ISSN 2282-0930 • Epidemiology Biostatistics and Public Health - 2023, Volume 18, Issue 1

Choosing a medical specialty course in Italy: explorative analysis of factors related to the choice

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SUMMARY

Background: In order to be able to access a course of medical or surgical specialization, in addition to the degree and the qualification to the profession it is necessary to perform an entrance test. In this study we wanted to analyze the possible factors that determined the choice of a given graduate school and the place where to attend it in the year 2021.
Study design: Cross-sectional study to evaluate the association between the type of graduate school, the score class obtained at the admission test, the location of the graduate school and the location of the degree.
Methods: The evaluation of the association between site of specialty admission and degree, score at degree and score at admission test was performed by multiple correspondences analysis (MCA). Then, through a logistic regression model, the Odds Ratios (OR) and the respective confidence interval with 95% (95%CI) confidence level of the covariates on the probability of remaining in the same degree site, or in the same region or in the same geographical area, were estimated.
Results The highest admission score and the highest age are significantly and independently associated with the probability of choosing, as a graduate school location, the same location where the degree was obtained.
Conclusion: In conclusion, the choice of the course and the location of the specialty course is made in most cases, taking into account the score made in the exam, based on the location where you attended the course of study in medicine and surgery.

Keywords: Medical Education; Competition; Young medical doctor; Medical specialities; Career choice.

BACKGROUND

In Italy, the issue specialty postgraduation degree in medical or surgical field is subject to the possession of a Degree in Medicine and Surgery and the qualification to practice the medical profession, as well as passing the entrance exam for access to specialty schools, and the completion of the related specialized training course.

Initially, access to the Schools of Specialty for medical doctors was governed by Legislative Decree no. 369 of 17 August 1999 [1], according to which the admission tests were held locally, on the same date each of the three areas (Medical, Surgical, Services) to which each specialty school belongs, with contents defined at national level, according to a prepared calendar. The selection boards were set up at local level, according to predetermined criteria and the applications administered were chosen from a public national database accessible to all. In addition to the score obtained in the entrance tests, each candidate was awarded a score relating to the degree mark and the curriculum of studies.

Since 2017, the procedures for admission of

DOI: 10.54103/2282-0930/19997
Accepted: 20th July 2023

doctors to specialty schools have been governed by Ministerial Decree no. 130 of 10 August 2017 [2], according to which the Medical specialty Schools are accessed through an annual test for qualifications and exams, in which the available places are indicated when the exam date is announced, divided for each school, the topics of study on which the questions are prepared no longer extrapolated from a public national database, the criteria for assigning the score, the calendar, the duration and the methods of carrying out and correcting the exam, as well as the application instructions, of a technical-IT nature, on the methods of administering the questions and correcting them, necessary to guarantee their reliability, transparency and uniformity.

The entrance test is mainly composed of questions related to the evaluation, within predefined mono and / or interdisciplinary scenarios, of clinical, diagnostic, analytical, therapeutic, and epidemiological data.

The questionnaire was entrusted to the Ministry, with the technical-operational support of Cineca, an Italian non-profit inter-university consortium, which, for this purpose, can make use of subjects with proven competence in the field.

Once the exam has been completed, the Ministry of Education, University and Research draw up a single national ranking, containing the overall score achieved by each candidate. In case of an equal score, the candidate who obtained the highest score in the exam prevails, in case of further parity, the youngest candidate.

Choosing a postgraduate career path is an important choice that is often difficult to change once in specialist training [3,4,5]. Career choices made by students shape the human resources landscape in healthcare, and a better understanding of the career choice process can help create a better match of students' preferences with specialist needs [6,7,8].

In the present study we wanted to analyze the possible factors that determined the choice of a given graduate school and the location where to attend it in the year 2021.

MATERIALS AND METHODS

The study was a cross-sectional on the results of the available list of participants to the selection. Data have been made available by Universitaly, that is the official web portal of MUR (Ministry of University and Research) that provide official rankings and allocations. Graduation site was obtained by subscription data of the National Federation of Physicians and Surgeons (Italian acronym FNOMCEO).

The movement of the student specializing between the place of graduation and the location of the graduate school was analyzed in relation to the score obtained on the admission test, age, gender and the presence or absence of the school chosen in the place of graduation. This shift has also been assessed at regional level. Then, through a logistic regression model, the Odds Ratios (OR) and the respective confidence interval with 95% (95%CI) confidence level of the covariates on the probability of remaining in the same degree site, or in the same region or in the same geographical area, were estimated.

The generalized linear models were used to compare, both by degree location and by chosen graduate school, the average scores achieved at the admission test between those who moved and those who did not move. The presence of the school in the place of graduation was considered as a possible modifier of effect. Multiple comparisons have been adjusted according to Tukey.

The evaluation of the multiple association between the type of graduate school, the score class obtained at the admission test, the location of the graduate school and the location of the degree was carried out through the application of the multiple correspondences analysis (MCA, multiple correspondence analysis, and the consequent creation of the Burt table. Scoring classes were identified based on percentiles of the score distribution (<5%, 5%-25%, 25%-50%, 50%-75%, 75-95%, >95%). The inertia of the first two dimensions identified by the MCA is the index for the evaluation of the variability explained by the association between the characteristics. The coordinates of the variables on the first two dimensions were represented graphically to be able to evaluate the associations between the characteristics of the variables.

The size and inertia of each feature were subsequently used as quantitative variables for the identification of aggregated characteristics which was carried out by means of a cluster analysis with the centroid method. In view of the number of graduate schools (in total = 50), as well as assuming that school locations, degree locations and scoring class can aggregate around each school, an approach was carried out with a high number of clusters, over 30, subsequently reduced to 25, in order to avoid clusters with isolated characteristics (clusters composed of a single point). To this end, the distance between the clusters and the loss of variability explained as the clusters decreased were considered, establishing not to fall below 95% of explained variability.

Data were analyzed by SAS software for PC and a $p<0.05$ was set for statistical significance.

RESULTS

The admission test to graduate schools was supported by 19442 graduates in medicine and surgery, however the analysis was carried out on 19269 participants; 173 participants were removed because of missing values on FNOMCEO data related to site of graduation. The average age (ds) is 28.7 years (4.7), of which 57.9% (11148/19269) male

and 42.1% female. A part of the participants appears as "fallen", that is, they have not made any choice or have not been able to obtain the desired choices: they are 3313 graduates, equal to 17.2% of all participants; have an average age (ds) of 29.9 years (5.7).

Among those entering graduate school, 4.2% (666/15968) have a score below 47 (percentile class between the minimum and 5th) points, 17.9% (2869/15968) have a score between 47 and 67 (percentile class 5th-25th), 22.7% (3617/15968) have a score between 67 and 80 (percentile class 25th-50th), 26.3% (4202/15968) have a score between 80 and 95 (percentile class 50°-75°), 23.1% (3685/15968) have a score between 95 and 114 (percentile class 75°-95°), 5.8% (921/15968) have a score between 114 and 138 (percentile class 95°-Maximum). For a residual 0.05% (8/15968) errors are found in the score which is therefore not analyzable.

57.9% (9238/15968) of those who enroll in a graduate school, change university location with respect to the degree location.

The highest admission score and the highest age are significantly and independently associated with the probability of choosing, as a specialty school location, the same location where the medical degree was obtained.

The choice not to change the location of graduate school with respect to the degree location is significantly associated with having achieved a higher score on the admission test and the higher age, respectively OR 1,007 for each additional point (95% CI 1,003-1,006) and OR 1,050 for each additional year (95% CI 1,041-1,059). When the location shift is evaluated between regions, in addition to the score and age, also the gender and the presence of the school within the same university location of graduation are significantly associated with a greater probability of choosing a school within the same region where the degree site is located: test score, OR 1,007 for each additional point (95% CI 1,005-1,008), Age, OR 1,051 for each additional year (95%CL 1,042-1,060); female (F vs M: OR 1.072, 95% CI 1.003-1.146), presence school in the degree (yes vs no: OR 3.801, 95% CI 3.400-4.250).

Tables 1 and 2 show the average scores per degree location and by type of graduate school, estimated in the group of those who move to a place of specialty other than the degree one and in the group of those who do not move. The relevant cases concern on the one hand graduates in Bologna and Palermo: those who remain in the same location have an average score significantly higher than those who choose other locations; on the other hand, the graduates in Foggia and Sassari for whom the highest score belongs to those who choose a school location different from the degree one. In relation to the School of Specialty, those who achieve a higher score on the admission test tend to choose the School in the same place of graduation, but the difference in score between those who change location of the university in which they graduated compared to those who do not change it, is statistically significant only for Schools in Radiodiagnostics, Internal Medicine, Hygiene and Pathological Anatomy.

The multiple correspondence analysis (figures 1, 2, 3 and 4) allows to highlight any associations between the score, locations and type of specialty school chosen. The graphs show the arrangement of the characteristics according to the first two dimensions that explain 23.2% of the variability. A decreasing trend can be observed in the score from left to right and the schools that orbit around the points corresponding to the scoring class on the test represent the type of school preferred over the score; another trend from left to top (II quadrant) to bottom right (IV quadrant) shows the arrangement of the degree seats and specialty locations, according to a north-south axis.

The analysis of the clusters identified the 25 groups that are shown in 4 different figures. Cluster formation allows for a better interpretation of the associations between features. Cluster 6, the first to be encountered from the left (Figure 1), contains high scores (above the 95th percentile), the graduate school in dermatology, the headquarters of the San Raffaele University School in Milan. This aggregation means that those who obtained the highest scores were able to choose first, and preferentially choose as a school the one in dermatology (regardless of the location) and as the seat of the school the San Raffaele University of Milan (regardless of the school). In the immediate vicinity (Figure 1) are clusters 2, 7 and 8. Cluster 2 mainly aggregates graduate school locations that are located in central and northern Italy. Cluster 7 mainly aggregates the scoring class between the 75th and 95th percentile and some types of specialty school obviously very coveted (Plastic Surgery, Neurology, Ophthalmology, Cardiology, Endocrinology, Diseases of the Digestive System and Pediatrics) and. Cluster 8, on the other hand, mainly contains graduate school locations at the universities of Milan.

The association of the scoring class with the locations is less clear: these clusters mainly contain degree and school locations in the central north, without a particular association between the type of school and the school location or flows between locations being highlighted, rather it could be the confirmation that the location chosen for the specialty is the same or close to the degree location.

Clusters 1 and 4 (Figure 1) are located at the bottom and rather detached from the other points (also compare the provisions in figures 2, 3 and 4); these represent the university campuses of Campania, highlighting the tendency to remain in the graduation region or to move within the region. This feeling is also confirmed in the points that belong to clusters 3, 5 and 10. These clusters are located around the point that represents the scoring class between the 5th and 25th percentiles.

Clusters 11 to 14 (Figure 2) are very close to each other (remember that the proximity of the points is not necessarily an indication of the strength of the association). Cluster 13 is characterized mainly by types of graduate schools and contains the scoring class between the 25th percentile and the median. Clusters 11, 12 and 14 mainly group together degree and school campuses: in particular, clusters 12 and 14 group the Roman universities.

Cluster 15 (Figure 3) contains the class of points between the median and 75th percentile, Northeast school and graduate locations, and graduate schools such as vascular surgery, pediatric surgery, psychiatry.

The last clusters, from 17 to 25 (Figure 4), represent almost regional aggregations of locations, both undergraduate and graduate school.

DISCUSSION AND CONCLUSIONS

The analysis of multiple matches, before being carried out to date for this topic allows to evaluate the association between the type of school chosen, the result of the test and the location of the preferred school.

The analyses presented did not highlight mobility flows. The idea that higher rankings choose more prestigious locations is not fully supported by the data. The result that has been obtained suggests that there is little mobility between the locations: the competitors prefer to stay in their own graduation site or in nearby locations. In addition, what emerges from the data is that doctors who achieve high scores and who have graduated from university campuses in the south prefer to move to universities in the north. However, the mobility flows highlighted may depend on the unavailability of places for graduates of the location rather than on the ranking and prestige of the school location [9]. Another hypothesis could rise from incurring costs related to mobility, our data couldn't help to analyze deeply this aspect: probably the mobility has taken place from the matriculation at first year of the graduation course, then once settled the student prefer to not move; on the other hand, those who cannot afford the mobility have chosen a site near home, even if they didn't realize their main ambition. Further studies are necessary to explore these hypothesis, with questionnaires to students.

However, the study has limitations. First, the analysis was carried out only on the choice made, not being aware of what the initial preferences of the competitors were. This information is essential to better interpret the association between score and type of school. Although it is quite evident that the highest score corresponds to schools such as dermatology, plastic surgery and ophthalmology, there is no information to say that the highest rankings (highest test points) choose the schools. It cannot also be excluded that among the highest rankings there are candidates who have indicated other schools than those previously mentioned.

In various research the chosen specialty was similar to those observed in this research [10]. More in-depth analyses, however, have shown how it is possible to associate the choice with the expectations of personal and professional fulfilment, with a view to a good life-work balance [11,12].

Specializations related to public health and general practice, as observed in our analysis, are less preferred [10], and often associated with the female sex [13,14].

These observations open to the further observation to the planning of specialty with respect to the real needs of the Italian healthcare system, anyway the choice of young doctors does not always take this last aspect into account [9]. However, the data available to us do not allow us to further investigate this aspect arising from the literature.

In an exploratory analysis, but not shown, carried out considering the evaluations of the Censis surveys (data not shown), it associates the top ten positions with the northern universities to which mainly northern graduate students did access, but it was not possible to associate types of schools.

It should also be noted that as of 27 January 2022 the number of unassigned contracts, compared to 18847 contracts announced 2539 contracts were not covered, equal to 13.5%. As can be seen from Table 3, however, there is great inhomogeneity: there are specializations that are in fact completely occupied, compared to very high percentages of unoccupied places in other specializations.

To the 2539 contracts 276 training contracts already abandoned must be added and therefore can no longer be awarded. The provisional result is therefore 15% of unoccupied posts. Solutions to avoid this waste of resources could be in a guided choice during the degree course [9,14,15], to increase awareness of their own propensity to certain specialty. Some authors have studied the personality trait of student (extraversion, conscientiousness, agreeableness, neuroticism, openness) [16], but these aspects couldn't be evaluated through the analysis of the simple provisional ranking.

In conclusion, the choice of the course and the location of the specialty course is made in most cases, taking into account the score made in the exam, based on the location where you attended the course of study in medicine and surgery. However, taking into account that the distribution of places in the different specialty should have the purpose of training a given number of specialists having in mind the demand and needs of the Italian health system, it emerges as a criticality that the specialty in which the demand does not meet the supply are the same in which there is greater shortage: for the specialty in emergency medicine compared to 1189 banned posts, only 665 were occupied, equal to 44.1%.

With this work, we wanted to explore factors involved in the choice of the specialty course and give an analysis that could help to give direction during the training of the Italian medical doctor accounting for the need of the sustainability of Italian national health system.

REFERENCES

1. Legislative Decree no. 369, 17 August 1999, Implementation of directive 93/16/EEC on the free movement of doctors and mutual recognition of their diplomas, certificates and other qualifications and of directives 97/50/EC, 98/21/EC, 98/63/EC and 99/46/EC amending directive 93/16/EEC)). pubblicato nella Official Bullettin of Italian Republic n. 250, 23 ottobre 1999 – Ordinary Supplement n. 187, (Amendment Official Bulletin. n. 44, 23 febbraio 2000)
2. Ministry of Education University and Research, Decree 10 August 2017, n. 130 Regulation of admission test to schools of specialization in medicine and surgery, Official Bullettin of Italian Republic n. 208, 06/09/2017.
3. Ladha F.A., Pettinato A.M. and Perrin A.E. Medical student residency preferences and motivational factors: a longitudinal, single-institution perspective. BMC Med Educ 2022;22(1):187.
4. Douglas Jones M.J., Yamashita T., Ross R.G. and Gong J. Positive predictive value of medical student specialty choices, BMC Med Educ 2018;18:33.
5. Woolf K., Elton C. and Newport M. The specialty choices of graduates from Brighton and Sussex Medical School: a longitudinal cohort study. BMC Med Educ 2015;15:46.
6. Di Silverio P., Conte A., D'Arenzio M., Ragazzo F., Atzeni D., Fodale A, [Specialistic Medical Educationa and triennal plannig] Formazione Specialistica e Programmazione triennale, Dirigenza Medica, n.1, 2018.
7. Di Silverio P., Conte A., D'Arenzio M., Ragazzo F., Atzeni D., Fodale A., [An algorythm to determine number of physicians required] Medici, un algoritmo sui fabbisogni, Il Sole 24 Ore Sanità, n.3, 2018.
8. Detsky A.S., Gauthier S.R., Fuchs V.R. Specialization in Medicine. How Much Is Appropriate? JAMA. 2012; 307; 5.
9. Errichiello C., De Gregorio MG. The new exam for admission to Specialty Schools in medicine and surgery: lights and shades. Il nuovo concorso nazionale italiano di accesso alle scuole di specializzazione: luci e ombre. Giornale di Tecniche Nefrologiche e Dialitiche 2015; (3):195-197.
10. Norredam M., Album D. Prestige and its significance for medical specialties and diseases. Scand J Public Health, 2007; 35: 655–661.
11. Sarikhani Y., Ghahramani S., Bayati M., Lotfi F. and Bastani P. A thematic network for factors affecting the choice of specialty education by medical students: a scoping study in lowand middle-income countries, BMC Med Educ; 21(1):99.
12. Hohf-Nova M., Hun-Pacheco R., Muñoz-Bustos D., Soto-Carriel A. and Pérez-Villalobos C. When it is time to decide: factors associated to the choice of a medical specialty. Rev Med Chile 2021,149:1352-1359.
13. Asaad M., Zayegh O., Badawi J. et al. Gender differences in specialty preference among medical Students at Aleppo University: a cross-sectional study, BMC Med Educ 2020;20:184.
14. Morte K., Nelson D., Marenco C., Lammers D., De Barros M., Bader J., and Bingham J., Gender Differences in Medical Specialty Decision Making: The Importance of Mentorship. J Surg Res 2021; (267): 678–686.
15. Hao K.A., Fu S., Islam S., Larson S.D., Mustafa M.M., Petroze R.T., and Taylor J.A. Medical Student Career Choice: Who Is the Influencer?. J Surg Res 2022; (272): 9–16.
16. Kwon O.Y. and Park S.Y. Specialty choice preference of medical students according to personality traits by Five-Factor Model, Korean J Med Educ 2016; 28(1): 95-102.

TABLES

Table 1. Average scores achieved by aspiring postgraduates in relation to the degree location and whether they have changed university location for graduate school.

Graduation Location	specialty **in another location**	specialty **same location**	**adj p-value**
SS	81,51±1,74	67,16±2,05	**0,0003**
FG	75,53±1,9	64,09±1,83	**0,0302**
AQ	80,03±1,45	69,88±1,96	**0,0555**
FE	82,1±1,29	72,5±2,14	0,1663
PV	86,47±1,2	78,39±2,11	0,5437
VA	85,84±1,75	77,98±2,6	0,9941
UNIMOL	78,53±1,89	70,89±7,19	1,0000
SI	84,59±1,34	77,25±2,21	0,9238
UNPIE	89,56±2,03	82,51±3,18	1,0000
VR	92,23±2,13	86,34±1,91	1,0000
PG	81,92±1,2	76,84±1,82	0,9989
RM_TV	81,41±1,24	76,89±1,79	1,0000
CA	81,94±1,77	77,82±1,35	1,0000
UD	90,14±2,54	86,07±3,48	1,0000
PD	88,61±1,29	84,88±1,06	0,9994
POLMAR	89,42±1,99	85,81±1,54	1,0000
UNCAM	77,34±0,87	74,27±1,13	0,9998
PI	84,65±1,45	81,93±1,38	1,0000
CZ	75,26±1,39	72,63±1,69	1,0000
FI	87,95±1,3	85,58±1,31	1,0000
NA_FED	84,55±1,09	82,86±1,16	1,0000
CH	79,26±1,23	78,17±1,87	1,0000
GE	83,53±1,62	82,6±1,22	1,0000
RM_SAP	81,42±0,69	81,49±0,83	1,0000
RM_BIO	84,41±1,57	84,74±3,27	1,0000
BA	74,14±1,29	74,99±1,13	1,0000
PR	81,73±1,28	82,67±1,89	1,0000
TO	85,02±1,42	86,77±0,93	1,0000
MI_BIC	89,2±1,79	91,25±2,49	1,0000
ME	68,17±1,12	70,29±1,43	1,0000
BS	82,26±1,66	84,42±1,46	1,0000
MO_RE	77,95±2,05	80,54±1,83	1,0000
CT	75,72±0,97	79±1,22	1,0000
TS	83,74±1,74	88,63±2,27	1,0000
MI_SRAF	92,81±1,5	98,93±2,68	1,0000
MI	87,82±1,23	94,07±1,17	0,2066
SA	80,39±1,21	87,25±2,24	0,9748
BO	82,85±1,1	90,31±1,24	**0,0092**
PA	71,67±0,82	79,57±1,04	**<,0001**
RM_CAT	85±1,19	93,05±1,66	0,0999
MI_HUM	91,2±2,47	104,1±5,28	0,9998

ISSN 2282-0930 • Epidemiology Biostatistics and Public Health - 2023, Volume 18, Issue 1

Table 2. Average scores achieved by aspiring postgraduates in relation to the type of specialization school chosen and whether they have changed university location for the specialization school.

Postgraduate School	specialty **in a location other than Bachelor's degree**	specialty **in the same degree location**	**adj p-value**
MedTer	46,79±13,99		
Stat	71,36±3,88	47,11±6,26	0,7034
Farm	55,24±3,39	50,12±2,34	1,0000
Alim	71,88±2,4	68,11±2,41	1,0000
CardCh	80,13±1,79	76,75±2,86	1,0000
ChPla	109,4±1,39	106,53±2,81	1,0000
Mdig	101,55±1,2	98,81±1,35	1,0000
Oto	94,62±1,26	93,01±1,61	1,0000
Micr	55,11±3,5	53,82±2,56	1,0000
Minf	75,69±1,05	74,51±1,15	1,0000
Gen	66,87±2,51	66,89±2,65	1,0000
MedSp	89,83±1,98	90,04±2,56	1,0000
Reum	93,51±1,63	93,82±1,95	1,0000
MedUrg	63,72±0,92	64,11±0,88	1,0000
ChVas	76,69±1,55	77,24±2,07	1,0000
Audio	60,8±3,06	61,46±4,04	1,0000
ChMax	85,12±2,16	85,94±3,3	1,0000
Npi	82,84±1,04	83,93±1,43	1,0000
Onc	83,24±0,99	84,33±1,19	1,0000
Derm	111±1,41	112,24±1,74	1,0000
Ema	86,14±1,17	87,41±1,32	1,0000
ChGen	70,88±0,76	72,72±0,81	1,0000
ChPed	80,58±1,87	82,53±3,88	1,0000
Allerg	85,99±1,81	88,12±2,01	1,0000
Ort	83,55±0,78	86,07±1,03	1,0000
Anest	68,95±0,48	71,59±0,55	0,2163
MedNuc	55,9±2,6	58,62±2,75	1,0000
Ped	101,29±0,62	104,15±0,76	0,8755
MedLeg	83,39±1,32	86,33±1,62	1,0000
Mresp	80,87±0,99	83,82±1,1	1,0000
Mcard	106,84±0,66	110,13±0,8	0,6737
PatCl	53,88±2,11	57,32±1,66	1,0000
Neur	102,39±0,98	105,83±1,21	1,0000
Oft	102±1,06	105,65±1,47	1,0000
Psi	79,46±0,69	83,34±0,86	0,4137
Gin	94,39±0,73	98,36±1,03	0,7618
Rad	53,04±2,04	57,06±2,05	1,0000
Radiagn	83,28±0,64	87,33±0,75	**0,0462**
MedInt	77,81±0,66	82,37±0,66	**0,0008**
MedLav	71,79±1,3	76,55±1,38	0,9981
Uro	81,87±1,07	86,9±1,36	0,9356

MedFis	71,81±1	76,96±1,23	0,7353
NeurCh	90,52±1,55	95,71±2,37	1,0000
Ger	67,56±0,99	72,89±0,88	0,0924
Endo	98,85±1,18	104,38±1,38	0,8768
MedCom	53,79±2,44	59,63±2,7	1,0000
Ig	60,53±0,77	66,38±0,78	**0,0001**
Nefr	69,15±1,03	75,96±1,43	0,2030
ChTor	60,98±2	71,66±2,65	0,7699
AnaPat	62,93±1,98	74,68±1,63	**0,0153**

Table 3. Contracts not awarded as of 26 January 2022

	Banned contracts	**Unassigned contracts**	**Abandoned contracts**	**% unallocated + abandoned**
Thermal medicine	4	3	1	100,0%
Microbiology and virology	154	104	2	68,8%
Clinical Pathology and Clinical Biochemistry	347	228	0	65,7%
Emergency medicine	1189	665	11	56,9%
Pharmacology and Clinical Toxicology	119	63	0	52,9%
Health Statistics and Biometrics	39	20	0	51,3%
Nuclear medicine	112	55	1	50,0%
Radiotherapy	186	90	3	50,0%
Pathological anatomy	216	80	5	39,4%
Medical genetics	96	31	1	33,3%
Community and Primary Care Medicine	89	27	1	31,5%
Audiology and phoniatrics	46	12	2	30,4%
Cardiac surgery	108	16	12	25,9%
Thoracic Surgery	99	22	3	25,3%
Anaesthesia Resuscitation	2155	358	42	18,6%
Food science	87	14	2	18,4%
Infectious and Tropical Diseases	393	59	11	17,8%
General Surgery	817	103	29	16,2%
Paediatric surgery	80	11	0	13,8%
Nephrology	341	40	5	13,2%
Vascular Surgery	147	14	5	12,9%
Hygiene and preventive medicine	809	78	13	11,2%
Geriatrics	545	55	4	10,8%
Internal medicine	1151	89	20	9,5%
Diseases of the respiratory system	418	33	5	9,1%
Haematology	287	19	7	9,1%
Urology	309	8	15	7,4%
Medical Oncology	378	23	5	7,4%

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Physical and rehabilitation medicine	369	22	5	7,3%
Maxillofacial surgery	69	5	0	7,2%
Sports and exercise medicine	98	7	0	7,1%
Occupational medicine	244	14	2	6,6%
Rheumatology	142	9	0	6,3%
Child neuropsychiatry	304	16	2	5,9%
Allergology and clinical immunology	117	4	2	5,1%
Orthopaedics and traumatology	580	16	13	5,0%
Gynaecology and Obstetrics	623	21	10	5,0%
Neurosurgery	125	2	4	4,8%
Forensics	207	7	2	4,3%
Radio diagnostics	985	27	10	3,8%
Diseases of the digestive system	267	10	0	3,7%
ENT	218	6	2	3,7%
Psychiatry	759	21	6	3,6%
Neurology	362	10	2	3,3%
Endocrinology and metabolic diseases	251	2	4	2,4%
Reconstructive and aesthetic plastic surgery	133	2	0	1,5%
Paediatrics	973	11	3	1,4%
Ophthalmology	281	2	1	1,1%
Diseases of the cardiovascular system	849	5	3	0,9%
Dermatology and venereology	170	0	0	0,0%
Total	**18847**	**2539**	**276**	**14,9%**

Table 4. Award of the first 1000 contracts

Specialty	**N.**
Diseases of the cardiovascular system	277
Paediatrics	139
Dermatology and venereology	79
Neurology	69
Ophthalmology	58
Reconstructive and aesthetic plastic surgery	39
Gynaecology and Obstetrics	38
Endocrinology and metabolic diseases	36
Diseases of the digestive system	32
Internal medicine	26
Psychiatry	22
Radio diagnostics	21
Haematology	19
Orthopaedics and traumatology	19

Anaesthesia Intensive Care And Pain Intensive Care	18
ENT	12
Infectious and Tropical Diseases	10
Neurosurgery	9
General Surgery	8
Medical Oncology	8
Rheumatology	8
Urology	7
Allergology and clinical immunology	6
Pathological anatomy	6
Geriatrics	5
Cardiac surgery	3
Diseases of the respiratory system	3
Emergency medicine	3
Forensics	3
Child neuropsychiatry	3
Paediatric surgery	2
Vascular Surgery	2
Sports and exercise medicine	2
Physical and rehabilitation medicine	2
Maxillofacial surgery	1
Thoracic Surgery	1
Medical genetics	1
Hygiene and preventive medicine	1
Nephrology	1
Health Statistics and Biometrics	1

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Figure 1. Scatter plot of data point for clusters 1 -10. Data Point are university of graduation (GR_), university sites of specialization school (SP_), the specific school and the result at the selection exam. The x-axes is related to a geographical trend in school university from north to south, and to a trend in decreasing result of the exam. The y-axes is related to the graduation university.

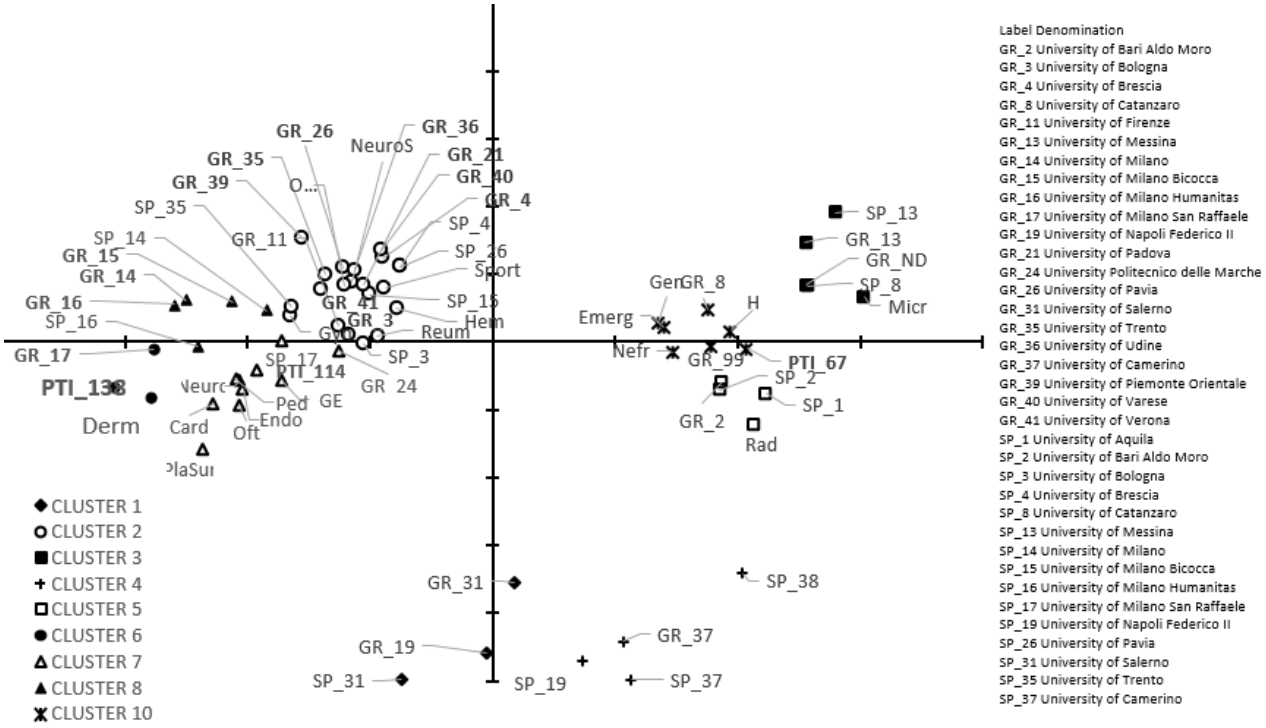
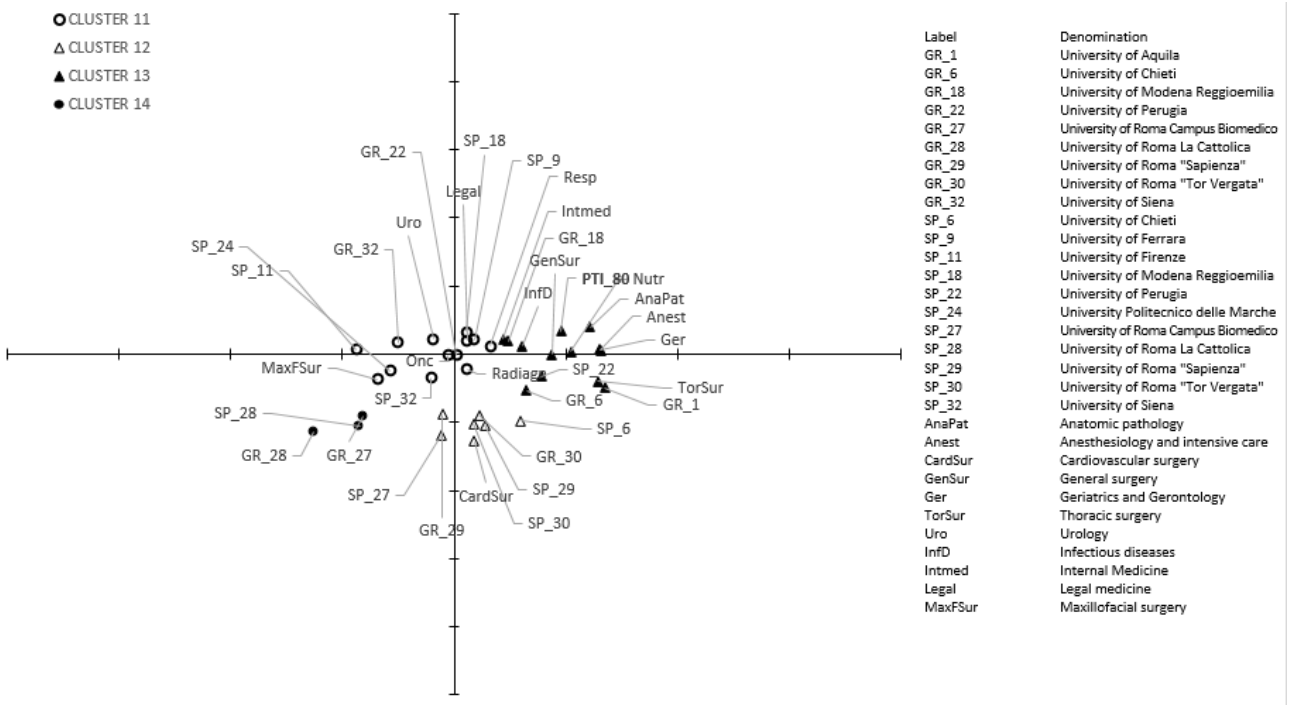


Figure 2. Scatter plot of data point for clusters 11 -14. Data Point are university of graduation (GR_), university sites of specialization school (SP_), the specific school and the result at the selection exam. The x-axes is related to a geographical trend in school university from north to south, and to a trend in decreasing result of the exam. The y-axes is related to the graduation university.



Label	Denomination
GR_1	University of Aquila
GR_6	University of Chieti
GR_18	University of Modena Reggioemilia
GR_22	University of Perugia
GR_27	University of Roma Campus Biomedico
GR_28	University of Roma La Cattolica
GR_29	University of Roma "Sapienza"
GR_30	University of Roma "Tor Vergata"
GR_32	University of Siena
SP_6	University of Chieti
SP_9	University of Ferrara
SP_11	University of Firenze
SP_18	University of Modena Reggioemilia
SP_22	University of Perugia
SP_24	University Politecnico delle Marche
SP_27	University of Roma Campus Biomedico
SP_28	University of Roma La Cattolica
SP_29	University of Roma "Sapienza"
SP_30	University of Roma "Tor Vergata"
SP_32	University of Siena
AnaPat	Anatomic pathology
Anest	Anesthesiology and intensive care
CardSur	Cardiovascular surgery
GenSur	General surgery
Ger	Geriatrics and Gerontology
TorSur	Thoracic surgery
Uro	Urology
InfD	Infectious diseases
Intmed	Internal Medicine
Legal	Legal medicine
MaxFSur	Maxillofacial surgery

Figure 3. Scatter plot of data point for cluster 15. Data Point are university of graduation (GR_), university sites of specialization school (SP_), the specific school and the result at the selection exam. The x-axes is related to a geographical trend in school university from north to south, and to a trend in decreasing result of the exam. The y-axes is related to the graduation university.

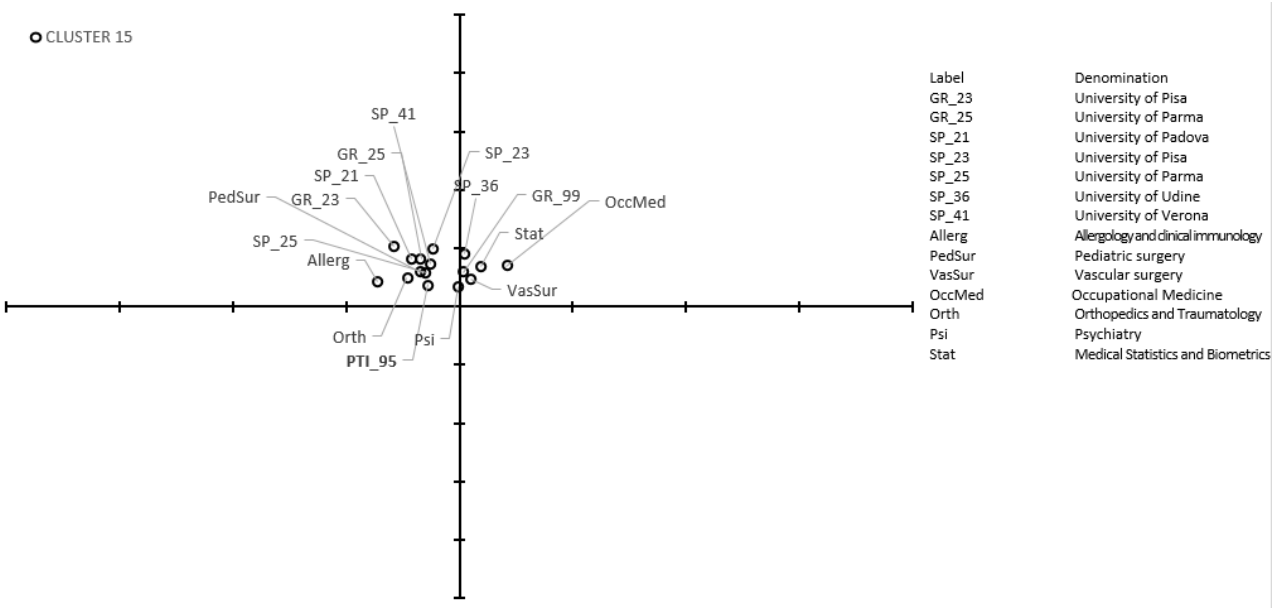


Figure 4. Scatter plot of data point for clusters 17 - 25. Data Point are university of graduation (GR_), university sites of specialization school (SP_), the specific school and the result at the selection exam. The x-axes is related to a geographical trend in school university from north to south, and to a trend in decreasing result of the exam. The y-axes is related to the graduation university.