Table A.1: list of departments of the University of Turin

ID	Department of:
1	Socio-economic and statistical sciences
2	**M**athematics
3	Economics and statistics
4	**P**olitics, culture and society
5	Literatures and modern cultures
6	Philosophy and education sciences
7	Law
8	History
9	Computer science
10	Forestry and food science
11	Veterinary sciences
12	Clinical and biological sciences
13	Life sciences and systems biology
14	Earth science
15	Psychology
16	Chemistry
17	Humanities
18	Medical sciences
19	Chirurgical sciences
20	Neuroscience
21	Management

22	Public health and pediatric sciences
23	Molecular biotechnology
24	Inter-university of territorial policies
25	Physics
26	Oncology
27	Science and technology of drugs
28	n.d.(not defined)

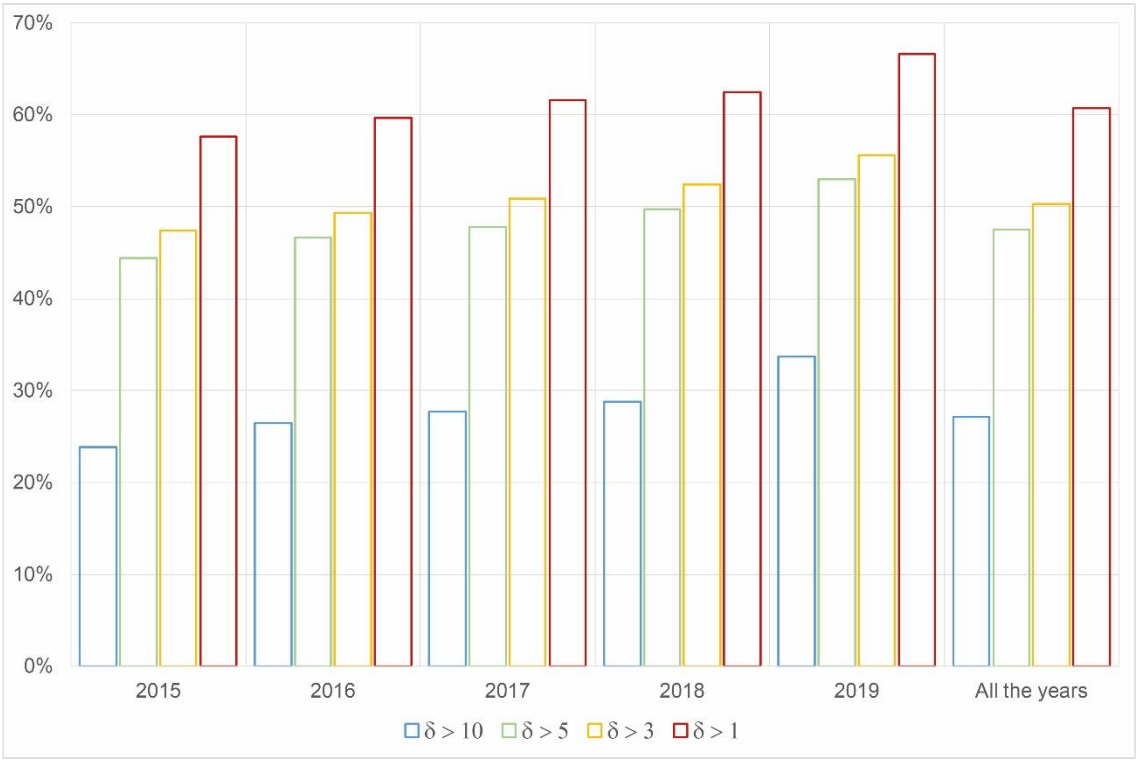
70%
60%
50%
40%
30%
20%
10%
0%
2015
2016
2017
2018
2019
All the years
δ > 10
δ > 5
δ > 3
δ > 1

Fig. B.1.a.

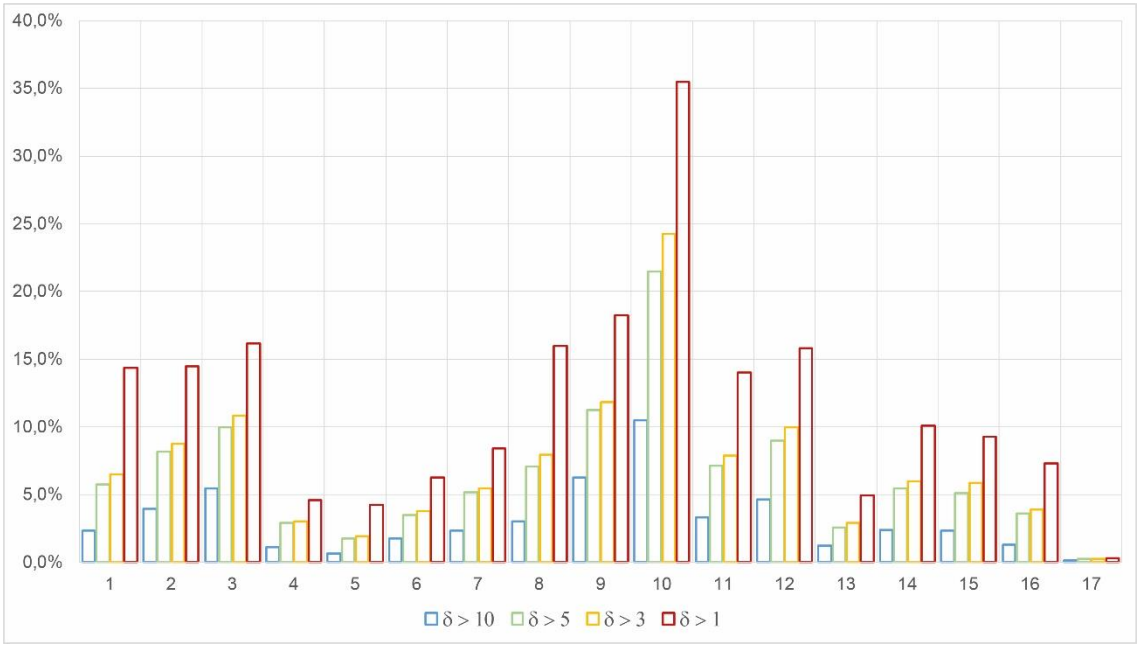

Fig. B.1.b.

Figure B.1: percentage of selected contributions with different thresholds. (a) Percentage of selected contributions per year related to all SDGs over the total research production of the University of Turin. (b) Percentage of selected contributions per SDG for the period 2015-2019 over the total research production of the University of Turin.

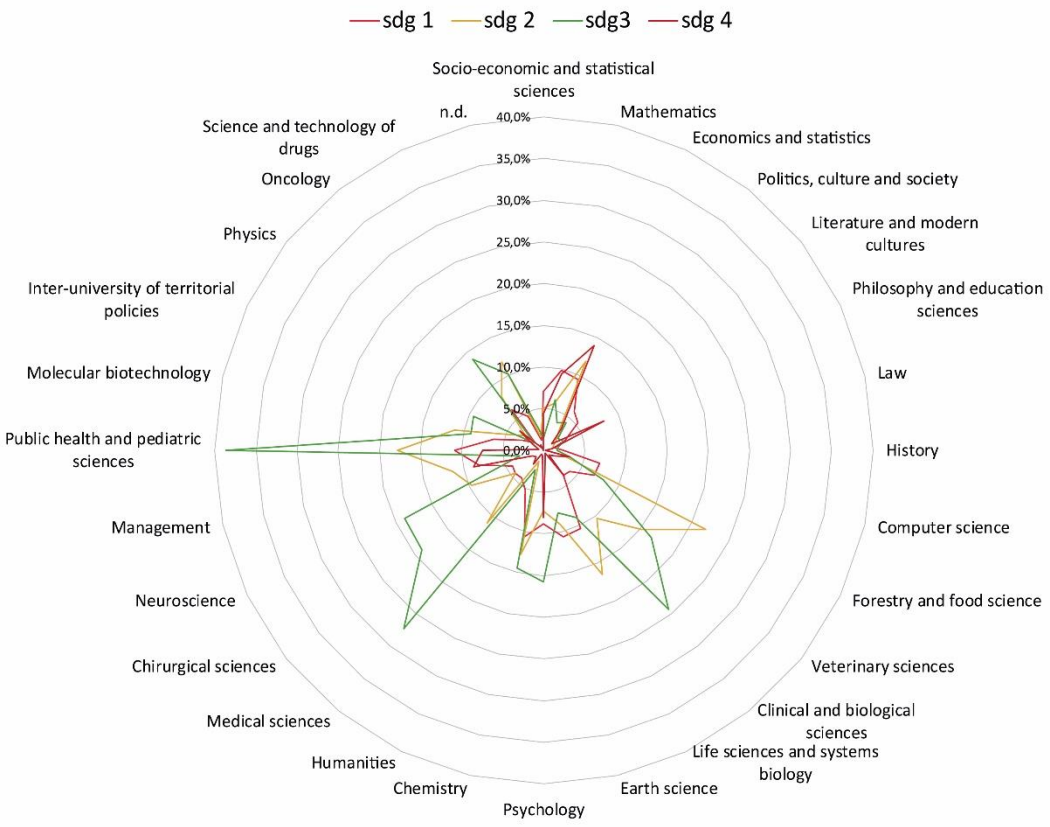
sdg 1
sdg 2
sdg3
sdg 4
Socio-economic and statistical sciences
Mathematics
Economics and statistics
Politics, culture and society
Literature and modern cultures
Philosophy and education sciences
Law
History
Computer science
Forestry and food science
Veterinary sciences
Clinical and biological sciences
Life sciences and systems biology
Earth science
Psychology
Chemistry
Humanities
Medical sciences
Chirurgical sciences
Neuroscience
Management
Public health and pediatric sciences
Molecular biotechnology
Inter-university of territorial policies
Physics
Oncology
Science and technology of drugs
n.d.
40,0%
35,0%
30,0%
25,0%
20,0%
15,0%
10,0%
5,0%
0,0%

Fig. B.2.a.

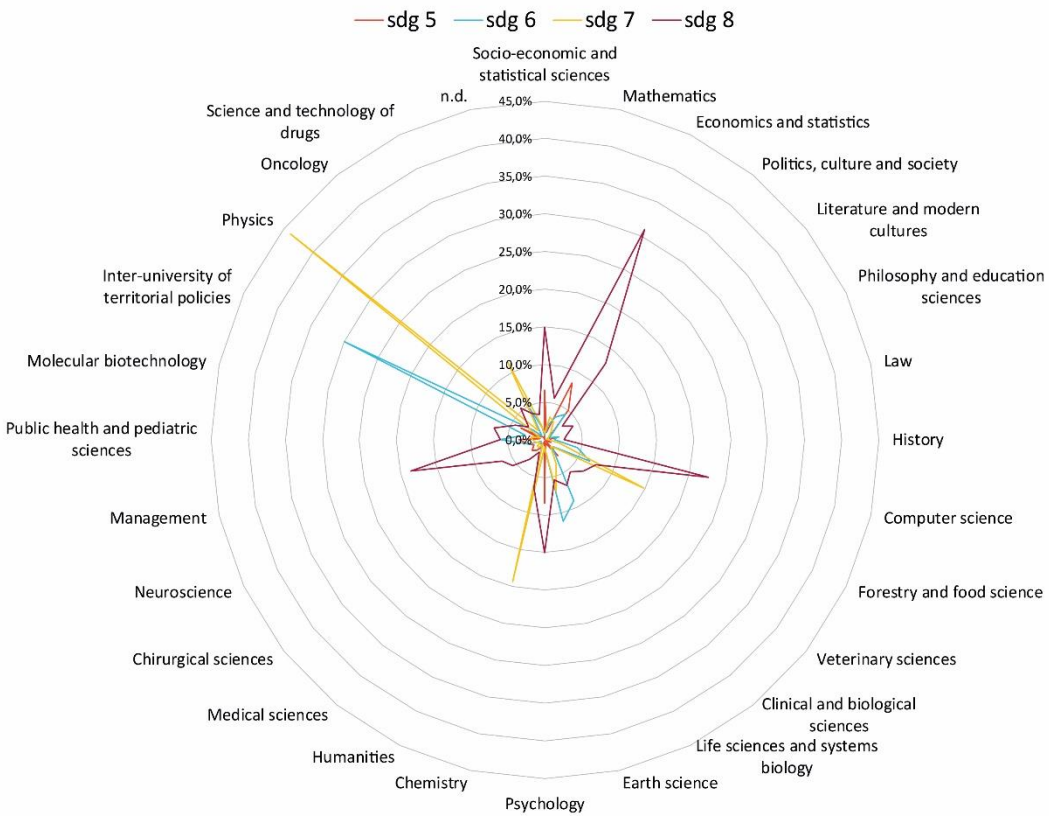
sdg 5
sdg 6
sdg 7
sdg 8
Socio-economic and statistical sciences
Mathematics
Economics and statistics
Politics, culture and society
Literature and modern cultures
Philosophy and education sciences
Law
History
Computer science
Forestry and food science
Veterinary sciences
Clinical and biological sciences
Life sciences and systems biology
Earth science
Psychology
Chemistry
Humanities
Medical sciences
Chirurgical sciences
Neuroscience
Management
Public health and pediatric sciences
Molecular biotechnology
Inter-university of territorial policies
Physics
Oncology
Science and technology of drugs
n.d.
45,0%
40,0%
35,0%
30,0%
25,0%
20,0%
15,0%
10,0%
5,0%
0,0%

Fig. B.2.b.

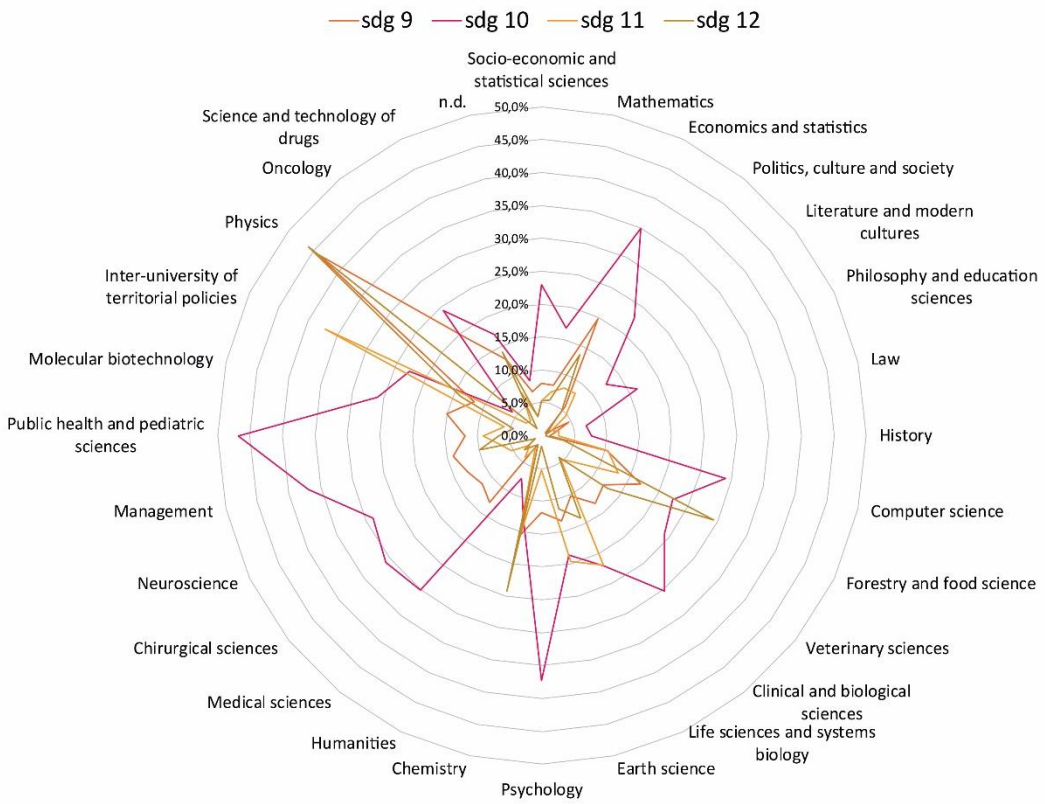
sdg 9
sdg 10
sdg 11
sdg 12
Socio-economic and statistical sciences
Mathematics
Economics and statistics
Politics, culture and society
Literature and modern cultures
Philosophy and education sciences
Law
History
Computer science
Forestry and food science
Veterinary sciences
Clinical and biological sciences
Life sciences and systems biology
Earth science
Psychology
Chemistry
Humanities
Medical sciences
Chirurgical sciences
Neuroscience
Management
Public health and pediatric sciences
Molecular biotechnology
Inter-university of territorial policies
Physics
Oncology
Science and technology of drugs
n.d.
50,0%
45,0%
40,0%
35,0%
30,0%
25,0%
20,0%
15,0%
10,0%
5,0%
0,0%

Fig. B.2.c.

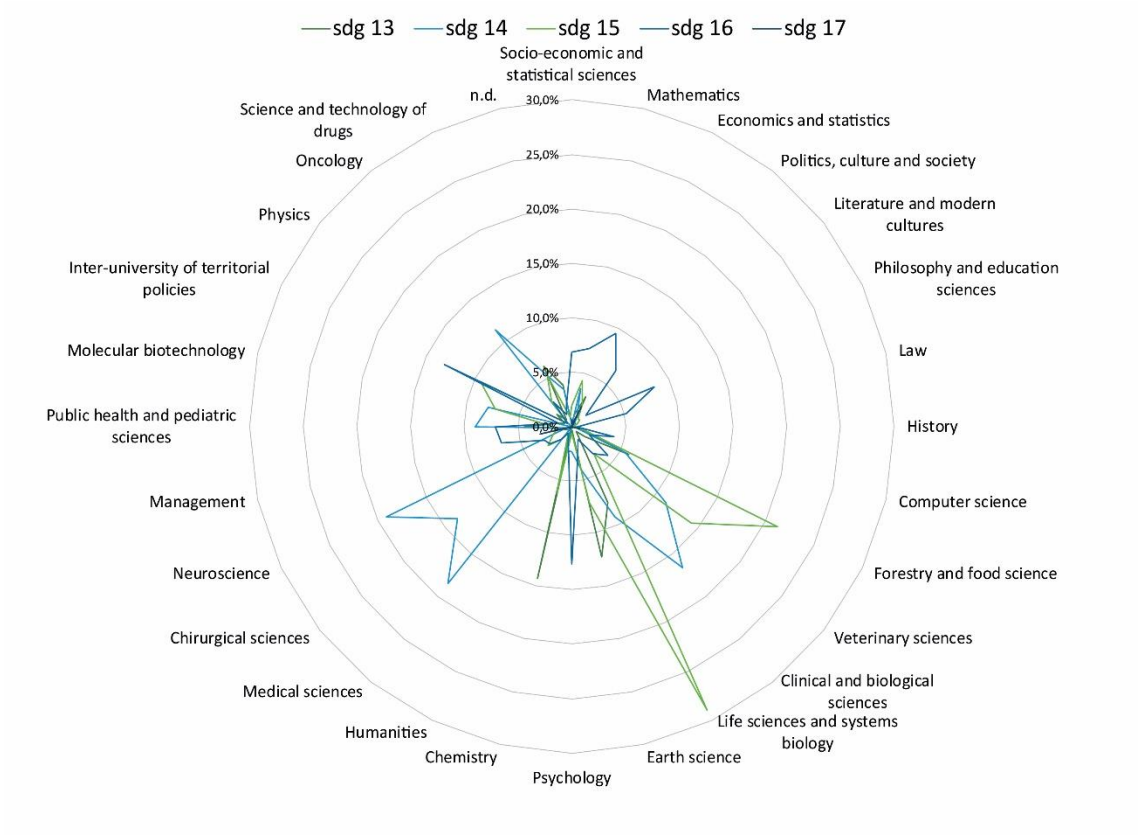

Fig. B.2.d.

Figure B.2: Percentage of contributions (over the total of contributions per department) for each SDG. (a) SDG 1 – 4. (b) SDG 5 – 8. (c) SDG 9 – 12. (d) SDG 13 – 17

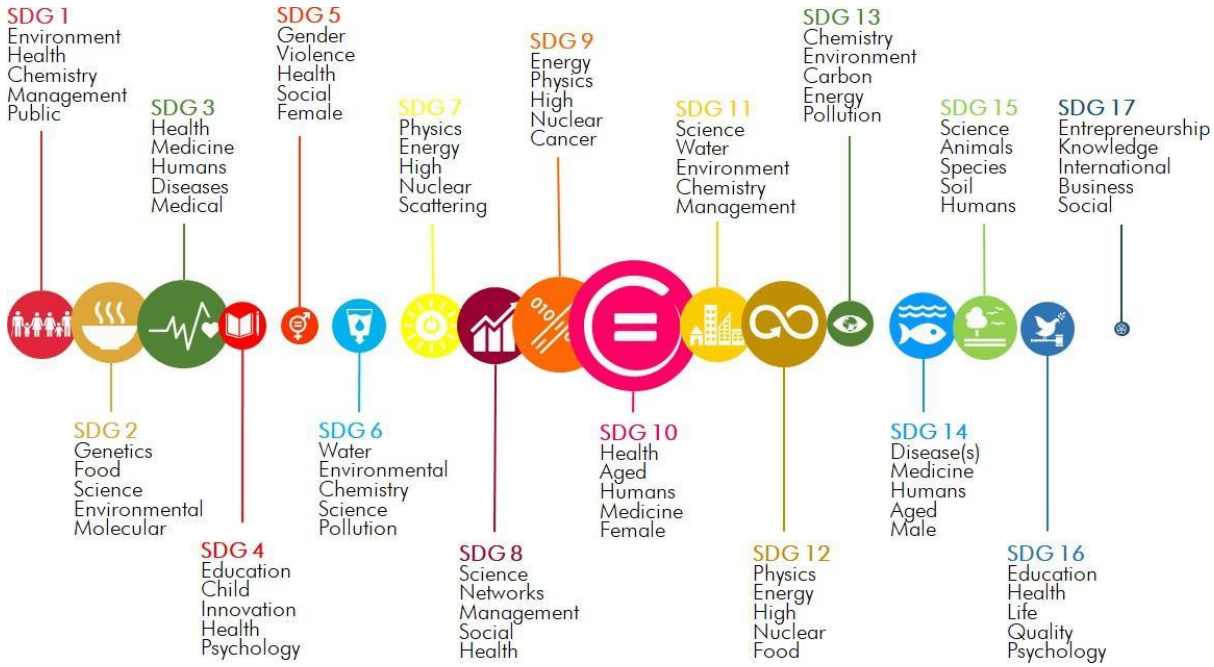

Figure C.1: Top five keywords extracted from abstract and authors keywords from selected contributions for each SDG.

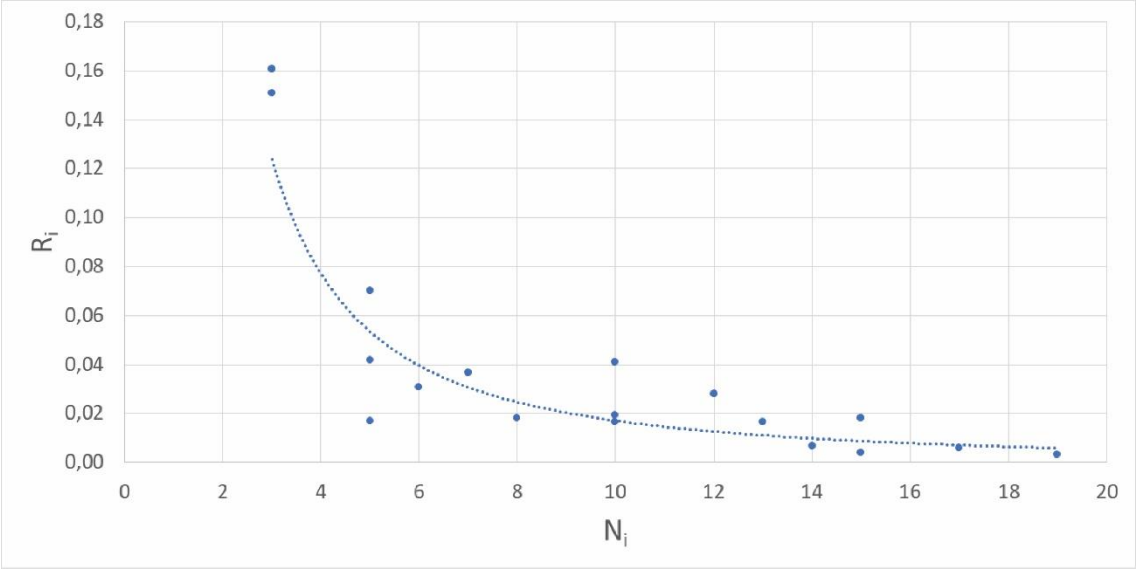
0,18
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
R_i
0
2
4
6
8
10
12
14
16
18
20
N_i

Fig. D.1.a.

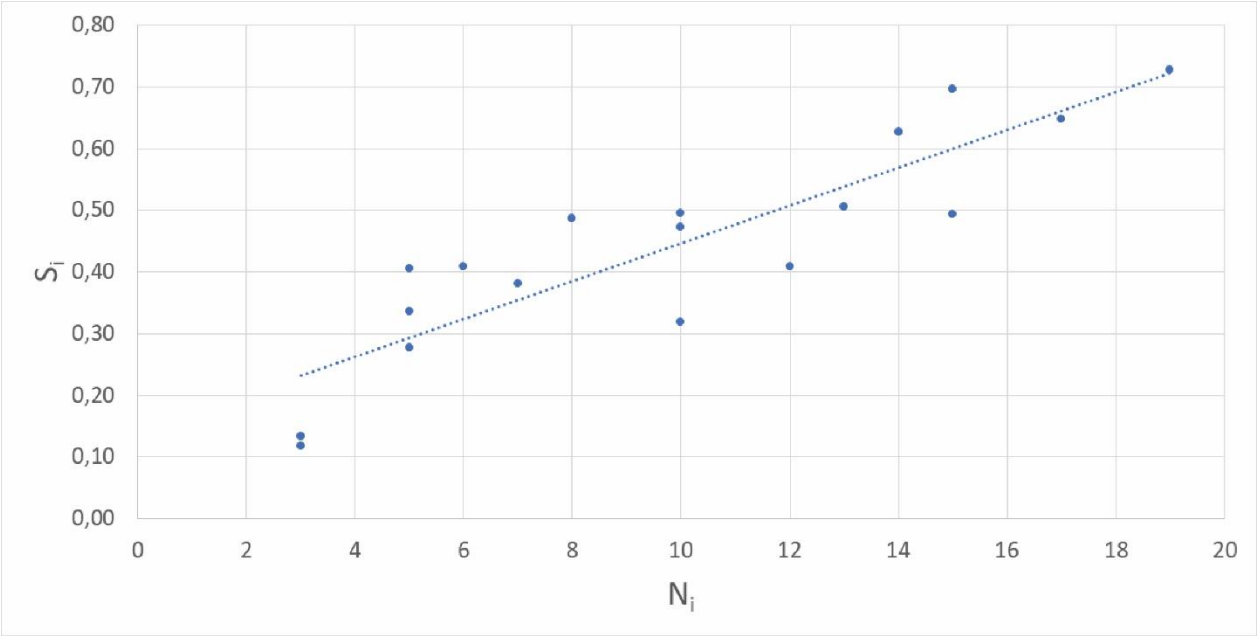

Fig. D.1.b.

Figure D.1: Variance and entropy as function of the number of departments N_i. (a) σ^2 vs N_i.(b) S_i vs N_i

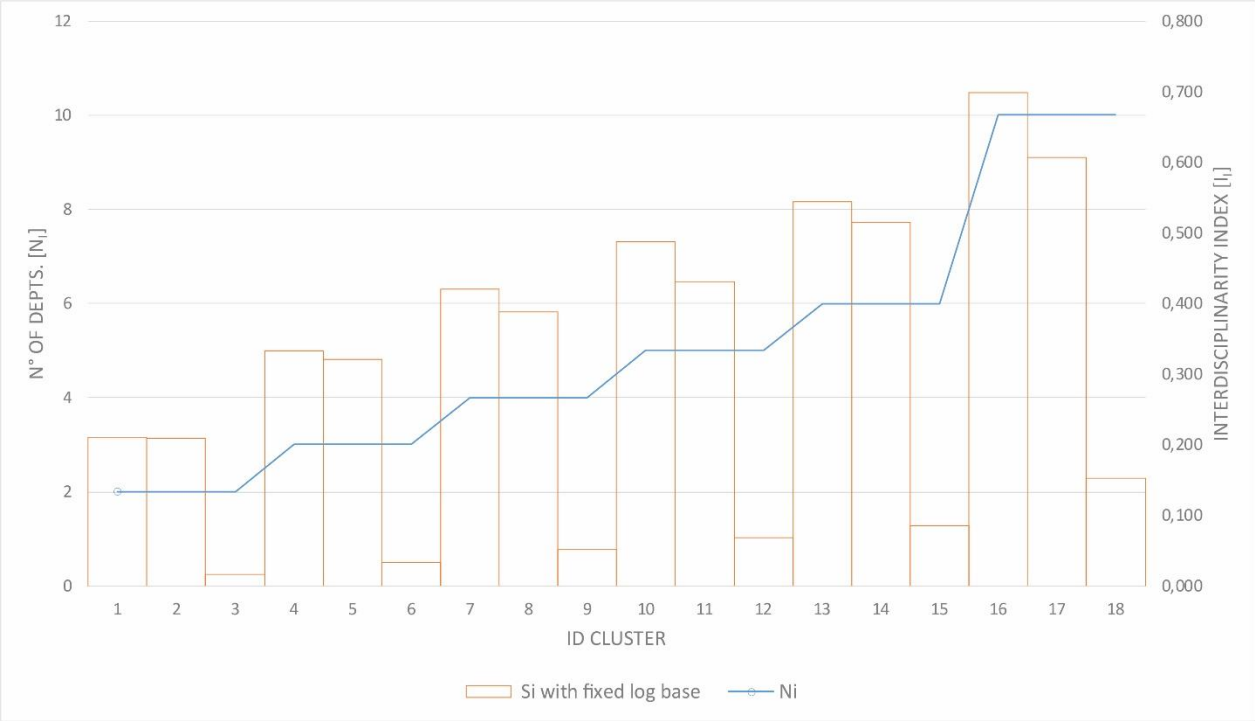
12
10
8
6
4
2
0
N° OF DEPTS. [N_i]
0,800
0,700
0,600
0,500
0,400
0,300
0,200
0,100
0,000
INTERDISCIPLINARITY INDEX [I_i]
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
ID CLUSTER
Si with fixed log base
Ni

Fig. D.2.a.

Fig. D.2.b.

Figure D.2: Comparison between the behavior of the entropy with a fixed logarithm base (equal to N) and the entropy with a variable logarithm base (equal to N_i). (a) $\boldsymbol{S_i = -\sum_{j=1}^{N} P_{ij} log_N P_{ij}}$ (b) $\boldsymbol{S_i = -\sum_{j=1}^{N} P_{ij} log_{Ni} P_{ij}}$

Supplementary Information

A. Context: University of Turin

The University of Turin is a generalist University with 27 departments spanning from philosophy and law to physics and medicine. Table A.1 shows the list of all the 27 departments.

Insert Table A.1 here

B. Scoring, ranking, and labelling results

In this section the detailed results are discussed in terms of ranking per SDG and per department related to the University of Turin. The results here presented are in support to allow readers to better contextualize the results presented in the case study.

Insert Figure B.1 (B.1.a and B.1.b) here

Figure B.1 shows the percentage of selected contributions for the entire analyzed database for different thresholds ($\delta = 1, 3, 5, 10$). Figure B.1a represents the total percentage of the selected contributions per year over the annual production, from 2015 to 2019, related to all SDGs, while Figure B.1b exhibits the percentage per SDG over the total research production of the University of Turin. Finally, the selected contributions were checked by analysing the frequency list of the words used by authors within the abstract and the keywords, in order to validate the extracted dataset of contributions. Considering the contribution of each department (Figure B.2), excluding publications in Italian language, as well as publications made by not permanent staff, the Department of Agricultural, Forestry and Food sciences (DISAFA) is one of the best performer, considering the percentage of publications about SDGs. Taking into account each of the 17 SDGs, the departments of *chemistry*, *earth science*, *public health and pedriatic sciences* are those dealing more with SDG1. SDG2 is a common subject in the department of *forestry and food sciences*, *life sciences and biology of systems* as well as in the department of *public health and pediatric sciences*. SDG3, which relates to health and well-being, is studied consistently by the departments of *public health and pediatric sciences*, *medical sciences* as well as *clinical and biological sciences*. The departments of *mathematics*, *economics and statistics* and *management* are the most involved on SDG4. One of the least popular SDG at the University of Turin is SDG5 which is dealt with by the department of *psychology* and by the department of *economics and statistics*. SDG6 is studied by the department of *chemistry* and *inter-university of territorial policies*, while SDG7 involves mostly the departments of *chemistry* and *physics*. SDG8 is a relevant matter of research for the departments of *management*, *computer science* and *economics and statistics*; SDG9 involves the departments of *physics*, *oncology*, *economics and statistics*. As mentioned before, SDG10 is popular among several departments but the most relevant contributions come from *public health and pediatric science*, *psychology* and *management*. SDG11 is a topic faced mainly by *inter-university of territorial policies*, *life sciences and systems biology*, *earth sciences*, while SDG12 is studied by the departments of *chemistry*, *physics*, *forestry and food sciences*. SDG13 is dealt with by the departments of *chemistry* and *earth sciences*, while the departments of *neurosciences*,

medical sciences, *clinical and biological sciences* focus on SDG14. In the matter of research related to SDG15 the departments of *life sciences and systems biology* and *forestry and food sciences*, as well as *veterinary sciences* play a significant role. SDG16 is studied by the *inter-university of territorial policies* and the department of *psychology*. Finally, SDG17, whose production is smaller compared to the other SDGs, involves the departments of *management* and *economics and statistics*.

Insert Figure B.2 (B.2.a, B.2.b, B.2.c and B.2.d) here

C. Validation of the scoring, ranking, and labelling process

Figure C.1 shows the top five authors' keywords for each SDG extracted from all analyzed contributions. The size of SDGs symbols represents the number of relevant contributions over the total of the analyzed contributions. The obtained frequency list of authors' keywords was used to further validate and check the methodology. The expanded dictionary was obtained by analyzing the frequency list of each word within the authors' keywords from every contribution with a threshold higher than $\delta = 5$ as discussed in the *methods* section.

Insert Figure C.1 here

D. Interdisciplinarity Sustainability Index

Insert Figure D.1 (D.1.a and D.1.b) here

Figure D.1 shows the behaviour of the variance $\boldsymbol{\sigma_i^2}$ versus the number of clusters $\boldsymbol{N_i}$ (Figure D.1a) and the entropy $\boldsymbol{S_i}$ versus $\boldsymbol{N_i}$ (Figure D.1b). $\boldsymbol{\sigma_i^2}$ has a potential trend with respect to $\boldsymbol{N_i}$, as $\boldsymbol{N_i}$ increases $\boldsymbol{\sigma_i^2}$ decreases and, generally, $\boldsymbol{\sigma_i^2 \to 0}$, $\boldsymbol{N_i \gg 1}$. Thus, for very large $\boldsymbol{N_i}$, the differences between clusters, in terms of internal distributions tend to be less and less recognizable. It is straightforward to say that the variance alone it's not a good estimator for the interdisciplinarity, even if a complex index which takes into account $\boldsymbol{N_i}$and $\boldsymbol{\sigma_i^2}$could be. Figure D.1b shows the linear behaviour of the entropy; indeed, $\boldsymbol{S_i}$is proportional to $\boldsymbol{N_i}$ and it maintains its linearity also for large $\boldsymbol{N_i}$. Moreover, the entropy defined according to equation 2, with the base of the logarithm equal to the maximum number of departments $\boldsymbol{N}$, is normalized between 0 and 1, where $\boldsymbol{S_i = 1 \;\Leftrightarrow\; N_i = N \;\; AND \;\; P_{ij} = \frac{1}{N}, \forall\, i,j = 1,2,\ldots,N}$, i.e. it occurs only when the cluster $\boldsymbol{i}$ has the maximum number of involved departments ($\boldsymbol{N}$) and each one contributes equally ($\boldsymbol{P_{ij} = \frac{1}{N}}$). Thus, the entropy is a better estimator for interdisciplinarity than the variance, with a double advantage: 1) it weights/rewards proportionally the increasing number of involved disciplines and 2) is a normalized index. The second feature, in particular, may allow comparisons among different HEIs with a different number of departments.

Several other indices may be defined. The choice to adopt one index or another one mainly depends on which behavior has to be pointed out. For instance, Figure D.2 shows a comparison between some ad hoc data, used to highlight the extreme behavior of the entropy defined by equation 2 (Figure D.2a) and a different definition of entropy with a variable base of the logarithm for each cluster (Figure D.2b), i.e. equal to the involved departments $\boldsymbol{N_i}$ within cluster $\boldsymbol{i}$. In the second case, the entropy is defined as $\boldsymbol{S_i} = -\sum_{j=1}^{N} \boldsymbol{P_{ij}} \boldsymbol{log_{Ni}} \boldsymbol{P_{ij}}$. Figure D.2 represents the trend of the two entropy definitions for a hypothetical case study with an incremental number of involved departments each triplet. The first cluster of each triplet, i.e. ID=1,4,7,10,13,16, always shows the case of equally distributed contributions ($\boldsymbol{\sigma_i^2 = 0}$) while the third one, i.e. ID=3,6,9,12,15,18, represents a completely asymmetrical distribution where the contribution of one department weighs more than the 90%.

Insert Figure D.2 (D.2.a and D.2.b) here

The middle case is an intermediate case between the two extreme cases. The entropy with variable base, for instance, allows to reward, with the same weight, clusters with a similar distribution within the cluster itself. In other words, a cluster with two equally distributed departments ($\boldsymbol{N_i = 2}; \boldsymbol{P_{i1} = P_{i2} = \frac{1}{2}}$) has the same resulting maximum entropy ($\boldsymbol{S_i = 1}$) of a cluster with ten equally distributed departments ($\boldsymbol{N_i = 10}; \boldsymbol{P_{ij} = \frac{1}{10, \forall j = 1,2,\ldots,10}}$), as shown in Figure E.2b. On the contrary, the entropy definition used in this study rewards more the cluster with a greater $\boldsymbol{N_i}$ even if the departments within the two clusters are equally distributed.