UDK: 378(497.5Zagreb)"1875/1900"
378:5-057.16
Original Research Article
Received: November 19, 2024
Accepted: September 26, 2025
https://doi.org/10.22586/ffs06p44

THE FACULTY OF PHILOSOPHY IN ZAGREB IN THE CONTEXT OF AUSTRO-HUNGARIAN UNIVERSITIES 1875-1900, WITH SPECIAL EMPHASIS ON SCIENCE AND MATHEMATICS TEACHING STAFF

Tihomir VUKELJA *

The structure of the science and mathematics teaching staff at the Faculty of Philosophy in Zagreb in the period 1875-1900 is well known. However, the accounts of that structure lack a comparative analysis that would show whether it met the university standards of the time. The aim of this paper is to satisfy the prerequisite for such an analysis: to explicate the more general status of the Faculty of Philosophy in Zagreb in an appropriate context. The narrowest appropriate context is the universities in the Austro-Hungarian Monarchy, and the position of the Faculty among them is considered with regard to the number of students, the total number of professors and private docents, and the number of science and mathematics professors and private docents. These considerations form the background against which it will be possible to interpret the results of the comparative analysis as parts of a meaningful whole. At the same time they show that the Faculty of Philosophy in Zagreb was, on average, the smallest faculty of philosophy in the Monarchy in terms of the total number of professors and the number of science and mathematics professors. It was one of the two smallest faculties of philosophy in terms of the number of full-time students and one of the three smallest in terms of the total number of private docents. Regarding the number of science and mathematics private docents, during the second half of the period under consideration it ranked amongst the medium-sized Austro-Hungarian faculties of philosophy.

Keywords: Austro-Hungarian Monarchy; 19th century; universities; Faculty of Philosophy in Zagreb; students; teaching staff at faculties of philosophy; science and mathematics teaching staff at faculties of philosophy

* Tihomir Vukelja, PhD, University of Zagreb, Faculty of Science, Zagreb, Croatia; tvukelja@phy.hr

Introduction

The university lecturing of science and mathematics in Croatia began at the Faculty of Philosophy of the Royal University of Francis Joseph I in Zagreb in 1875.[1] According to the law of 1874,[2] the Faculty consisted of two departments: the Department of Philosophy and History and the Department of Mathematics and Science. The basic structure of the Department of Mathematics and Science was set by the same law, which stipulates that mathematics, physics, zoology, botany, mineralogy, geology and chemistry will be regularly lectured at the Department, while astronomy, comparative anatomy and physiology will be lectured occasionally.

The structure of the Department, established on that basis by the appointment of professors and private docents in the period from the autumn semester of 1875/76 until the autumn semester of 1899/900, i.e. the science and mathematics teaching staff of the Faculty, was the basis of the university education of scientists and mathematicians in Croatia in the last quarter of the 19th century, so the analysis of that structure is the starting point for the discussion about the scope and level of that education. However, insufficient attention has been paid to this analysis in Croatian historiography. Accounts of the structure can be found in the literature,[3] but these accounts are not accompanied by a comparative analysis that would allow one to assess the extent to which it met the university standards of the time. The aim of this paper is to open that topic by some general considerations. For this purpose, universities in the Austro-Hungarian Monarchy were used as a context. In the autumn of 1875, there were ten universities in the Monarchy: in Budapest, Cluj, Chernivtsi, Graz, Innsbruck, Krakow, Lviv, Prague, Vienna and Zagreb. In 1882 the University of Prague was divided into two universities – German and Czech – and until the end of the century the number of universities in the Monarchy did not change.[4] At all these universities, except in Cluj, there was a faculty

---

[1] Tihana Luetić and Tihomir Vukelja, *Prirodoslovci i matematičari. Postanak domaće akademske prirodoslovno-matematičke zajednice u Hrvatskoj* (Zagreb: Srednja Europa, 2017), 71-73.

[2] "Zakonski članak ob ustrojstvu sveučilišta Franje Josipa I. u Zagrebu", *Sbornik zakonah i naredabah valjanih za kraljevine Hrvatsku i Slavoniju*, year 1874, 11-28.

[3] For example: Vanda Kochansky-Devidé, ed., *Spomenica Prirodoslovno-matematičkoga fakulteta 1874 – 1974. Prilikom stogodišnjice organiziranog znanstvenog i nastavnog rada iz prirodnih i matematičkih znanosti* (Zagreb: Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu, 1974). Žarko Dadić, *Egzaktne znanosti u Hrvata u doba kulturnog i znanstvenog preporoda (1835. – 1900.)* (Zagreb: Izvori, 2010), 278-285, 318-324, 329-341. Luetić and Vukelja, *Prirodoslovci i matematičari*, 258-283.

[4] *Hof- und Staatshandbuch der Österreichisch-Ungarischen Monarchie*, for the years 1876-1900.

of philosophy equivalent to the Faculty of Philosophy in Zagreb, which covered social sciences and humanities as well as science and mathematics. At the University of Cluj there was the Faculty of Mathematics and Science and the Faculty of Philosophy, History and Philology.

In the rest of the paper the F. Phil.[5] in Zagreb is compared with other Austro-Hungarian fs. phil.[6] by several parameters, in order to consider some aspects of its position in the group of equivalent institutions and thereby prepare the ground for bringing to light the standard structure of science and mathematics teaching staff at Austro-Hungarian universities in the last quarter of the 19th century, and for assessing the compliance of the structure of science and mathematics teaching staff of the F. Phil. in Zagreb with that standard. The comparison according to the given parameter was carried out so that the group of fs. phil. in the Monarchy in the autumn semester of each academic year from the considered period was characterized using five values: the minimum value of the parameter, the value of the parameter for the F. Phil. in Zagreb, the median of the distribution of faculties according to the considered parameter, and the lower and upper quartiles of the distribution. Since quartiles can be calculated in different ways, it is necessary to explicitly describe the procedure used. The value of the parameter was determined for each f. phil. using historical sources, and the values thus obtained were arranged in a series from the smallest to the largest (the first value is the minimum value of the parameter). For the period from 1875/76 to 1881/82 (10 faculties) for the lower quartile of the distribution the third value in the series was taken, for the median the mean value of the fifth and sixth values, and for the upper quartile the eighth value. For the period from 1882/83 to 1899/900 (11 faculties) the third value in the series was taken for the lower quartile, the sixth value for the median, and the ninth value for the upper quartile.

The structure of the Department of Mathematics and Science of the F. Phil. in Zagreb

The structure of the Department in the period from the autumn semester of 1875/76 until the autumn semester of 1899/900 is shown in Table 1.[7]

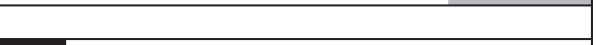
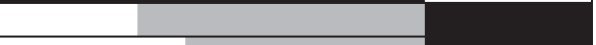
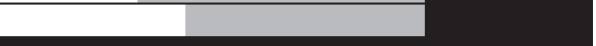
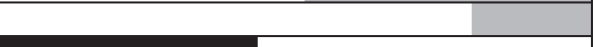
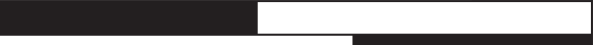
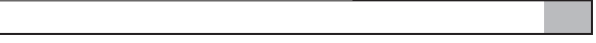
---

5 In the rest of the paper the abbreviation "F. Phil." will be used for "Faculty of Philosophy".

6 In the rest of the paper the abbreviation "fs. phil." will be used for "faculties of philosophy", and the abbreviation "f. phil." for "faculty of philosophy".

7 This structure can be reconstructed on the basis of various sources (for example: *Akademičke oblasti, osoblje i red predavanja u Kr. sveučilištu Franje Josipa I. u Zagrebu*, from 1875/76 to 1899/900) and teachers' biographies.

Table 1. Structure of the Department of Mathematics and Science of the Faculty of Philosophy in Zagreb 1875-1900.

		1879/80 1889/90
Mathematics	K. Zahradnik	
	D. Segen	
	V. Varićak	
Physics	V. Dvořák	
	A. Mohorovičić	
Astronomy		
Chemistry	A. Veljkov	
	G. Janeček	
Terristics	Đ. Pilar	
	M. Kišpatić	
	D. Gorjanović	
Animalistics	S. Brusina	
	L. Car	
	A. Langhoffer	
Plantistics	B. Jiruš	
	A. Heinz	
	S. Gjurašin	

The first column represents the basic structure of the Department. The second column lists the teachers of those scientific disciplines in the considered period. The third column shows the period in which a teacher lectured as a private docent (grey field) and/or as a professor (black field).

The basic structure of the Department shown in the first column of Table 1 was defined specifically for the purposes of comparative analysis and is therefore not simply a list of chairs, but rather each component encompasses one segment of the lecturing prescribed by the university law. For example, the component "Mathematics" does not just refer to the mathematics chair, but to the entire lecturing of mathematics (including geometry), and the same applies to physics, chemistry, and astronomy. In order to extend this approach to the entire spectrum of lecturing, the terms "animalistics", "plantistics", and "terristics" were used. Thus, the component "Animalistics" encompasses the entire lecturing of considerations of various problem areas of scientific research on animals, i.e. lecturing of zoology, comparative anatomy, animal physiology, etc. In the same sense the component "Plantistics" includes the lecturing of botany, plant physiology, geobotany, plant morphology and anatomy, etc., and the component "Terristics" includes the lecturing of geology, palaeontology, mineralogy and petrography. Basing the Department's structure on such, more broadly defined components, rather than on chairs, is more appropriate for

comparative analysis for several reasons. First, such a basis provides a stable structure that still leaves room for internal dynamics (establishment, abolition, merger and separation of chairs). Second, it is possible to harmoniously fit private docents into such a structure. Finally, such components, unlike chairs, can be mapped to all the faculties of philosophy of the time included in this research and therefore, at least within the framework of this research, they are universal categories for comparison.

Full-time students

The position of the F. Phil. in Zagreb among Austro-Hungarian fs. phil. during the last quarter of the 19th century can be considered with regard to many parameters, but in this paper we limit ourselves to the number of students and the number of teachers. The first parameter that we will deal with is the number of full-time students of social sciences, humanities, science and mathematics in the autumn semester of the academic year.[8] Data on the number of students at the F. Phil. in Zagreb were taken from second memorial of the University of Zagreb,[9] and data on the number of students at fs. phil. in the Austrian part of the Monarchy (Chernivtsi, Graz, Innsbruck, Krakow, Lviv, Prague, Vienna) from the Austrian statistics of educational institutions.[10] Data on the number of students in the Hungarian part of the Monarchy (Budapest and Cluj) until 1887/88 were taken from the Hungarian Statistical Yearbook.[11] But the new series of Yearbook, which began to be published in 1893, contains only data on the total number of students (full-time and part-time).[12] Therefore, for the academic years from 1888/89 to 1899/900 data on the number of full-time students at the faculties of the University of Cluj were taken from the Almanac of the University of Cluj,[13] and data on the number of full-time

[8] In other words, part-time students, students of pharmacy, etc., were not taken into account. For the University of Cluj, the students of the Faculty of Mathematics and Science and the Faculty of Philosophy, History and Philology were added together.

[9] *Spomenica o 25-godišnjem postojanju Sveučilišta Franje Josipa I. u Zagrebu* (Zagreb: Akademički senat, 1900), 136-139.

[10] *Oesterreichische Statistik. Statistik der Unterrichts-Anstalten in den im Reichsrathe vertretenen Königreichen und Ländern*, for the school years from 1881/82 (covers the period from 1875/76) to 1899/900.

[11] *Magyar statistikai évkönyv*, for the years 1876-1888.

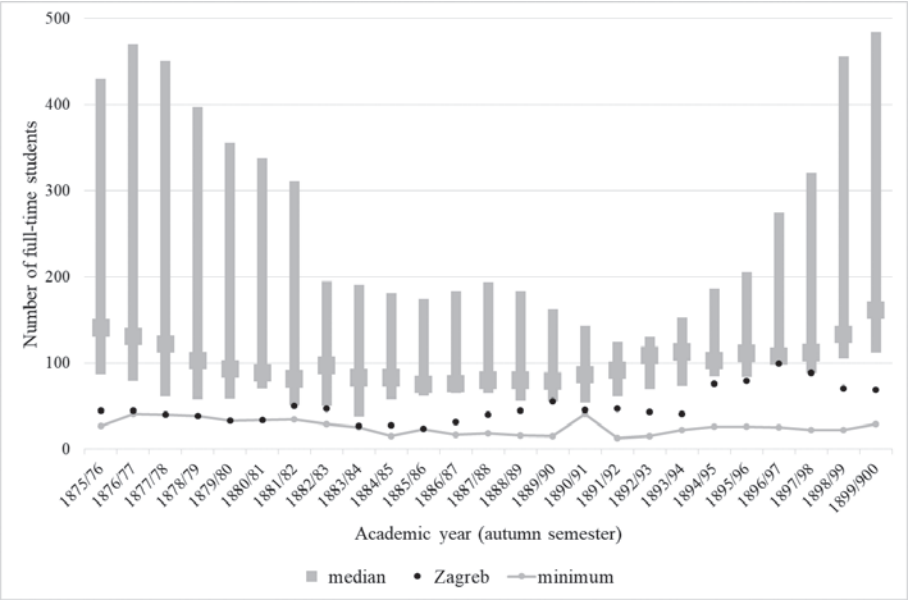
[12] *Magyar statistikai évkönyv*, for the years from 1893 (covers the period from 1889) to 1900.

[13] *A Kolozsvári Magyar Királyi Ferencz-József-Tudomány-Egyetem almanachja és tanrendje*, for the academic years from 1888/89 to 1899/900.

students at the F. Phil. in Budapest from the Almanac of the University of Budapest.[14]

The result of the analysis of the number of full-time students of Austro-Hungarian fs. phil. is shown in Graph 1. The grey vertical rectangle for each academic year shows the interquartile range, so that the lower edge of the rectangle indicates the lower quartile of the distribution, and the upper edge the upper quartile. The median is shown as a grey square on the interquartile range illustration. The grey points connected by a grey line show the number of students at the f. phil. with the fewest enrolled full-time students for the given academic year (minimum value of the parameter), and the black points show the number of full-time students at the F. Phil. in Zagreb. The maximum values are not shown on the graph for clarity.

Graph 1. Characteristic values (without maximum values) of the distribution of Austro-Hungarian fs. phil. by the number of full-time students in the autumn semester of the academic year from 1875/76 to 1899/900.



The graph shows a strong asymmetry of the distribution of faculties by the number of students – the upper quartile is generally much further from the median than the lower quartile – especially prominent at the beginning

[14] *A Budapesti Királyi Magyar Tudomány-Egyetem Almanachja*, for the academic years from 1888/89 to 1899/900.

and end of the period. Equally noticeable are large changes in the value of the upper quartile. At the beginning of the period, in 1875/76 and 1876/77, in the position of the upper quartile was the F. Phil. in Budapest, and then, until 1881/82, the F. Phil. in Prague. A noticeable drop in the value of the upper quartile in 1882/83 is a consequence of the division of the University in Prague into two universities, and from then until the end of the century the position of the upper quartile was occupied by the F. Phil. of the Czech University in Prague. If we look beyond the upper quartile, in the area not shown in the graph, at the top of the distribution during the entire period we find the F. Phil. in Vienna, at which studied from 391 (1891/92) to 920 (1876/77) full-time students. Between the maximum and the upper quartile in 1875/76 and 1876/77 we find the F. Phil. in Prague, and from 1877/78 until the end of the century the F. Phil. in Budapest.

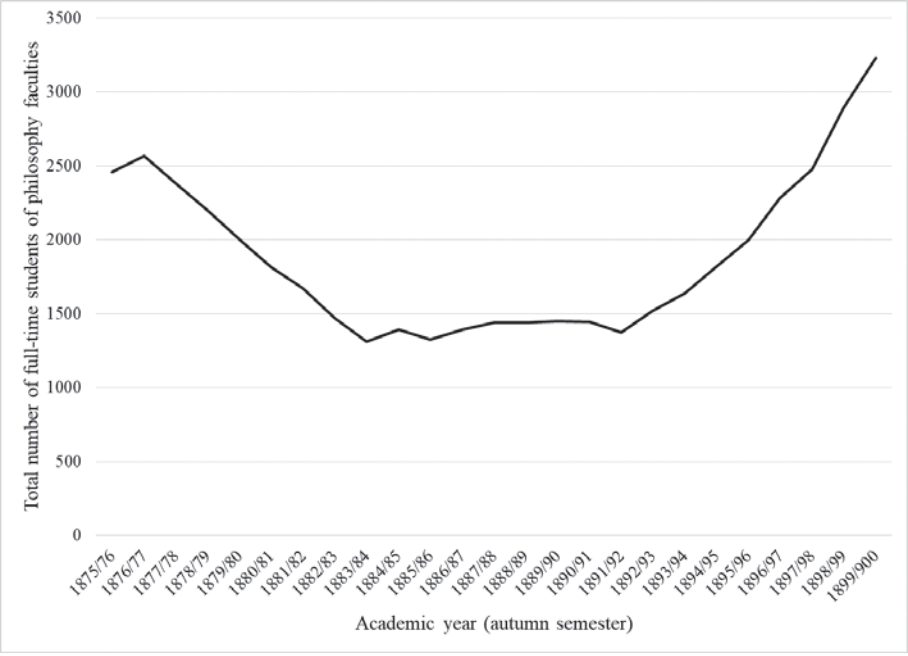
We can see that the peaks of the distribution were occupied by universities in Vienna, Budapest and Prague, and the distance of these peaks from the median suggests that these universities gathered a large part of the student population of the Austro-Hungarian fs. phil. In fact, the share of full-time students at the F. Phil. in Vienna in the total number of full-time students at the Austro-Hungarian fs. phil. ranged in this period between 24.4% (1898/99) and 36.7% (1884/85), and the share of students of the F. Phil. in Budapest between 15.2% (1884/85) and 24.2% (1898/99). In this way we arrive at an important, but not surprising, feature of the student population at the Austro-Hungarian fs. phil. in the considered period: at the two fs. phil. with the largest number of students (Vienna and Prague until 1876/77 and Vienna and Budapest from 1877/78 till the end of the century) studied approximately half of all full-time students at fs. phil. in the Monarchy: from 47.7% (1882/83 and 1883/84) to 56.5% (1878/79).

While the upper part of the distribution is firmly held by Vienna, Budapest and Prague, on Graph 1 we see that the F. Phil. in Zagreb is located in the lower part of the distribution, in the space between the minimum and the lower quartile. In other words, in the considered period it was among the smallest fs. phil. in the Monarchy as regards the number of full-time students, with a share in the student population of Austro-Hungarian fs. phil. between 1.6% (1879/80) and 4.4% (1896/97). Until 1876/77 we find it a little above the minimum, which was then occupied by the F. Phil. in Chernivtsi, only to spend the next four years at the bottom of the distribution. But in 1881/82 the F. Phil. in Chernivtsi returned at the rear, and until the end of the century it remained the f. phil. with the fewest full-time students in the Monarchy. On the other hand, in 1881/82 and 1882/83 the F. Phil. in Zagreb came quite close to the position of the lower quartile, which was then occupied by the F. Phil. in Innsbruck, and it reached that position on two occasions: in 1889/90, when it had

more full-time students than the fs. phil. in Chernivtsi and Innsbruck, and in 1896/97 and 1897/98, when it had more full-time students than the fs. phil. in Chernivtsi and Lviv.

In Graph 1 large changes in the value of the upper quartile can be observed: a rapid decline in the years from 1876/77 to 1881/82, followed by a relatively stable period with fluctuations, and even faster growth from 1892/93 until the end of the century. We have seen that from 1877/78 to 1881/82 the F. Phil. in Prague was placed in the position of the upper quartile, and that from 1882/83 until the end of the century that place was occupied by the F. Phil. of the Czech University in Prague, but such trends were not limited to Prague. Corresponding changes in the number of students affected the fs. phil. in Vienna and Budapest, and a similar behaviour, although less pronounced, is observed for the median, lower quartile and minimum of the distribution. The result of these trends are the changes in the total number of full-time students of the Austro-Hungarian fs. phil. shown in Graph 2.

Graph 2. The total number of full-time students at Austro-Hungarian fs. phil. from 1875/76 to 1899/900.



From the local maximum in 1876/77 to the local minimum in 1883/84, the number of students was halved (a drop of 49.0%). In the autumn semester of 1883/84, all fs. phil. in the Monarchy had fewer full-time students than in the autumn semester of 1876/77. The number of students decreased the most

at the F. Phil. in Innsbruck (a drop of 75.6%), and the least at the F. Phil. in Krakow (13.9%). At the F. Phil. in Zagreb, the number of students decreased by 40.0%. On the other hand, from the local minimum in 1891/92 to the maximum in 1899/900, the number of students increased by 135.5%. In the autumn semester of 1899/900, all fs. phil. in the Monarchy had more full-time students than in the autumn semester of 1891/92. The number of students increased the most at the F. Phil. of the Czech University in Prague (287.2%), and the least at the F. Phil. in Zagreb (46.8%).[15]

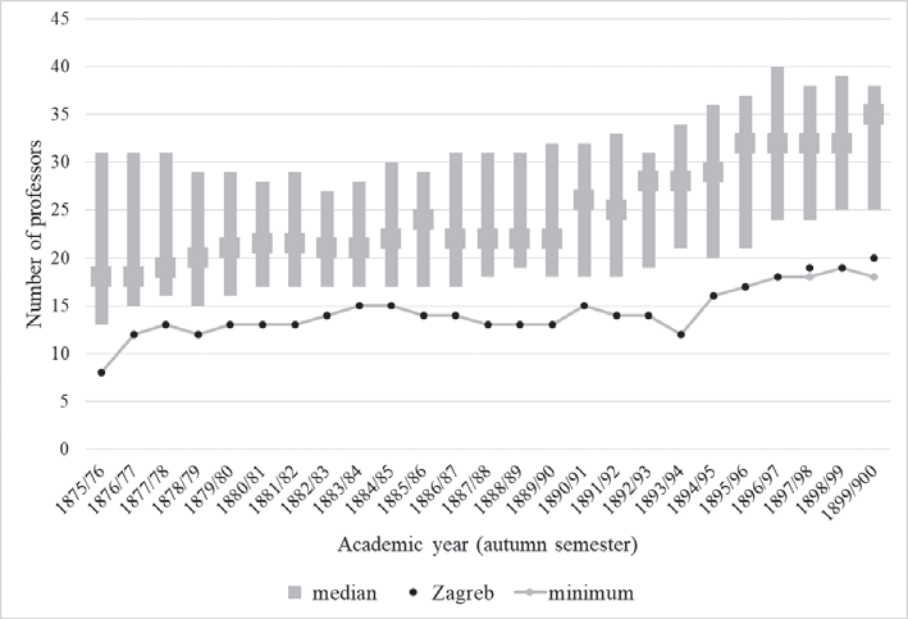
Professors and private docents

Let us now consider the position of the F. Phil. in Zagreb among the Austro-Hungarian fs. phil. with regard to the number of professors and private docents. Data on university teachers can be found in various sources (university yearbooks, statistical yearbooks, civil servants registers, etc.), which are not always in perfect agreement. However, it should be kept in mind that the composition of the university staff is variable, and that data for different publications were not collected at the same time. In this paper, the data listed in the Court and State Handbook of the Austro-Hungarian Monarchy are consistently used.[16] The Handbook was published at the beginning of the calendar year as a single publication for the entire Monarchy, and in it all teachers of all universities were listed by name and the positions they held. The first parameter for the comparison of fs. phil. that will be discussed in this paragraph is the number of all professors (professors of social sciences, humanities, science, mathematics and other fields) in the autumn semester of the academic year. As in the case of the number of full-time students, for the University of Cluj we add the professors of the Faculty of Mathematics and Science and the Faculty of Philosophy, History and Philology. The result of the analysis of the number of professors at the Austro-Hungarian fs. phil. is shown in Graph 3.

[15] On the trends in the number of students at the F. Phil. in Zagreb see: Tihana Luetić, "Brojčano stanje studenata Filozofskog fakulteta Sveučilišta u Zagrebu, odnosi sa drugim fakultetima i osvrt na izbor studija (1874. – 1914.)," in *Humanitas et litterae ad honorem Franjo Šanjek*, eds. Lovorka Čoralić and Slavko Slišković (Zagreb: Dominikanska naklada Istina; Kršćanska sadašnjost, 2009), 597-622. Luetić and Vukelja, *Prirodoslovci i matematičari*, 66-83. Tihomir Vukelja and Tihana Luetić, *Prirodoslovke i matematičarke. Prve žene u hrvatskoj akademskoj prirodoslovno-matematičkoj zajednici* (Zagreb: Srednja Europa, 2024), 158-168.

[16] *Hof- und Staatshandbuch der Österreichisch-Ungarischen Monarchie*, for the years 1876-1900.

Graph 3. Characteristic values (without maximum values) of the distribution of Austro-Hungarian fs. phil. by the number of professors in the autumn semester of the academic year from 1875/76 to 1899/900.



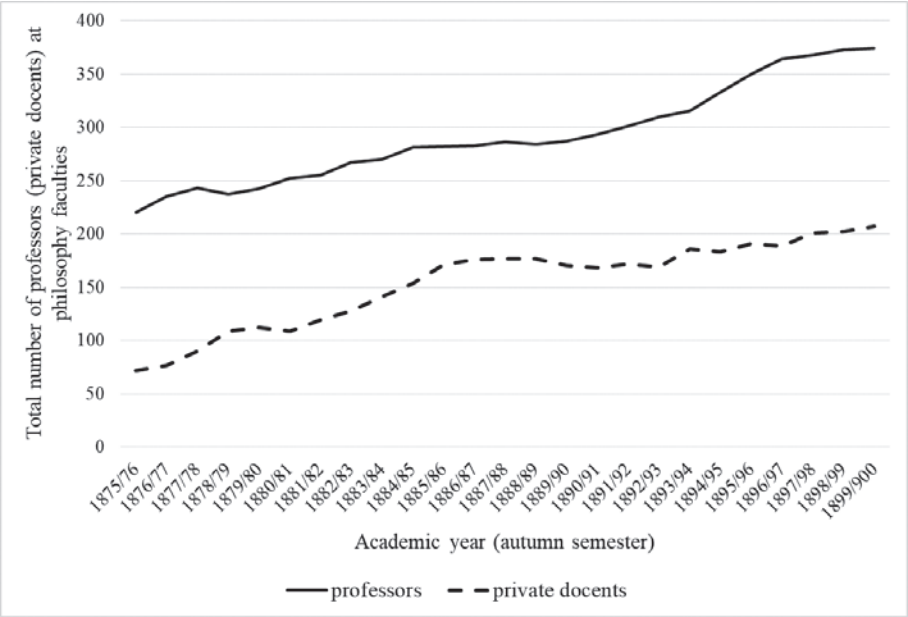
Graph 3 clearly shows a distribution of a different nature than the distribution by the number of full-time students shown in Graph 1: the asymmetry of the distribution is smaller, and the distribution steadily, with certain fluctuations, moves towards higher values. However, Graph 3 does not give a complete picture because it does not show the maximum values, which should definitely be taken into account when assessing the asymmetry of the distribution. At the maximum of the distribution during the entire period we again find the F. Phil. in Vienna, where between 48 (1877/78 and 1878/79) and 68 (1899/900) professors lectured. These values certainly contribute to the asymmetry of the distribution, but not to the same extent as in the case of students, because the share of professors at the F. Phil. in Vienna in the total number of professors at the Austro-Hungarian fs. phil. was significantly lower than the corresponding share of students and ranged between 17.2% (1892/93) and 22.6% (1875/76). Between the maximum and the upper quartile of the distribution until the division of the University of Prague in 1882 we find the F. Phil. in Prague, with a share in the total number of professors from 12.7% (1879/80) to 15.4% (1875/76), and from 1882/83 until the end of the century the F. Phil. in Budapest, with a share in the total number of professors from 10.8% (1894/95) to 14.1% (1887/88). It follows that at the two fs. phil. largest in terms of number of professors (Vienna and Prague until 1881/82 and Vienna

and Budapest from 1882/83 until the end of the century) approximately a third of all professors of fs. phil. in the Monarchy lectured: from 28.8% (1892/93 and 1893/94) to 38.0% (1875/76). These smaller shares show that the leading universities in the Monarchy differed somewhat less from the others in the number of professors of fs. phil. than in the number of full-time students of those faculties.

On the other hand, in Graph 3 we see that the F. Phil. in Zagreb during almost the entire period was the f. phil. with the smallest number of professors in the Monarchy. Although towards the end of the century the number of professors at the Faculty grew, and on two occasions, in 1897/98 and 1899/900, the Faculty surpassed the F. Phil. in Chernivtsi in terms of the number of professors, it should be noted that this growth was slower than the growth of the lower quartile, median and maximum of the distribution, and approximately equal to the growth of the upper quartile of the distribution. Thus in 1876/77, when the chairs at the Department of Mathematics and Science were filled, we find the F. Phil. in Zagreb (with 12 professors) below the lower quartile for 3 professors, below the median for 6 professors, below the upper quartile for 19 professors, and below the maximum for 37 professors. On the other hand, at the end of the century, in 1899/900, the Faculty (with 20 professors) was below the lower quartile for 5 professors, below the median for 15 professors, below the upper quartile for 18 professors, and below the maximum for 48 professors. In other words, while the F. Phil. in Zagreb competed with the F. Phil. in Chernivtsi to escape from the rear of the distribution, it increasingly lagged behind the other fs. phil. in the Monarchy. The causes and consequences of such a state of affairs are not difficult to conjecture, but this remains a topic for future research.

On Graph 3 we also see that during the considered period all displayed characteristic values of the distribution grew with some fluctuations, and the same, as we saw, was true for the maximum value, which points to an increase in the total number of professors at Austro-Hungarian fs. phil. The trend of the total number of professors is shown in Graph 4 by the solid line.

Graph 4. The trend of the total number of professors and the total number of private docents at Austro-Hungarian fs. phil. from 1875/76 to 1899/900.



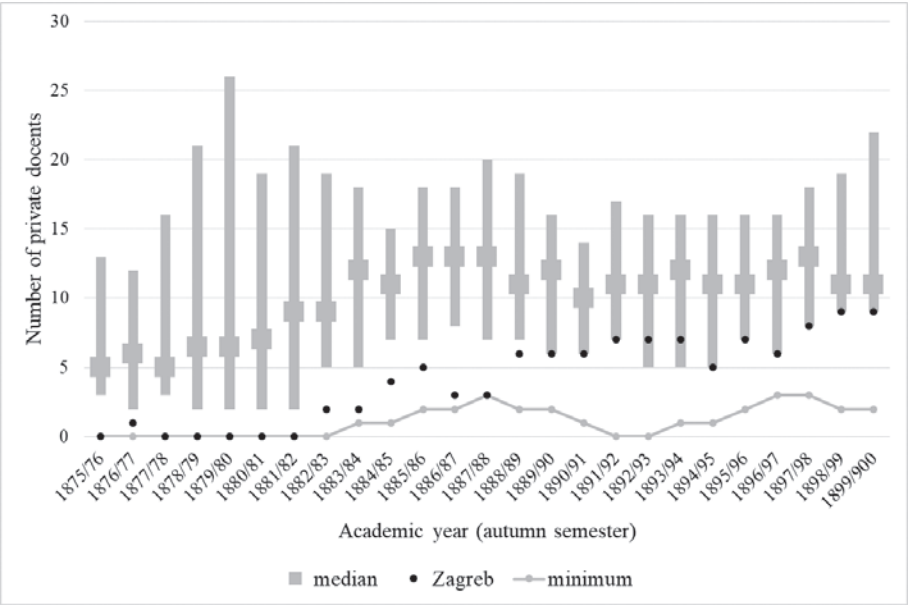
We see that the total number of professors at the Austro-Hungarian fs. phil. increased from 220 in 1875/76 to 374 in 1899/900, i.e. by 70.0%.

The next parameter that will be considered is the number of private docents. Private docents played an important role in the functioning of Austro-Hungarian universities. At the fs. phil., private docents usually were secondary school or high school of technology professors with a Ph.D. who, based on the habilitation procedure, were allowed to hold lectures in some courses. Thus, in the absolutely elective cyclical system of university courses at the Austro-Hungarian fs. phil., private docents expanded the spectrum of lectures offered to students with their often highly specialized courses. Also, vacant chairs were very often filled with candidates from among private docents.[17]

[17] In this period, the appointment, rights and duties of private docents at the University of Zagreb were governed by the following regulations: "Zakonski članak ob ustrojstvu sveučilišta Franje Josipa I. u Zagrebu," *Sbornik zakonah i naredabah valjanih za kraljevine Hrvatsku i Slavoniju*, year 1874, 11-28. "Naredba kr. hrv.-slav.-dalm. zemaljske vlade, odjela za bogoštovje i nastavu od 13. travnja 1879. br. 651. o habilitaciji privatnih docenata, njihovu položaju, njihovih dužnostih i pravih na kr. sveučilištu Franje Josipa I. u Zagrebu", *Sbornik zakonah i naredabah valjanih za kraljevine Hrvatsku i Slavoniju*, year 1879, 103-107. "Zakon od 6. listopada 1894., kojim se preinačuju, odnosno nadopunjuju njeke ustanove zakonskoga članka sabora kraljevinah Hrvaske, Slavonije i Dalmacije od 5. siječnja 1874. ob ustrojstvu sveučilišta Franje Josipa I. u Zagrebu", *Sbornik zakonah i naredabah valjanih za kraljevine Hrvatsku i Slavoniju*, year 1894, 463-473.

The result of the analysis of the number of private docents at the Austro-Hungarian fs. phil. is shown in Graph 5.

Graph 5. Characteristic values (without maximum values) of the distribution of Austro-Hungarian fs. phil. by the number of private docents in the autumn semester of the academic year from 1875/76 to 1899/900.



A docentship was basically a matter of personal initiative, so the number of private docents was to a greater extent accidental than the number of professors, which is reflected in Graph 5. This distribution also moves towards higher values during the period, but with greater fluctuations and with greater asymmetry than in the case of professors. At the maximum of the distribution during the entire period we again find the F. Phil. in Vienna, where between 22 (1875/76) and 73 (1898/99 and 1899/900) private docents lectured, with a share in the total number of private docents at Austro-Hungarian fs. phil. between 26.7% (1879/80) and 38.9% (1894/95). The F. Phil. in Vienna was also the only f. phil. in the Monarchy with the number of private docents greater than the number of professors, from 1887/88 onwards. Between the maximum and the upper quartile we mostly find the F. Phil. in Budapest, except for 1875/76 and 1881/82, when that position was occupied by the F. Phil. in Prague, and 1888/89, when that position was occupied by the F. Phil. in Graz, whereby the share of private docents at the faculty in that position in the total number of private docents ranged between 11.8% (1889/90) and 23.9% (1878/79). The joint share of the two largest fs. phil. in terms of the number

of private docents in the total number of private docents was higher than the corresponding share in the total number of professors and ranged between 42.6% (1883/84) and 57.0% (1894/95). This shows that the largest fs. phil. in the Monarchy outstripped the smaller ones in the number of private docents more than in the number of professors.

Comparing Graph 5 with Graph 3 we see that the F. Phil. in Zagreb fared better in terms of the number of private docents than in terms of the number of professors. In this case, we find it at the minimum of the distribution only during the first seven years, at a time when there was usually not a single private docent at the Faculty. For the next seven years, from 1882/83, it was mostly located in the space between the minimum and the lower quartile. In 1889/90 it reached the position of the lower quartile, from which it did not descend again. Moreover, in 1892/93 and 1893/94 it rose briefly to the space between the median and the lower quartile.

Finally, let us look again at Graph 4, where we can see that in the considered period the total number of private docents at the Austro-Hungarian fs. phil. on average grew almost as fast as the number of professors, rising from 72 in 1875/76 to 207 in 1899/900, i.e. by 187.5%. We also see that this growth was not uniform, but was much faster in the first half of the period than in the second: by 1887/88, the number of private docents increased from 72 to 177 (in average 8.8 new docents per year), i.e. by 145.8%; from 1887/88 to the end of the period, the number of private docents increased from 177 to 207 (in average 2.5 new docents per year), i.e. by 16.9%. In other words, in the first half of the period 77.8% of the total growth in the number of private docents was achieved, and in the second only 22.2%.

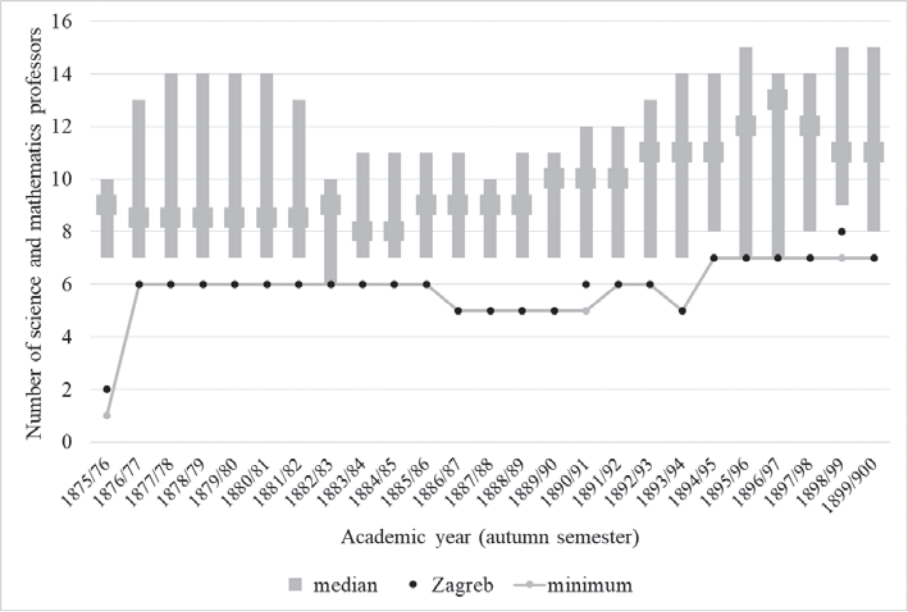
Science and mathematics professors and private docents

After general consideration of the position of the F. Phil. in Zagreb with regard to the number of teachers, let us focus the discussion on a question more directly related to the topic that motivated this paper, the question of the number of science and mathematics teachers.[18] The result of the analysis of the number of sci-math[19] professors at the Austro-Hungarian fs. phil. is shown in Graph 6.

[18] *Hof- und Staatshandbuch der Österreichisch-Ungarischen Monarchie*, for the years 1876-1900.

[19] In the rest of the paper the abbreviation "sci-math" will be used for "science and mathematics".

Graph 6. Characteristic values (without maximum values) of the distribution of Austro-Hungarian fs. phil. by the number of sci-math professors in the autumn semester of the academic year from 1875/76 to 1899/900.



This distribution is less dynamic than these discussed earlier. The lower quartile is particularly stable, remaining unchanged until the last years of the century, when it begins to move towards higher values. The minimum of the distribution behaves similarly, with somewhat larger fluctuations. The upper quartile was relatively stable at the beginning of the period, but its value fell noticeably in 1882/83 due to the division of the University of Prague, after which it was stable at lower values for some time. The increase is observed after 1889/90, when it quickly reached the value it had at the beginning of the period and remained at that level with a tendency to increase. Only the median of the distribution steadily moves towards higher values, with shorter or longer periods of stability.

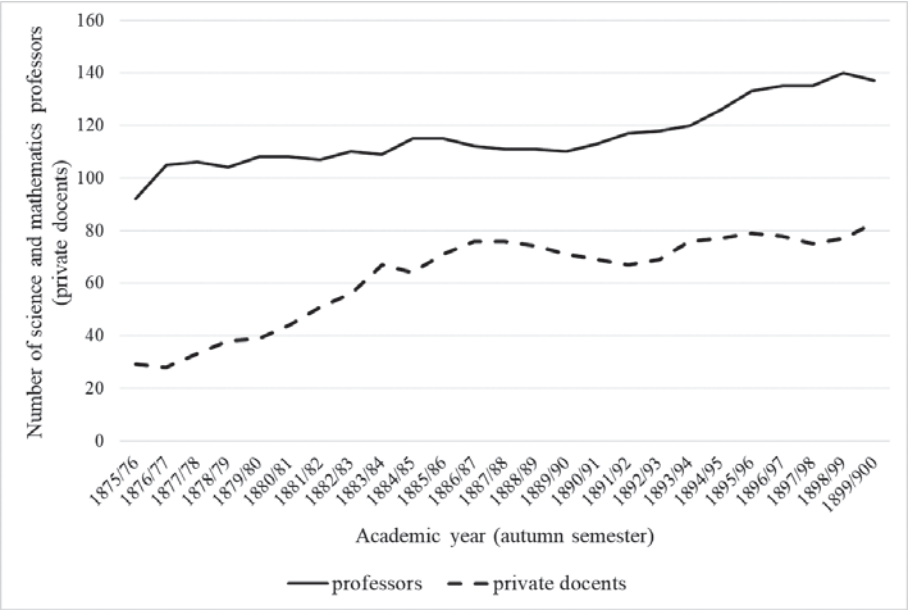
In the position of the maximum throughout the period we find the F. Phil. in Vienna, where between 21 (1892/93) and 29 (1898/99) sci-math professors lectured. The share of sci-math professors at the F. Phil. in Vienna in the total number of sci-math professors at Austro-Hungarian fs. phil. was roughly the same as the share of all professors at the Faculty in the total number of professors at fs. phil.: from 17.8% (1892/ 93) to 27.1% (1875/76). Between the maximum and the upper quartile, the situation in this case is somewhat more complex than with the previously considered distributions. Until 1876/77 the F. Phil. in Prague was placed between the maximum and the upper quartile

with 13 and 14 sci-math professors respectively, and the F. Phil. in Graz at the upper quartile with 10 and 13 professors respectively. However, in the period from 1877/78 to 1880/81, we find 14 sci-math professors at both faculties. Therefore, after the division of the University of Prague in 1882 until the end of the century, between the maximum and the upper quartile we mostly find the F. Phil. in Graz, where between 12 (from 1888/89 to 1890/91) and 16 (1894/95 and 1896/97) sci-math professors lectured. However, the number of sci-math professors at the Prague universities grew over time, so that in 1890/91 and 1895/96 the F. Phil. of the Czech University reached, and in 1898/99 temporarily overtook, the F. Phil. in Graz by the number of these professors. In 1897/98 and 1899/900 both Prague fs. phil. had the same number of sci-math professors as the F. Phil. in Graz (14 and 15 respectively). The joint share of the two fs. phil. with the largest number of sci-math professors in the total number of sci-math professors at the Austro-Hungarian fs. phil. ranged in approximately the same range as the corresponding share calculated in the previous chapter for all professors: between 29.7% (1892/93) and 41.2% (1875/76).

The F. Phil. in Zagreb, where mainly five to seven sci-math professors lectured in the considered period, spent almost the entire time (except for 1890/91 and 1898/99) at the minimum of the distribution. The lag behind the lower quartile was not large, only one or two professors, which opens up the possibility that it shared that last place in the Monarchy with another f. phil., but during the first twenty years this was mostly not the case. Of the 19 years between 1875/76 and 1893/94, the F. Phil. in Zagreb spent 12 years alone at the bottom of the list, 4 years it shared the last place with one faculty (Chernivtsi or Lviv), one year with two faculties (Chernivtsi and Lviv 1882/ 83), and for two years it rose above the minimum (1875/76 and 1890/91; in both cases the minimum was occupied by the F. Phil. in Chernivtsi). The situation changed somewhat after 1894/95, when the F. Phil. in Zagreb reached the number of 7 sci-math professors. Although it remained at the bottom of the distribution (except for 1898/99), in this period it shared that position with the F. Phil. in Chernivtsi, and in 1895/96 and 1896/97 also with the Faculty of Mathematics and Science in Cluj. In short, the F. Phil. in Zagreb was simply the smallest f. phil. in the Monarchy in terms of the number of sci-math professors throughout most of the considered period, and it only reached the status of one of the smallest towards the end of the century.

Although the distribution of Austro-Hungarian fs. phil. by the number of sci-math professors (Graph 6) seems more static than the distribution by the total number of professors (Graph 3), a certain increase in characteristic values can be observed, which points to an increase in the total number of sci-math professors. The trend of the total number of sci-math professors during the considered period is shown by the solid line in Graph 7.

Graph 7. The trend of the total number of sci-math professors and the total number of sci-math private docents at Austro-Hungarian fs. phil. from 1875/76 to 1899/900.



With regard to the number of professors, Graph 7 shows a slightly different picture then Graph 3. The period of stagnation between 1876/77 and 1889/90 should be noted in particular, when over 13 years the total number of sci-math professors increased by only 5 (from 105 to 110). The growth was somewhat faster later, but the increase in the number of sci-math professors was lower than the increase in the total number of professors at the fs. phil.: from 92 in 1875/76 to 137 in 1899/900, i.e. 48.9%. This smaller increase resulted in a decrease in the share of sci-math professors at the Austro-Hungarian fs. phil., which dropped from 44.7% in 1876/77 to 36.6% in 1899/900.

Three remarks important for the discussion initiated by this paper should be added to this account of the number of sci-math professors at Austro-Hungarian universities. The first remark concerns the basic structure of the Department of Mathematics and Science of the F. Phil. in Zagreb, shown in Table 1. Namely, for the purpose of counting professors, every professor next to whose name is in the used source listed a chair in the field of science or mathematics is included among the sci-math professors. A review of those chairs shows that they consistently and completely fit into the basic structure shown in the first column of Table 1. In other words, throughout the considered period, the lecturing of science and mathematics at all Austro-Hungarian universities was organized by the same components that formed the basic structure of the De-

partment of Mathematics and Science of the F. Phil. in Zagreb. This conclusion provides a partial answer to the question about the structure of the Department posed in the Introduction: the basic structure of the Department corresponded to the standard established in Austro-Hungarian universities in the last quarter of the 19th century. Of course, for a complete answer to that question it is necessary to consider the superstructure, i.e. the number and distribution of teachers involved in classes, but the material exposed so far allows us to see one limit. Namely, a look at Table 1 shows that in principle at least six or seven professors are needed to conduct such organized university classes in science and mathematics, which agrees with the distribution shown in Graph 6.

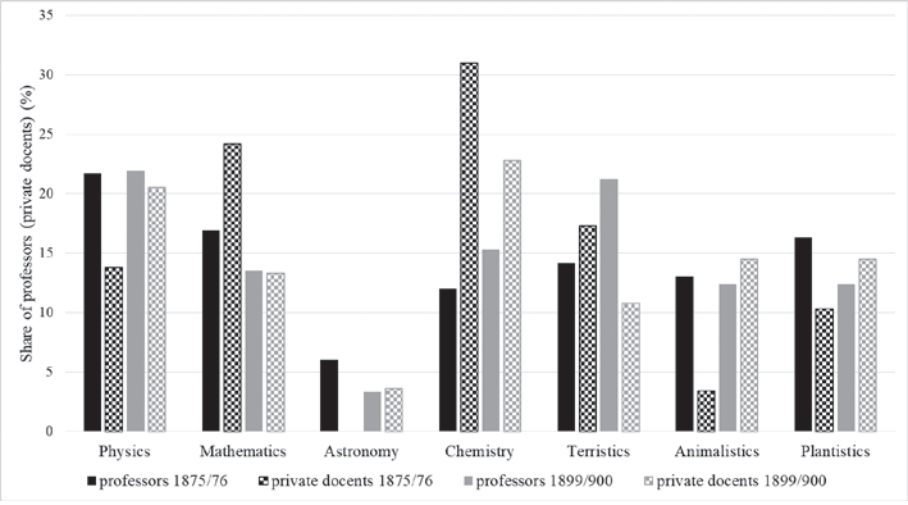
The second remark concerns the relationship between the number of students and the number of sci-math professors. The discussion so far has shown that the fs. phil. in Zagreb and Chernivtsi were the smallest in the Monarchy both by the number of sci-math professors and by the number of students. On the other hand, the F. Phil. in Vienna was the largest both in terms of the number of sci-math professors and the number of students. Such a situation at the edges of the distribution could lead to the conclusion that the larger number of professors was a reflection of the need to adequately organize lectures for a larger number of students, i.e. that faculties with a large number of professors provided to a large number of students basically the same education as faculties with a small number of professors to a small number of students. But such a conclusion would be wrong. First of all, it should be noted that in the considered period, even at the largest faculties in their best years, the number of full-time students was relatively small by today's standards, and the maximum of 920 was reached at the F. Phil. in Vienna in the autumn semester of 1876/77. Due to the system of lecturing at the fs. phil. at the time, without analysing the enrolled courses of each student it is impossible to say how many of these students studied science and mathematics, but if for a rough estimate we rely on the analysis of the student population of the F. Phil. in Zagreb, we can count on around 40%,[20] which gives about 370 sci-math students for that most generous semester. If we divide that number by three or four, the number of years the students spent at the university, and if we take for example some of the most popular courses, such as General Physics, which as a rule were taken by all sci-math students, we arrive at a maximum of about a hundred enrolled students, which does not seem like a number that would require a special organization of classes. Furthermore, it should be emphasized that the central part of the distribution leaves a different impression. For example, the number of students at the F. Phil. in Budapest was not far behind the number of students at the F. Phil. in Vienna, especially after 1890, but in that period 21 to 29 sci-math pro-

[20] Luetić and Vukelja, *Prirodoslovci i matematičari*, 75.

fessors lectured in Vienna, and only 8 to 11 in Budapest. Let us also mention that at the end of the century, in the autumn semester of 1899/900, the F. Phil. in Graz and both fs. phil. in Prague each had 15 sci-math professors, while the F. Phil. in Budapest only had 10. At the same time, at the F. Phil. in Budapest 760 full-time students were enrolled, at the F. Phil. of the Czech University in Prague 484, at the F. Phil. of the German University in Prague 144, and at the F. Phil. in Graz only 112. In other words, the greater number of professors did not reflect the need to provide a greater number of students with basic sci-math education, but rather the need to provide students with an education that keeps up with the rapid development of science and mathematics through a greater offer of various courses. Let us also mention that this conclusion is supported by the schedules of lectures of fs. phil., the analysis of which goes beyond the scope of this paper.

The last remark concerns the growth in the number of sci-math professors. A closer analysis of this growth shows that the number of professors in different scientific fields did not grow at the same pace, and the resulting change in the structure of sci-math teaching staff at the Austro-Hungarian fs. phil. is shown in Graph 8. The black bars without a pattern show the shares of professors of particular scientific fields in the total number of sci-math professors at the Austro-Hungarian fs. phil. in the autumn semester of 1875/76, and the grey columns without pattern show the corresponding shares in the autumn semester of 1899/900. Black (grey) columns with a checkerboard pattern show the corresponding shares of private docents.

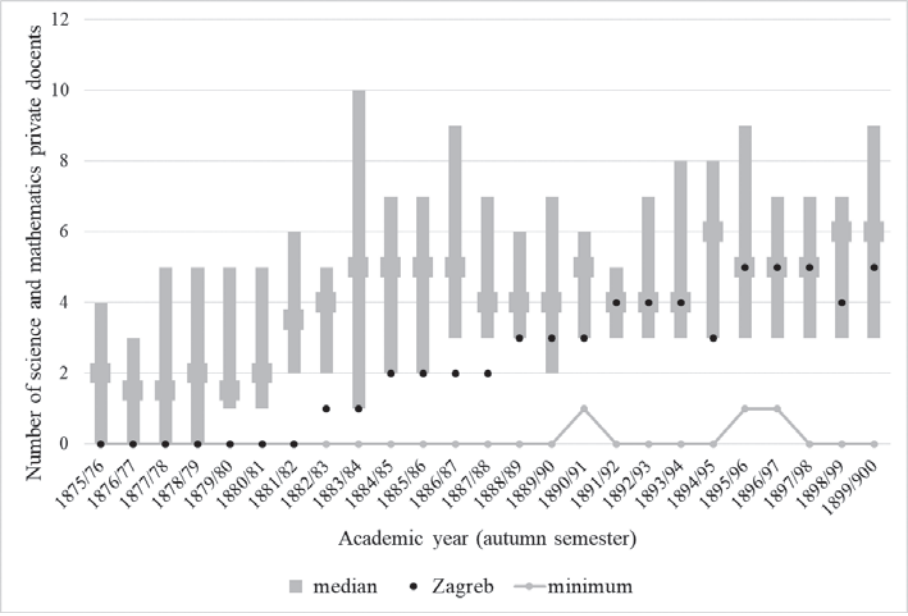
Graph 8. The structure of the sci-math teaching staff at the Austro-Hungarian fs. phil. in 1875/76 and 1899/900.



On this occasion we cannot engage in a deeper discussion of the observed changes. Let us just mention that on the graph we see that both at the beginning and at the end of the period physics professors made up the largest group. But during the period, the number of terristics professors increased the most and more than doubled, so at the end of the century the number of terristics professors almost reached the number of physics professors. Impressive growth is also observed in the case of the number of professors of chemistry, which almost doubled, so that group, which was second to last at the beginning, by the end of the period managed to take third place, behind physics and terristics. A more modest growth, and consequently a decline in the share, was recorded by mathematics and plantistics, and the number of astronomy professors even decreased.

At the end of this chapter, let us pay some attention to the distribution of fs. phil. by the number of sci-math private docents. The result of the analysis of the number of sci-math private docents at Austro-Hungarian fs. phil. is shown in Graph 9.

Graph 9. Characteristic values (without maximum values) of the distribution of Austro-Hungarian fs. phil. by the number of sci-math private docents in the autumn semester of the academic year from 1875/76 to 1899/900.



This distribution stands out among the distributions of fs. phil. by the number of teachers in several ways. In addition to the expected large fluctua-

tions, the distribution is characterized by strong asymmetry. At the maximum of the distribution during the entire period was the F. Phil. in Vienna, where from 12 (1875/76) to 30 (1888/89) sci-math private docents lectured, with a very large share in the total number of these docents at Austro-Hungarian fs. phil., which ranged between 31.2% (1884/85) and 51.4% (1877/78). Between the maximum and the upper quartile until 1882 was the F. Phil. in Prague (1877/78 with the same number of docents as the F. Phil. in Budapest), from 1882/83 to 1894/95 the F. Phil. in Graz (1883/84 with the same number of docents as the F. Phil. of the Czech University in Prague, and in 1894/95 with the same number of docents as the F. Phil. in Budapest), and from 1895/96 the F. Phil. in Budapest. The joint share of the two largest fs. phil. in terms of the number of sci-math private docents in the total number of these private docents was also very high and ranged from 43.7% (1884/85) to 66.6% (1877 /78 and 1879/80). On the other hand, it should be noted that almost every year during the considered period there were fs. phil. in the Monarchy without a single sci-math private docent.

The distribution also differs from the others discussed in this chapter by the position of the F. Phil. in Zagreb: by the end of the century, the Faculty was placed unexpectedly high according to previous experience. Until 1882 there were no sci-math private docents at the Faculty, but after that their number steadily grew, so that in 1891 the Faculty reached the position of the median of the distribution and remained at that position or slightly below it until the end of the century. The status of the F. Phil. in Zagreb among Austro-Hungarian fs. phil. was better in terms of the number of private docents than in the number of professors, and particularly good in terms of the number of sci-math private docents.

On the other hand, this distribution shares some features with those discussed so far. First of all, it indicates an increase in the total number of sci-math private docents at the Austro-Hungarian fs. phil., visible in Graph 7. We can see that the number of private docents on average grew slightly faster than the number of sci-math professors, rising from 29 in 1875/76 to 83 in 1899/900, i.e. by 186.2%. Since the relative increase in the number of sci-math private docents was almost identical to the relative increase in the number of all docents, the share of sci-math private docents in the total number of private docents at Austro-Hungarian fs. phil. did not change from the beginning to the end of the period, in contrast to the share of sci-math professors, and remained 40%. Furthermore, we see that the growth in the number of sci-math private docents was not uniform, but was much faster in the first half of the period, just like the growth of the total number of docents (Graph 4), than in the second: by 1887/88, the number of sci-math private docents increased from 29 to 76 (in average 3.9 new docents per year), i.e. by 162.1%; from 1887/88 to the end

of the period, the number of sci-math private docents increased, with oscillations, from 76 to 83 (in average 0.6 new docents per year), i.e. by 9.2%. In other words, in the first half of the period, 87.0% of the total growth in the number of sci-math private docents was achieved, and in the second only 13.0%. Finally, let us mention that the relative increase in the number of private docents, just like the increase in the number of professors, was not equal in all scientific fields, which resulted in the change in structure shown in Graph 8.

Conclusion

The motive for this research is the open question of the extent to which the education that the F. Phil. in Zagreb provided to sci-math students during the last quarter of the 19th century was compatible with the university standard of the time. An important factor for evaluating this extent is the result of a comparative analysis of the structure of the Faculty's sci-math teaching staff, i.e. structure of the Department of Mathematics and Science of the Faculty, since the scope of sci-math lecturing directly depended on that structure. Universities in the Austro-Hungarian Monarchy form a suitable context for such a comparative analysis. In this paper, this context is used for a general consideration of the position of the F. Phil. in Zagreb among the fs. phil. in the Monarchy with regard to the number of full-time students, professors and private docents. The purpose of these more general considerations is to prepare the ground for a detailed comparative analysis of the structure of the Department of Mathematics and Science of the Faculty, i.e. outlining the broader picture of the status of the F. Phil. in Zagreb necessary for the discussion of the results of that analysis.

The results presented in this paper first of all show the dynamics of the situation at Austro-Hungarian fs. phil. in the considered period: great changes in the number of students and a significant increase in the number of professors and private docents. Therefore, it is not possible to fully assess the status of the F. Phil. in Zagreb without introducing a time dimension, but it can be said that on average the Faculty was the smallest f. phil. in terms of the number of professors, one of the two smallest fs. phil. in terms of the number of full-time students, and one of the three smallest in terms of the number of private docent. The presented results further show that the basic structure of the Department of Mathematics and Science of the F. Phil. in Zagreb was standard for Austro-Hungarian fs. phil. But while the number of sci-math private docents at the Faculty grew steadily, and in the second half of the period the Faculty was ranked among the medium-sized Austro-Hungarian fs. phil. in terms of this parameter, the number of sci-math professors at the Faculty was all the

time very small and fluctuated around the minimum defined by such a basic structure, so that in the considered period the Faculty was generally the smallest f. phil. in the Monarchy in terms of the number of sci-math professors. Although such lagging behind other fs. phil. cannot be directly justified by the small number of students, it cannot be unequivocally concluded that the structure of sci-math teaching staff at the F. Phil. in Zagreb in the considered period did not reach at least the minimum standards established at Austro-Hungarian universities, because for such a conclusion it would be necessary to know the distribution of sci-math professors by scientific fields at other fs. phil.

So, the next step in the development of the topic is a comparative analysis of the structure of the Department of Mathematics and Science of the F. Phil. in Zagreb in the context of the Austro-Hungarian fs. phil., which includes defining the standard distribution of sci-math professors and private docents by scientific fields based on the actual situation, account of changes in this standard during the considered period and assessment of the compatibility of the structure of the Department of Mathematics and Science of the F. Phil. in Zagreb with this standard. The results of this comparative analysis will be presented and discussed in the next paper.

Bibliography

Published Sources:

A Budapesti Királyi Magyar Tudomány-Egyetem Almanachja. Budapest: for the academic years from 1888/89 to 1899/900.

A Kolozsvári Magyar Királyi Ferencz-József-Tudomány-Egyetem almanachja és tanrendje. Cluj-Napoca: for the spring semester of the academic years from 1888/89 to 1899/900.

Akademičke oblasti, osoblje i red predavanja u Kr. sveučilištu Franje Josipa I. u Zagrebu. Zagreb: for the academic years from 1875/76 to 1899/900.

Hof- und Staatshandbuch der Österreichisch-Ungarischen Monarchie. Vienna: for the years 1876-1900.

Magyar statistikai évkönyv. Budapest: for the years 1876-1888, 1893-1900.

Oesterreichische Statistik. Statistik der Unterrichts-Anstalten in den im Reichsrathe vertretenen Königreichen und Ländern. Vienna: for the school years from 1881/82 (covers the period from 1875/76) to 1899/900.

Sbornik zakonah i naredabah valjanih za kraljevine Hrvatsku i Slavoniju. Zagreb: for the years 1874, 1879, 1894.

Literature

Dadić, Žarko, *Egzaktne znanosti u Hrvata u doba kulturnog i znanstvenog preporoda (1835. – 1900.)*. Zagreb: Izvori, 2010.

Kochansky-Devidé, Vanda. ed., *Spomenica Prirodoslovno-matematičkoga fakulteta 1874 – 1974. Prilikom stogodišnjice organiziranog znanstvenog i nastavnog rada iz prirodnih i matematičkih znanosti.* Zagreb: Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu, 1974.

Luetić, Tihana. "Brojčano stanje studenata Filozofskog fakulteta Sveučilišta u Zagrebu, odnosi sa drugim fakultetima i osvrt na izbor studija (1874. – 1914.)." In *Humanitas et litterae ad honorem Franjo Šanjek*, edited by Lovorka Čoralić and Slavko Slišković, 597-622. Zagreb: Dominikanska naklada Istina; Kršćanska sadašnjost, 2009.

Luetić, Tihana and Tihomir Vukelja, *Prirodoslovci i matematičari. Postanak domaće akademske prirodoslovno-matematičke zajednice u Hrvatskoj.* Zagreb: Srednja Europa, 2017.

Spomenica o 25-godišnjem postojanju Sveučilišta Franje Josipa I. u Zagrebu. Zagreb: Akademički senat, 1900.

Vukelja, Tihomir and Tihana Luetić, *Prirodoslovke i matematičarke. Prve žene u hrvatskoj akademskoj prirodoslovno-matematičkoj zajednici*. Zagreb: Srednja Europa, 2024.