+(2) to the total number of articles
UOPEL-ECON	1	1	8	19%
UOPIR-ECON	3	3	1	5%
UOTH-ECON	5	15	46	40%

Table 15, Number of Articles that were coauthored jointly by two or more economic departments

	AUEB-DEOS	AUEB-ECON	AUTH-ECON	DUTH-ECON	KEPE	PANTEI O-OPA	UOA-ECON	UOC-ECON	UOI-ECON	UOM-ECON	UOPAT RAS-ECON	UOPEL-ECON	UOPIR-ECON	UOTH-ECON
AUEB-DEOS	19	5						5	8	1				
AUEB-ECON	5	7		1	4		3		5	1			1	
AUTH-ECON			10	4			1	1	4	4				9
DUTH-ECON		1	4	13	1									1
KEPE		4		1	4				1	1	2			
PANTEI O-OPA						18	3							
UOA-ECON		3	1			3	4	1	1	1			1	1
UOC-ECON	5		1				1	15		7			1	
UOI-ECON	8	5	4		1		1		9	1				3
UOM-ECON	1	1	4		1		1	7	1	5				1
UOPATRAS-ECON					2						10	1		
UOPEL-ECON											1	8		
UOPIR-ECON		1					1	1					1	
UOTH-ECON			9	1			1		3	1				46

The 2010-2014 period is considered.

We counted the number of distinct articles that were co-authored by two or more different departments. In the diagonal the number of articles that were co-authored by two or more inter-Department authors

8 Assembling the research profile

Although bibliometric indices like h-index could be used to directly rank GEDs, we follow a more holistic approach trying to distinguish groups of similar departments in terms of their research attributes. The derived research profile can be of use to policy makers for identifying the strengths and weaknesses of the various department groups and for drawing conclusions about the factors that affect publication prolificacy and research impact. Also, if indicators have a limited discriminatory power, profiling could assist evaluators to efficiently focus on the most promising group of institutions.

In order to assemble the research profile we will use cluster data analysis which is a well established family of statistical methods for identifying and partitioning homogeneous groups of objects within data, sometimes named “unsupervised classification” (Tan et al., 2005). It has been used in numerous scientific fields and there is extensive related literature. The existence of many techniques for employing this type of analysis and the availability of many related computer implementations plus the fact that several arbitrary decisions have to be made (number of clusters, definition of proximity measure, etc.) call for a careful utilization of the methods.

To our present knowledge, there is no attempt to classify universities or departments through the use of cluster data analysis, apart from a working paper (Pasfield, 2015) classifying US universities but focused on assisting prospective students selecting college rather than on research profile.

We decided to follow a hierarchical and complete clustering due to the nature of the data and the purpose of the paper. We have relatively few data points that are relatively high dimensional. Thus it is natural to consider each department on its own and progressively build clusters by finding the most similar ones, as hierarchical clustering is doing. Moreover with this approach nested clusters are created, giving as the ability to focus on various level of grouping.

We will focus on the 2010-2014 time window in order to avoid the dataset shortcomings that were mentioned on section 2. The hierarchical cluster analysis of the dataset containing 14 economic departments was performed on the following variables: The number of faculty staff, an index of the composition of faculty rank¹, the average number of publications per faculty, the Gini index, the average per faculty h-index, the number of links to other Greek departments and the percentage of coauthored papers.

The variable values have been scaled as follows: For each variable, the mean value was found and each data point subtracted from it and the result was divided by the standard deviation. Finally an euclidean distance matrix was created and the hierarchical agglomeration algorithm was applied.

¹ This index takes values from 1 (if all faculty was Lecturers) to 4 (in the case where all staff was full professors) and computed as a weighted average of the various ranks composition of each departments, where the weights are: Full Professor=4, Associate Professor=3, Assistant Professor=2, Lecturer=1.

The algorithm starts out with each observation as a single-member separate cluster and then examines all the distances between them and pairs together the two closest ones to form a new cluster. We used three known proximity measures: the minimum distance between an observation and any member of the cluster (MIN); the maximum distance (MAX); and the Ward's method. [explain more].

One can see in Figure 6 the result of every method of the agglomerative hierarchical clustering. The more close to the bottom the agglomeration of the clusters take place, the more related are the joined clusters. [What is Height – Y-axis ?]

In all methods there are some common department groups. PANTEIO-OPA and UOPIR-ECON, AUTH-ECON and UOC-ECON, AUEB-DEOS and UOM-ECON, DUTH-ECON and UOI-ECON. Thus one quick but certain conclusion is that those department couples pertain a relatively high degree of similarity in terms of their research profile. Also, in all methods, UOTH-ECON, UOA-ECON and UPATRAS-ECON join an existing cluster quite late, an indication that those departments is reasonable to be treated as unique cases.

In order to create larger groups we have to select one of the three proximity measures and cut the tree in a certain height. We will continue with ward's method [why] and cut the tree on the half of the total height [why], taking 6 unique clusters. This operation is shown in Figure 5.

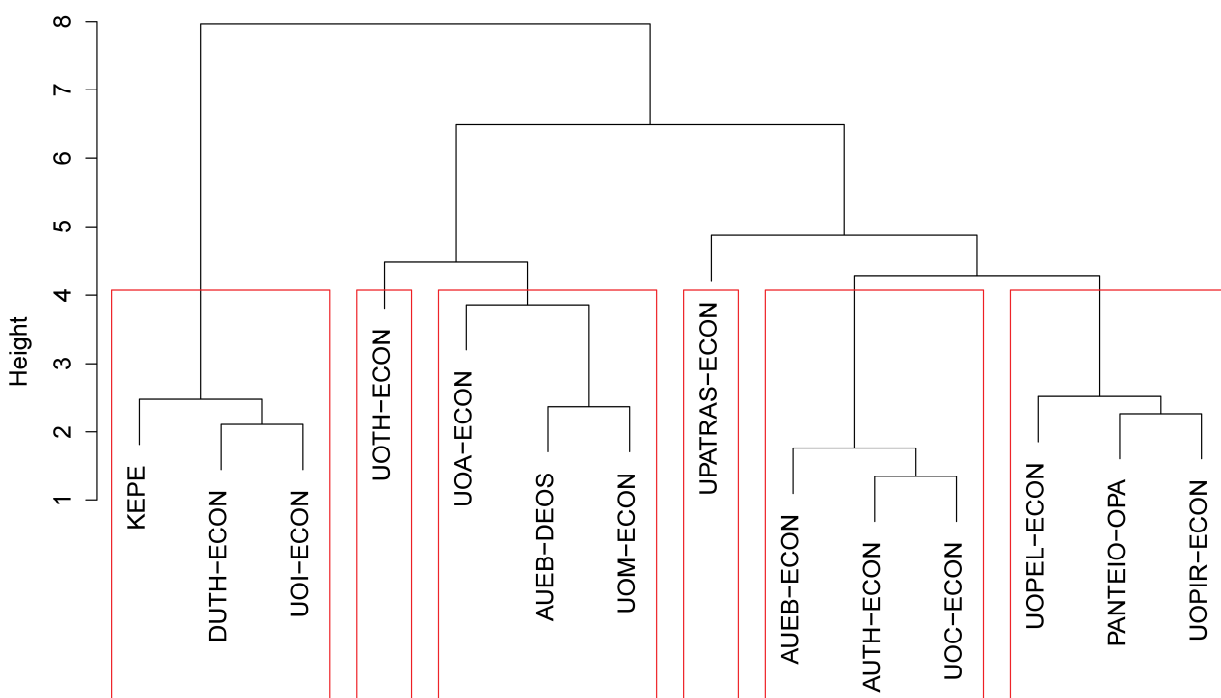


Figure 5, Six clusters of Greek Economic Departments

AUTH-ECON, AUEB-ECON and UOC-ECON form an early cluster, a sign of a relatively high degree of similarity. On the other hand UPATRAS-ECON and UOA-ECON seem to join a cluster quite late, implying that they are rather distinct cases.

Finally, three big clusters seem to be formed. Cluster A: UOA-ECON, UOTH-ECON, AUEB-DEOS and UOM-ECON. Cluster B: UOPIR-ECON, PANTEIO-OPA, AUTH-ECON, AUEB-ECON and UOC-ECON. Cluster C: KEPE, DUTH-ECON, UOI-ECON, UOPEL-ECON and UPATRAS-ECON.

Group	Average within group						
	Faculty Number	Rank Index	Mean Publications	Gini	Mean h-index	Number of Links	% Co-authoring
AUEB-DEOS, UOA-ECON, UOM-ECON	30,3	3,27	5,44	0,540	4,93	6,67	0,173
AUEB-ECON, AUTH-ECON, UOC-ECON	21,7	2,94	4,97	0,366	4,43	6	0,283
DUTH-ECON, KEPE, UOI-ECON	20,7	2,25	2,98	0,402	2,07	5,33	0,360
PANTEIO-OPA, UOPEL-ECON, UOPIR-ECON	18	2,89	4,75	0,397	3,93	1,67	0,137
UPATRAS-ECON	9	3,5	2,89	0,222	4,9	2	0,500
UOTH-ECON	17	2,45	8,94	0,542	4,1	5	0,400
<i>Average of all departments</i>	<i>21,2</i>	<i>2,85</i>	<i>4,73</i>	<i>0,420</i>	<i>3.93</i>	<i>4.71</i>	<i>0.269</i>

In order to test for statistical significance we used t-test (paired samples).

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10 Appendix

Table 16, ARTICLES_METADATA Dataset

Field Name	Description
year	Year of publication, based on cover data
articleID	SCOPUS article unique identifier
articleTitle	Title of article
journalISSN	ISSN of the journal of the publication (if applicable)
citedByCount	Number of citations until the research time
DepInDept	Whether, for an article, SCOPUS database reports that the author is affiliated with the department. This seems a very good estimation for whether the author published the article when he was a member of the Department or not.
totalAuthors	Number of article authors
totalAuthorsOffDept	Number of article co-authors that (at cover date) are not affiliated with the author's department
totalAuthorsOffGreece	Number of article co-authors that (at cover date) are affiliated with a department outside Greece.
pubType	Type of publication: Journal, Book Series, Book, Conference Proceeding, Trade Journal
pubSubType	Article, Chapter, Review, Conference Paper, Article in Press, Letter Erratum, Book, Editorial, Note, Conference Review

Table 17, COAUTHORS_METADATA Dataset

Field Name	Description
year	Year of publication, based on cover data
articleID	SCOPUS article unique identifier
journalISSN	ISSN of the journal of the publication (if applicable)
coAuthorID	SCOPUS co-author unique identifier
affiliationID	SCOPUS affiliation (of the co-author) unique identifier
affiliationCountry	The country of the affiliated institution, as reported by SCOPUS