A Universidade do Porto no CWTS Leiden Ranking 2018

Universidade do Porto. Reitoria.
Gabinete de Estudos Estratégicos e Melhoria Contínua
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Sumário

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http://www.leidenranking.com/

1. Metodologia do CWTS Leiden Ranking 2018

"Information
The CWTS Leiden Ranking 2018 uses a sophisticated bibliometric methodology. Detailed information on the different elements of this methodology is available on the following pages:

- Data
- Universities
- Fields
- Indicators
- Updates and corrections

In addition, we also provide guidelines on the responsible use of the Leiden Ranking and university rankings more generally."[1]

"Data

The CWTS Leiden Ranking 2018 is based exclusively on bibliographic data from the Web of Science database produced by Clarivate Analytics. Below we discuss the Web of Science data that is used in the Leiden Ranking. We also discuss the enrichments made to this data by CWTS.

Web of Science
The Web of Science database consists of a number of citation indices. The Leiden Ranking uses data from the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The Leiden Ranking is based on Web of Science data because Web of Science offers a good coverage of the international scientific literature and generally provides high quality data.
The Leiden Ranking does not take into account conference proceedings publications and book publications. This is an important limitation in certain research fields, especially in computer science, engineering, and the social sciences and humanities.

Enriched data
CWTS enriches Web of Science data in a number of ways. First of all, CWTS performs its own citation matching (i.e., matching of cited references to the publications they refer to). Furthermore, in order to calculate the distance-based collaboration indicators included in the Leiden Ranking, CWTS performs geocoding of the addresses listed in publications in Web of Science. Most importantly, CWTS puts a lot of effort in assigning publications to universities in a consistent and accurate way. This is by no means a trivial issue. Universities may be referred to using many different name variants, and the definition and delimitation of universities is not obvious at all. The methodology employed in the Leiden Ranking to assign publications to universities is discussed here .

More information
More information on the citation matching that is performed by CWTS is provided in a paper by Olensky, Schmidt, and Van Eck (2016). For more information on the geocoding of addresses, we refer to a paper by Waltman, Tijssen, and Van Eck (2011).

- Olensky, M., Schmidt, M., & Van Eck, N.J. (2016). Evaluation of the citation matching algorithms of CWTS and iFQ in comparison to Web of Science. *Journal of the Association for Information Science and Technology*, 67(10), 2550–2564. (paper, preprint)
- Waltman, L., Tijssen, R.J.W., & Van Eck, N.J. (2011). Globalisation of science in kilometres.*Journal of Informetrics, 5*(4), 574–582. (paper, preprint)" [2]

[1] http://www.leidenranking.com/information , acedido 16 de maio de 2018
[2] http://www.leidenranking.com/information/data , acedido 16 de maio de 2018

“Universities

The CWTS Leiden Ranking 2018 includes 938 universities worldwide. These universities have been selected based on their number of Web of Science indexed publications in the period 2013–2016. As discussed below, a sophisticated data collection methodology is employed to assign publications to universities.

Identification of universities

Identifying universities is challenging due to the lack of clear internationally accepted criteria that define universities. Typically, a university is characterized by a combination of education and research tasks in conjunction with a doctorate-granting authority. However, these characteristics do not mean that universities are particularly homogeneous entities that allow for international comparison on every aspect. As a result of its focus on scientific research, the Leiden Ranking presents a list of institutions that have a high degree of research intensity in common. Nevertheless, the ranking scores for each institution should be evaluated in the context of its particular mission and responsibilities, which are strongly linked to national and regional academic systems. Academic systems - and the role of universities therein - differ substantially between countries and are constantly changing. Inevitably, the outcomes of the Leiden Ranking reflect these differences and changes.

The international variety in the organization of academic systems also poses difficulties in terms of identifying the proper unit of analysis. In many countries, there are collegiate universities, university systems, or federal universities. Instead of applying formal criteria, whenever possible we follow common practice based on the way these institutions are perceived locally. Consequently, we treat the University of Cambridge and the University of Oxford as entities, whereas in the case of the University of London we distinguish between the constituent colleges. For the United States, university systems (e.g. the University of California) are split up into separate universities. The higher education sector in France, like in many other countries, has gone through several reorganizations in recent years. Many French institutions of higher education have been grouped together in *Communautés d'Universités et Etablissements* (COMUEs), succeeding the earlier *Pôles de Recherche et d'Enseignement Supérieur* (PRES). Except in the case of full mergers, the Leiden Ranking still distinguishes between the different constituent institutions.

Publications are assigned to universities based on their recent configuration. Changes in the organizational structures of universities up to 2017 have been taken into account. For example, in the Leiden Ranking 2018, Grenoble Alpes University encompasses all publications previously assigned to Joseph Fourier University, Pierre Mendès-France University, and Stendhal University.

Affiliated institutions

A key challenge in the compilation of a university ranking is the handling of publications originating from research institutes and hospitals affiliated with universities. Among academic systems, a wide variety exists in the types of relations maintained by universities with these affiliated institutions. Usually, these relationships are shaped by local regulations and practices affecting the comparability of universities on a global scale. As there is no easy solution for this issue, it is important that producers of university rankings employ a transparent methodology in their treatment of affiliated institutions.

CWTS distinguishes three different types of affiliated institutions:

1. Component
2. Joint research facility or organization
3. Associated organization

In the case of a *component*, the affiliated institution is actually part of or controlled by the university. Universitaire Ziekenhuizen Leuven is an example of a component, since it is part of the legal entity of Katholieke Universiteit Leuven.

A *joint research facility or organization* is the identical to a component except that it is administered by more than one organization. The Brighton & Sussex Medical School (the joint

medical faculty of the University of Brighton and the University of Sussex) and Charité (the medical school of both the Humboldt University and the Freie Universität Berlin) are examples of this type of affiliated institution.

The third type of affiliated institution is the *associated organization*, which is more loosely connected to a university. This organization is an autonomous institution that collaborates with one or more universities based on a joint purpose but at the same time has separate missions and tasks. In many countries, hospitals that operate as teaching or university hospitals fall into this category. The Massachusetts General Hospital, one of the teaching hospitals of the Harvard Medical School, is an example of an associated organization.

The Leiden Ranking 2018 counts a publication as output of a university if at least one of the affiliations in the publication explicitly mentions either the university or one of its components or joint research facilities. In a limited number of cases, affiliations with academic hospitals that are not controlled or owned by the university are also treated as if they were mentioning the university itself. The rationale for this is that in some cases academic hospitals – although formally being distinct legal entities – are so tightly integrated with the university that they are commonly perceived as being a component or extension of that university. Examples of this situation include the university medical centers in the Netherlands and some of the academic health science systems in the United States and other countries. In these cases, universities have actually delegated their medical research and teaching activities to the academic hospitals and universities may even no longer act as the formal employer of the medical researchers involved. In other cases, tight integration between a university and an academic hospital may manifest itself by an extensive overlap in staff. In this situation, researchers may not always mention explicitly their affiliation with the university. An example of this tight integration is the relation between the University Hospital Zurich and the University of Zurich.

The list of academic hospitals that have been treated as a component of a university for the 2018 edition is available **here**. Inevitably, some degree of arbitrariness is involved in the decision to treat an academic hospital as a component even though it constitutes an independent legal entity. We have discussed this in more detail in a **blog post**.

Affiliated organizations that are not classified as a component or a joint research facility or treated as such are labeled as associated organizations. In the case of publications with affiliations from associated organizations, a distinction is made between publications from associated organizations that also mention the university and publications from associated organizations that do not include a university affiliation. In the latter case, a publication is not considered to originate from the university. On the other hand, if a publication includes an affiliation from a particular university as well as an affiliation from an associated organization, both affiliations are considered to represent that particular university. The effect of this procedure depends on the **counting method** that is used in the calculation of bibliometric indicators. The procedure influences results obtained using the fractional counting method, but it has no effect on results obtained using the full counting method.

Selection of universities

The Leiden Ranking 2018 includes 938 universities from 55 different countries. These are all universities worldwide that have produced at least 1000 Web of Science indexed publications in the period 2013–2016. Only so-called **core publications** are counted, which are publications in international scientific journals. Also, only research articles and review articles are taken into account. Other types of publications are not considered. Furthermore, collaborative publications are counted fractionally. For instance, if a publication includes five authors of which two belong to a particular university, the publication is counted with a weight of 2 / 5 = 0.4 for that university.

It is important to note that universities do not need to apply to be included in the Leiden Ranking. The universities included in the Leiden Ranking are selected by CWTS according to the procedure described above. Universities do not need to provide any input themselves.

Data quality

The assignment of publications to universities is not free of errors, and it is important to emphasize that in general universities do not verify and approve the results of the Leiden Ranking data collection methodology. Two types of errors are possible. On the one hand, there may be false positives, which are publications that have been assigned to a university when in

fact they do not belong to the university. On the other hand, there may be false negatives, which are publications that have not been assigned to a university when in fact they do belong to the university. The data collection methodology of the Leiden Ranking can be expected to yield substantially more false negatives than false positives. In practice, it turns out to be infeasible to manually check all addresses occurring in Web of Science. Because of this, many of the 5% least frequently occurring addresses in Web of Science have not been manually checked. This can be considered a reasonable upper bound for errors, since most likely the majority of these addresses do not belong to universities." [3]

"Fields

The CWTS Leiden Ranking 2018 provides statistics not only at the level of science as a whole but also at the level of the following five main fields of science:

- Biomedical and health sciences
- Life and earth sciences
- Mathematics and computer science
- Physical sciences and engineering
- Social sciences and humanities

As discussed below, these five main fields are defined based on large number of micro-level fields.

Algorithmically defined main fields

Each publication of a university belongs to one, or sometimes to more than one, of the above main fields. If a publication belongs to more than one main field, the publication is assigned fractionally to each of the main fields. For instance, a publication belonging to two main fields is assigned to each of the two fields with a weight of 1 / 2 = 0.5.

Publications are assigned to the five main fields using an algorithmic approach. Traditionally, fields of science are defined by sets of related journals. This approach is problematic especially in the case of multidisciplinary journals such as *Nature*, *PLOS ONE*, *PNAS*, and *Science*, which do not belong to one specific scientific field. The five main fields listed above are defined at the level of individual publications rather than at the journal level. In this way, publications in multidisciplinary journals can be properly assigned to a field.

Publications are assigned to main fields in the following three steps:

1. We start with 4047 micro-level fields of science. These fields are constructed algorithmically. Using a computer algorithm, each publication in Web of Science is assigned to one of the 4047 fields. This is done based on a large-scale analysis of hundreds of millions of citation relations between publications.
2. We then determine for each of the 4047 micro-level fields the overlap with each of the 249 journal subject categories defined in Web of Science (excluding the *Multidisciplinary Sciences* subject category).
3. Each subject category in Web of Science has been linked to one of the five main fields. Based on the link between subject categories and main fields, we assign each of the 4047 micro-level fields to one or more of the five main fields. A micro-level field is assigned to a main field if at least 25% of the publications in the micro-level field belong to subject categories linked to the main field.

After the above steps have been taken, each publication in Web of Science has an assignment to a micro-level field, and each micro-level field in turn has an assignment to at least one main field. Combining these results, we obtain for each publication an assignment to one or more main fields.

The link between subject categories and main fields can be found in this **Excel file**.

[3] http://www.leidenranking.com/information/universities , acedido 16 de maio de 2018.

Overview of micro-level fields

Information on the 4047 micro-level fields is available in this **Excel file**. For each micro-level field, the file provides the following information:

- Numerical identifier (integer value between 1 and 4047).
- Number of publications in a micro-level field (2000–2017).
- List of the main fields to which a micro-level field belongs.
- List of the five journals with the largest number of publications in a micro-level field.
- List of five characteristic terms extracted from the titles of the publications in a micro-level field.

[…]

It should be noted that the micro-level fields play an important role in the calculation of the field-normalized **impact indicators** in the Leiden Ranking.

Assignment of publications to micro-level fields

CWTS and Clarivate Analytics have jointly decided to make the definitions of the micro-level fields publicly available. For each publication in Web of Science in the period 2006–2016 (*article* and *review* document types only), the Web of Science accession number (also known as the UT code) is made available along with a link to the micro-level field to which the publication has been assigned. Also, for each publication it is indicated whether the publication has been classified as **a core or a non-core publication**. If you want to get access to the definitions of the micro-level fields, please briefly tell us about the purpose for which you want to use the field definitions. To do so, please fill out the form below. CWTS and Clarivate Analytics will not share your data with other parties. The definitions of the micro-level fields are made available for non-commercial use. Redistribution and commercial use are not allowed.

[…]"[4]

"Indicators

The CWTS Leiden Ranking 2018 offers a sophisticated set of bibliometric indicators that provide statistics on the scientific impact of universities and on universities' involvement in scientific collaboration. The indicators available in the Leiden Ranking are discussed in detail below.

Publications

The Leiden Ranking is based on publications in the Web of Science database produced by Clarivate Analytics. The most up-to-date statistics made available in the Leiden Ranking are based on publications in the period 2013–2016, but statistics are also provided for a number of earlier periods. Web of Science includes a number of citation indices. The Leiden Ranking uses the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. Only publications of the Web of Science document types *article* and *review* are taken into account. The Leiden Ranking does not consider book publications, publications in conference proceedings, and publications in journals not indexed in the above-mentioned citation indices of Web of Science.

The Leiden Ranking takes into account only a subset of the publications in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. We refer to the publications in this subset as core publications. Core publications are publications in international scientific journals in fields that are suitable for citation analysis. In order to be classified as a core publication, a publication must satisfy the following criteria:

- The publication has been written in English.
- The publication has one or more authors. (Anonymous publications are not allowed.)
- The publication has not been retracted.
- The publication has appeared in a core journal.

[4] **http://www.leidenranking.com/information/fields** , acedido 16 de maio de 2018

The last criterion is a very important one. In the Leiden Ranking, a journal is considered a core journal if it meets the following conditions:

- The journal has an international scope, as reflected by the countries in which researchers publishing in the journal and citing to the journal are located.
- The journal has a sufficiently large number of references to other core journals, indicating that the journal is situated in a field that is suitable for citation analysis. Many journals in the arts and humanities do not meet this condition. The same applies to trade journals and popular magazines.

In the calculation of the Leiden Ranking indicators, only core publications are taken into account. Excluding non-core publications ensures that the Leiden Ranking is based on a relatively homogeneous set of publications, namely publications in international scientific journals in fields that are suitable for citation analysis. The use of such a relatively homogeneous set of publications enhances the international comparability of universities. It should be emphasized that non-core publications are excluded not because they are considered less important than core publications. Non-core publications may have an important scientific value. About one-sixth of the publications in Web of Science are excluded because they have been classified as non-core publications.

Our concept of core publications should not be confused with the Web of Science Core Collection. The Web of Science Core Collection represents a subset of the citation indices available in Web of Science. As explained above, the core publications on which the Leiden Ranking is based represent a subset of the publications in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index.

A list of core and non-core journals is available in this **Excel file**.

Size-dependent vs. size-independent indicators

Except for the publication output indicator P, all indicators included in the Leiden Ranking have two variants: A size-dependent and a size-independent variant. In general, size-dependent indicators are obtained by counting the absolute number of publications of a university that have a certain property, while size-independent indicators are obtained by calculating the proportion of the publications of a university with a certain property. For instance, the number of highly cited publications of a university and the number of publications of a university co-authored with other organizations are size-dependent indicators. The proportion of the publications of a university that are highly cited and the proportion of a university's publications co-authored with other organizations are size-independent indicators. In the case of size-dependent indicators, universities with a larger publication output tend to perform better than universities with a smaller publication output. Size-independent indicators have been corrected for the size of the publication output of a university. So when size-independent indicators are used, both larger and smaller universities may perform well.

Impact indicators

The Leiden Ranking offers the following indicators of scientific impact:

- *P(top 1%) and PP(top 1%)*. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 1% most frequently cited.
- *P(top 5%) and PP(top 5%)*. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 5% most frequently cited.
- *P(top 10%) and PP(top 10%)*. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 10% most frequently cited.
- *P(top 50%) and PP(top 50%)*. The number and the proportion of a university's publications that, compared with other publications in the same field and in the same year, belong to the top 50% most frequently cited.
- *TCS and MCS*. The total and the average number of citations of the publications of a university.
- *TNCS and MNCS*. The total and the average number of citations of the publications of a university, normalized for field and publication year. An MNCS value of two for instance means that the publications of a university have been cited twice above the average of their field and publication year.

Citations are counted until the end of 2017 in the calculation of the above indicators. Author self citations are excluded. All indicators except for TCS and MCS are normalized for differences in citation practices between scientific fields. For the purpose of this field normalization, about **4000 fields** are distinguished. These fields are defined at the level of individual publications. Using a computer algorithm, each publication in Web of Science is assigned to a field based on its citation relations with other publications.

The TCS, MCS, TNCS, and MNCS indicators are not available on the main ranking page. These indicators can be accessed by clicking on the name of a university. An overview of all bibliometric statistics available for the university will then be presented. This overview also includes the TCS, MCS, TNCS, and MNCS indicators.

Collaboration indicators

The following indicators of scientific collaboration are provided in the Leiden Ranking:

- *P(collab) and PP(collab)*. The number and the proportion of a university's publications that have been co-authored with one or more other organizations.
- *P(int collab) and PP(int collab)*. The number and the proportion of a university's publications that have been co-authored by two or more countries.
- *P(industry) and PP(industry)*. The number and the proportion of a university's publications that have been co-authored with one or more industrial organizations. All private sector for profit business enterprises, covering all manufacturing and services sectors, are regarded as industrial organizations. This includes research institutes and other corporate R&D laboratories that are fully funded or owned by for profit business enterprises. Organizations in the private education sector and private medical/health sector (including hospitals and clinics) are not classified as industrial organizations.
- *P(<100 km) and PP(<100 km)*. The number and the proportion of a university's publications with a geographical collaboration distance of less than 100 km, where the geographical collaboration distance of a publication equals the largest geographical distance between two addresses mentioned in the publication's address list.
- *P(>5000 km) and PP(>5000 km)*. The number and the proportion of a university's publications with a geographical collaboration distance of more than 5000 km.

Some limitations of the above indicators need to be mentioned. In the case of the P(industry) and PP(industry) indicators, we have made an effort to identify industrial organizations as accurately as possible. Inevitably, however, there will be inaccuracies and omissions in the identification of industrial organizations. In the case of the P(<100 km), pp(<100 km), P(>5000 km), and PP(>5000 km) indicators, we rely on geocoding of addresses listed in Web of Science. There may be some inaccuracies in the geocoding that we have performed, and for addresses that are used infrequently no geocodes may be available. In general, we expect these inaccuracies and omissions to have only a small effect on the indicators.

Counting method

The impact indicators in the Leiden Ranking can be calculated using either a full counting or a fractional counting method. The full counting method gives a full weight of one to each publication of a university. The fractional counting method gives less weight to collaborative publications than to non-collaborative ones. For instance, if a publication has been co-authored by five researchers and two of these researchers are affiliated with a particular university, the publication has a weight of 2 / 5 = 0.4 in the calculation of the impact indicators for this university. The fractional counting method leads to a more proper field normalization of impact indicators and therefore to fairer comparisons between universities active in different fields. For this reason, fractional counting is the preferred counting method for the impact indicators in the Leiden Ranking. Collaboration indicators are always calculated using the full counting method.

Trend analysis

To facilitate trend analyses, the Leiden Ranking provides statistics not only based on publications from the period 2013–2016, but also based on publications from seven earlier periods: 2006–2009, 2007–2010, 2008–2011, 2009–2012, 2010–2013, 2011–2014, and 2012–2015. The statistics for the different periods are calculated in a fully consistent way. For each

period, citations are counted until the end of the first year after the period has ended. For instance, in the case of the period 2006–2009 citations are counted until the end of 2010, while in the case of the period 2013–2016 citations are counted until the end of 2017.

Stability intervals

Stability intervals provide some insight into the uncertainty in bibliometric statistics. A stability interval indicates a range of values of an indicator that are likely to be observed when the underlying set of publications changes. For instance, the PP(top 10%) indicator may be equal to 15.3% for a particular university, with a stability interval ranging from 14.1% to 16.5%. This means that the PP(top 10%) indicator equals 15.3% for this university, but that changes in the set of publications of the university may relatively easily lead to PP(top 10%) values in the range from 14.1% to 16.5%. The Leiden Ranking employs 95% stability intervals constructed using a statistical technique known as bootstrapping.

More information

More information on the Leiden Ranking methodology can be found in a number of papers published by CWTS researchers. A detailed discussion of the Leiden Ranking is presented by Waltman et al. (2012). This paper relates to the 2011/2012 edition of the Leiden Ranking. Although not entirely up-to-date anymore, the paper still provides a lot of relevant information on the Leiden Ranking. The algorithmic approach taken in the Leiden Ranking to define scientific fields is described in detail by Waltman and Van Eck (2012). Field normalization of impact indicators based on algorithmically defined fields is studied by Ruiz-Castillo and Waltman (2014). The methodology adopted in the Leiden Ranking for identifying core publications and core journals is outlined by Waltman and Van Eck (2013a, 2013b). Finally, the importance of using fractional rather than full counting in the calculation of field-normalized impact indicators is explained by Waltman and Van Eck (2015).

- Waltman, L., Calero-Medina, C., Kosten, J., Noyons, E.C.M., Tijssen, R.J.W., Van Eck, N.J., Van Leeuwen, T.N., Van Raan, A.F.J., Visser, M.S., & Wouters, P. (2012). The Leiden Ranking 2011/2012: Data collection, indicators, and interpretation. *Journal of the American Society for Information Science and Technology*, *63*(12), 2419–2432. (**paper**, **preprint**)
- Waltman, L., & Van Eck, N.J. (2012). A new methodology for constructing a publication-level classification system of science. *Journal of the American Society for Information Science and Technology*, *63*(12), 2378–2392. (**paper**, **preprint**)
- Waltman, L., & Van Eck, N.J. (2013a). Source normalized indicators of citation impact: An overview of different approaches and an empirical comparison. *Scientometrics*, *96*(3), 699–716. (**paper**, **preprint**)
- Waltman, L., & Van Eck, N.J. (2013b). A systematic empirical comparison of different approaches for normalizing citation impact indicators. *Journal of Informetrics*, *7*(4), 833–849. (**paper**, **preprint**)
- Ruiz-Castillo, J., & Waltman, L. (2015). Field-normalized citation impact indicators using algorithmically constructed classification systems of science. *Journal of Informetrics*, *9*(1), 102–117. (**paper**)
- Waltman, L., & Van Eck, N.J. (2015). Field-normalized citation impact indicators and the choice of an appropriate counting method. *Journal of Informetrics, 9*(4), 872–894. (**paper**, **preprint**)" [5]

"Updates and corrections

The following updates and corrections have been made to the CWTS Leiden Ranking.
May 16, 2018. Release of the 2018 edition of the Leiden Ranking. No major changes have been made to the methodology of the ranking. The criterion for selecting the universities that are included in the ranking has not been changed. The number of universities included in the ranking has increased from 903 to 938. Two new impact indicators have been added to the ranking: P(top 5%) and PP(top 5%).
[…]" [6]

[5] http://www.leidenranking.com/information/indicators acedido 16 de maio de 2018
[6] http://www.leidenranking.com/information/updates acedido 16 de maio de 2018

2. Evolução 2013-2018 dos indicadores e posições da U.Porto no CWTS Leiden Ranking

A metodologia do Leiden Ranking não foi alterada de 2017 para 2018; apenas foi acrescentado um novo indicador de impacto (PP Top5%).

Recorde-se que a alteração do indicador pré-definido de ordenação (PP(top10%), em 2015 e P, em 2016) inviabiliza a comparação de posições entre 2015 e 2016.

O **Anexo I** contém a proposta de uso responsável dos rankings universitários apresentada pelo CWTS.

Evolução[7] U.Porto no Leiden Ranking

		2013	2014	2015	2016	2017	2018
Impacto (contagem fracionada)	P	4057	4450	4970	5377	5772	5993
	PP(top10%)	7.7%	8.5%	8.8%	8.8%	8.8%	9.0%
	PP(top1%)			0.8%	0.7%	0.8%	0.8%
	PP(top50%)			49.7%	50.4%	50.6%	51.7%
	PP(top5%)						4.2%
	MNCS	0.86	0.91	0.93	0.94	0.95	0.95
Colaboração (contagem inteira)	P	7234	8314	9462	10436	11386	12309
	PP(collab)	75.0%	79.7%	80.7%	80.4%	82.0%	83.4%
	PP(int collab)	48.8%	49.7%	50.0%	50.4%	50.9%	52.4%
	PP (industry)					2.8%	3.7%
	PP(<100 km)		19.8%	20.3%	20.6%	20.3%	19.9%
	PP(>5000 km)			21.5%	22.3%	23.6%	25.3%
Rank	World	391	436	425/750	149/842	143/902	145/938
	Europe	177	203	200/285	42/316	40/334	40/345
	Iberoamerica	12	13	12/54	5/63	5/69	5/72
	Portugal	4	3	4/6	2/6	2/6	2/6

[7] Dados de 2013 a 2015 foram retirados de http://www.leidenranking.com em 20 de maio de 2015; 2016 a 2018 foram acedidos respetivamente em 18 de maio de 2016, 17 de maio de 2017 e 16 de maio de 2018.

3. Universidades portuguesas no CWTS Leiden Ranking 2018

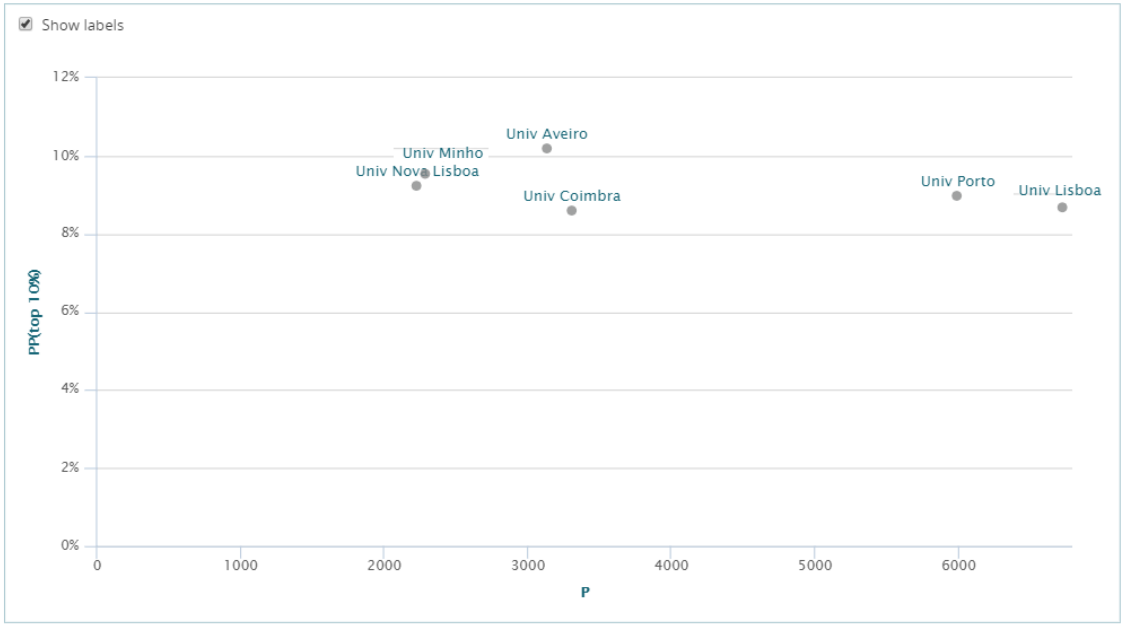
3.1 All Sciences [8]

3.1.1 Type of indicators: Impact
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100; Calculate impact indicators using fractional counting.

	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	# EU	# IbAm	#PT
Univ Lisboa	6723	8.7%	0.8%	4.3%	50.0%	120	31	3	1
Univ Porto	5993	9.0%	0.8%	4.2%	51.7%	145	40	5	2
Univ Coimbra	3305	8.6%	1.0%	4.3%	49.1%	359	122	21	3
Univ Aveiro	3137	10.2%	0.9%	4.7%	52.0%	375	127	23	4
Univ Minho	2290	9.5%	0.9%	4.5%	50.2%	507	176	31	5
Univ Nova Lisboa	2230	9.2%	0.9%	4.8%	48.3%	517	181	32	6
# IES						938	345	72	6

Gráfico 1: Leiden Ranking 2018 – All sciences, impact



Fonte: CWTS, Leiden ranking 2018, chart view

[8] http://www.leidenranking.com/ranking/2018/list acedido 16 de maio de 2018

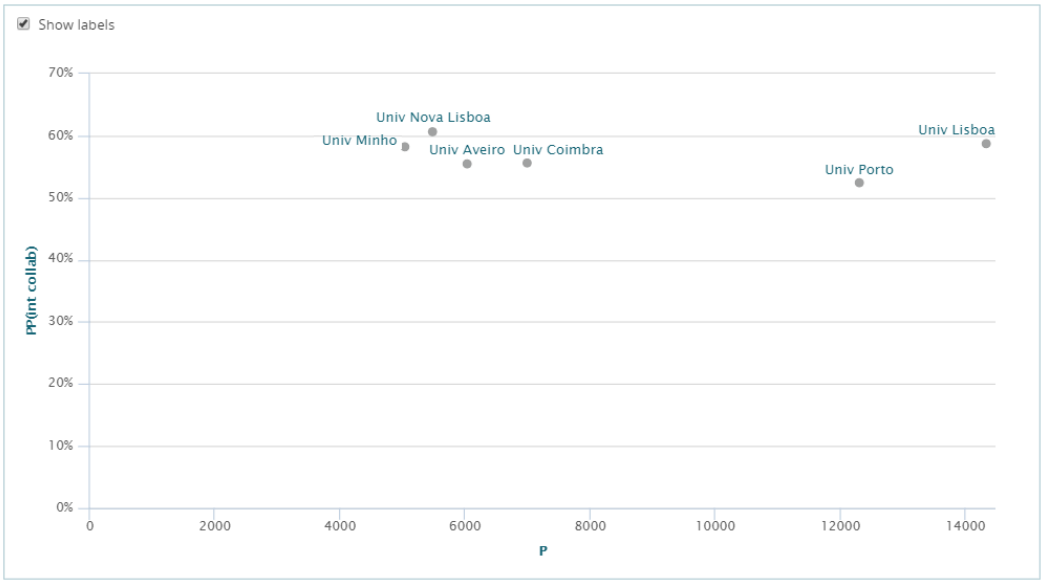
3.1.2 Type of indicators: Collaboration

Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100

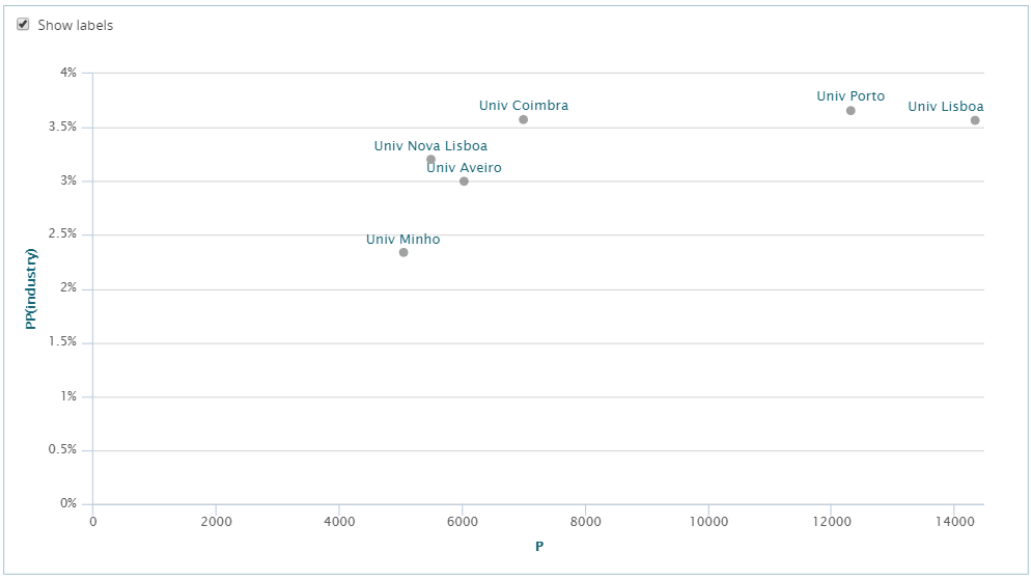
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	# EU	# IbAm	#PT
Univ Lisboa	14333	3.6%	82.8%	58.7%	13.8%	28.6%	121	40	3	1
Univ Porto	12309	3.7%	83.4%	52.4%	19.9%	25.3%	156	52	5	2
Univ Coimbra	6997	3.6%	83.1%	55.6%	13.6%	28.7%	332	125	19	3
Univ Aveiro	6035	3.0%	82.1%	55.5%	13.2%	24.8%	398	156	25	4
Univ Nova Lisboa	5495	3.2%	87.8%	60.6%	17.7%	29.5%	430	168	29	5
Univ Minho	5047	2.3%	83.8%	58.2%	16.6%	32.1%	469	178	31	6
# IES							938	345	72	6

Gráfico 2: Leiden Ranking 2018 – All sciences, international collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

Gráfico 3: Leiden Ranking 2018 – All sciences, industry collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

3.2 By Fields[9]

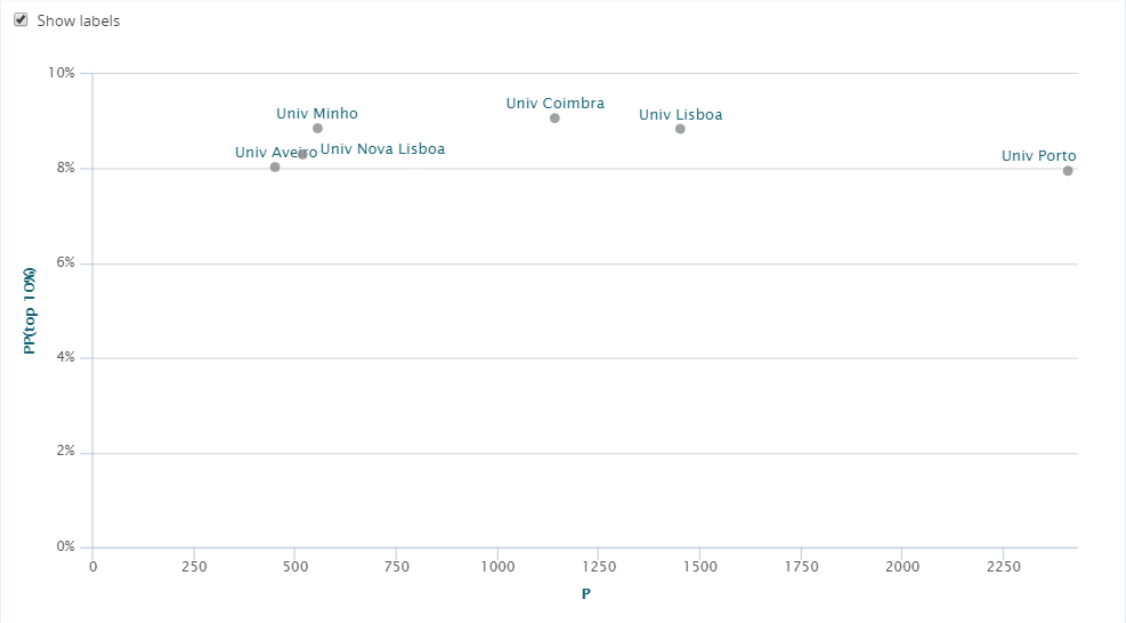
3.2.1 Biomedical and health sciences

Type of indicators: Impact
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100; Calculate impact indicators using fractional counting.

	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	# EU	# IbAm	#PT
Univ Porto	2409	8.0%	0.6%	3.6%	49.2%	178	55	5	1
Univ Lisboa	1452	8.8%	0.9%	4.0%	48.8%	294	108	15	2
Univ Coimbra	1142	9.1%	0.9%	4.5%	50.0%	360	133	18	3
Univ Minho	555	8.9%	0.5%	3.6%	46.5%	575	216	35	4
Univ Nova Lisboa	520	8.3%	0.6%	3.9%	47.8%	590	221	38	5
Univ Aveiro	452	8.0%	0.6%	3.1%	45.7%	618	231	41	6
# IES						886	337	71	6

Gráfico 4: Leiden Ranking 2018– Biomedical and health sciences, impact



Fonte: CWTS, Leiden ranking 2018, chart view

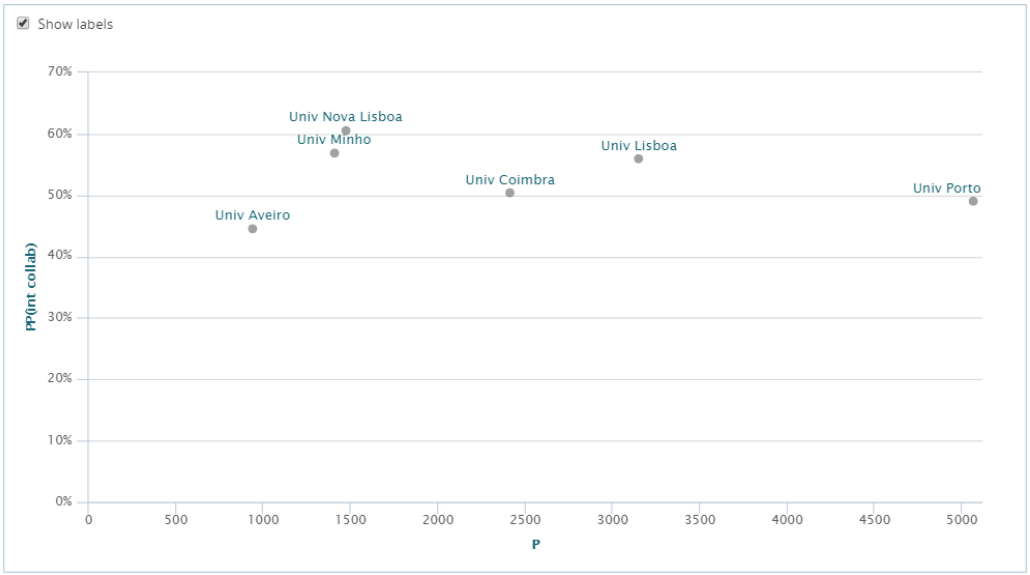
[9] http://www.leidenranking.com/ranking/2018/list acedido 16 e 17 de maio de 2018.

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100

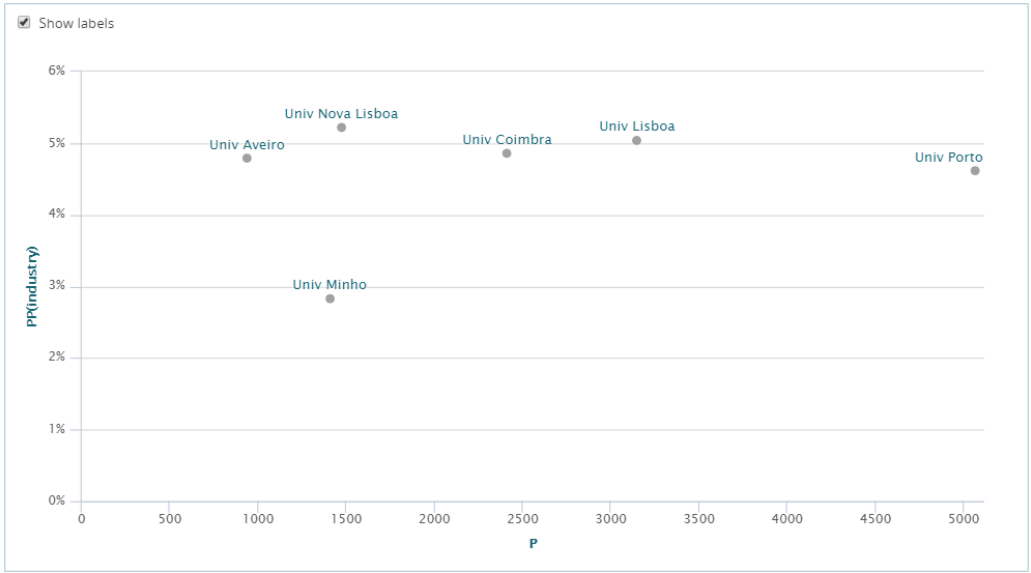
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	# EU	# IbAm	#PT
Univ Porto	5066	4.6%	86.3%	49.0%	25.9%	25.9%	178	67	4	1
Univ Lisboa	3149	5.0%	84.7%	55.9%	18.9%	18.9%	292	115	15	2
Univ Coimbra	2415	4.9%	84.4%	50.4%	19.7%	19.7%	373	150	18	3
Univ Nova Lisboa	1475	5.2%	92.4%	60.5%	21.3%	21.3%	509	206	29	4
Univ Minho	1408	2.8%	89.2%	56.9%	25.1%	25.1%	521	210	31	5
Univ Aveiro	939	4.8%	84.5%	44.5%	23.8%	23.8%	636	245	44	6
# IES							918	345	72	6

Gráfico 5: Leiden Ranking 2018 – Biomedical and health sciences, international collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

Gráfico 6: Leiden Ranking 2018 – Biomedical and health sciences, industry collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

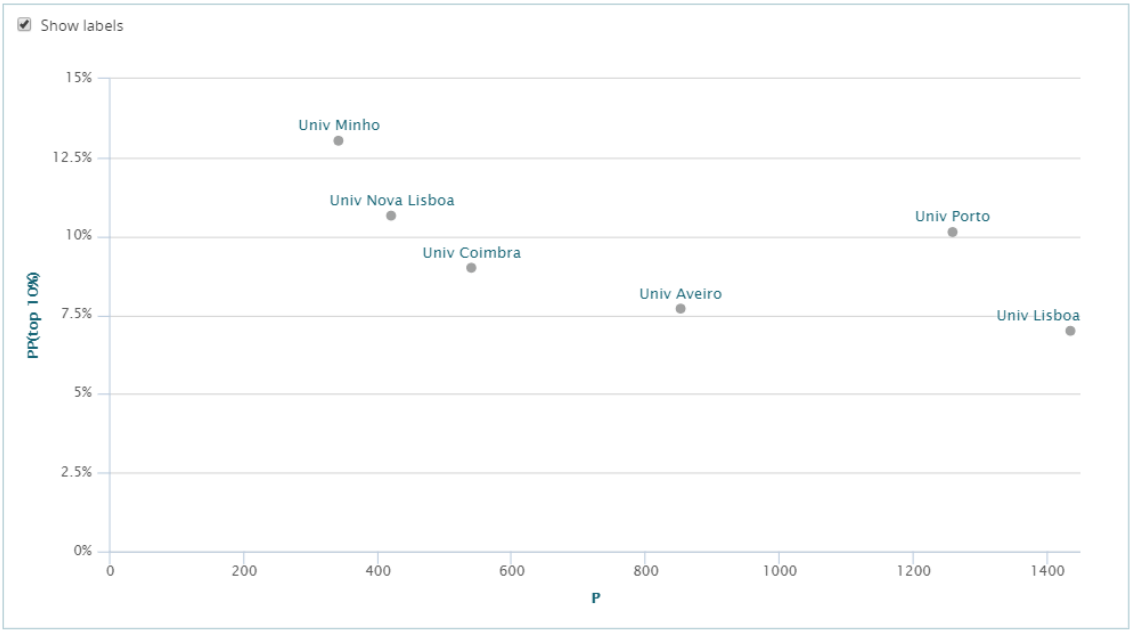
3.2.2 Life and earth sciences

Type of indicators: Impact
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100; Calculate impact indicators using fractional counting.

	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	# EU	# IbAm	#PT
Univ Lisboa	1435	7.0%	0.5%	3.2%	51.1%	56	10	4	1
Univ Porto	1259	10.1%	1.0%	4.7%	54.4%	72	15	5	2
Univ Aveiro	852	7.7%	0.6%	3.1%	50.4%	150	44	15	3
Univ Coimbra	541	9.0%	1.0%	4.4%	51.5%	283	100	31	4
Univ Nova Lisboa	421	10.7%	0.7%	5.2%	53.2%	385	142	44	5
Univ Minho	342	13.0%	1.4%	6.7%	54.3%	447	169	48	6
# IES						819	312	71	6

Gráfico 7: Leiden Ranking 2018 – Life and earth sciences, impact



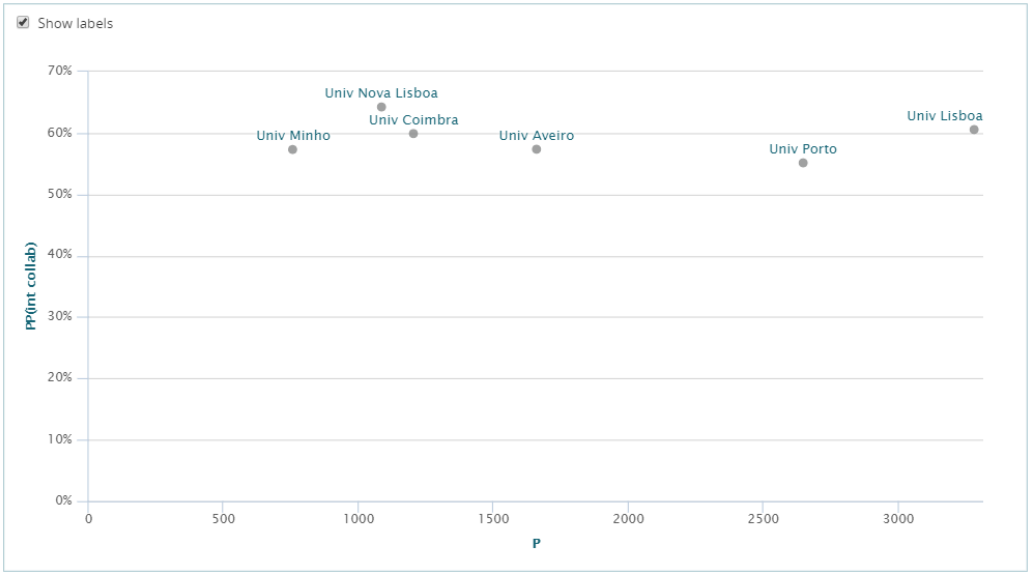
Fonte: CWTS, Leiden ranking 2018, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100

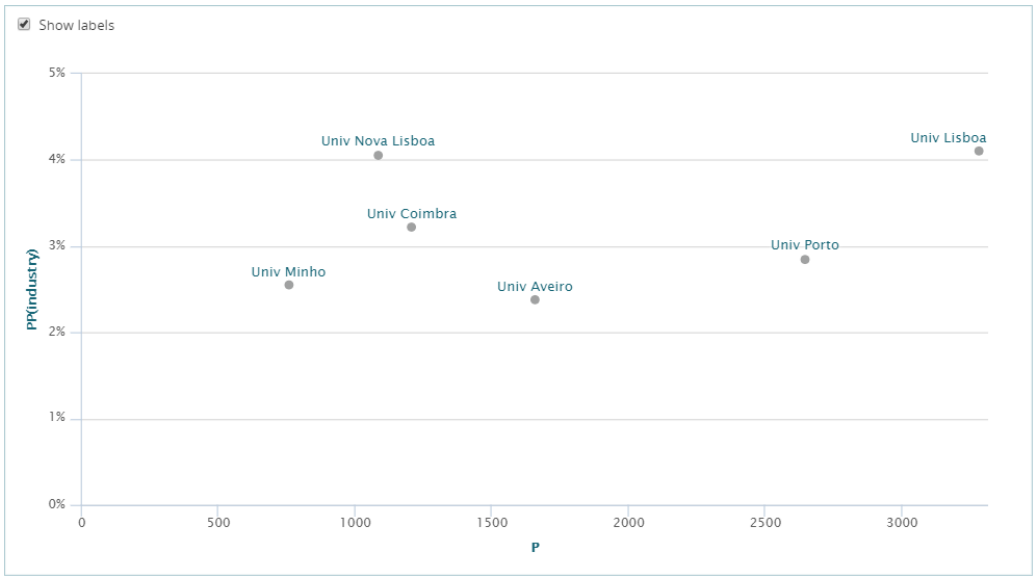
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	# EU	# IbAm	#PT
Univ Lisboa	3281	4.1%	88.1%	60.6%	13.0%	27.1%	50	13	4	1
Univ Porto	2648	2.8%	84.4%	55.1%	15.3%	22.5%	87	23	5	2
Univ Aveiro	1660	2.4%	83.1%	57.4%	10.8%	22.3%	177	66	16	3
Univ Coimbra	1206	3.2%	87.5%	59.9%	10.1%	27.0%	270	108	26	4
Univ Nova Lisboa	1086	4.1%	91.4%	64.2%	17.6%	28.6%	306	123	33	5
Univ Minho	758	2.6%	84.6%	57.3%	14.9%	23.6%	445	176	46	6
# IES							910	337	71	6

Gráfico 8: Leiden Ranking 2018 – Life and earth sciences, international collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

Gráfico 9: Leiden Ranking 2018 – Life and earth sciences, industry collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

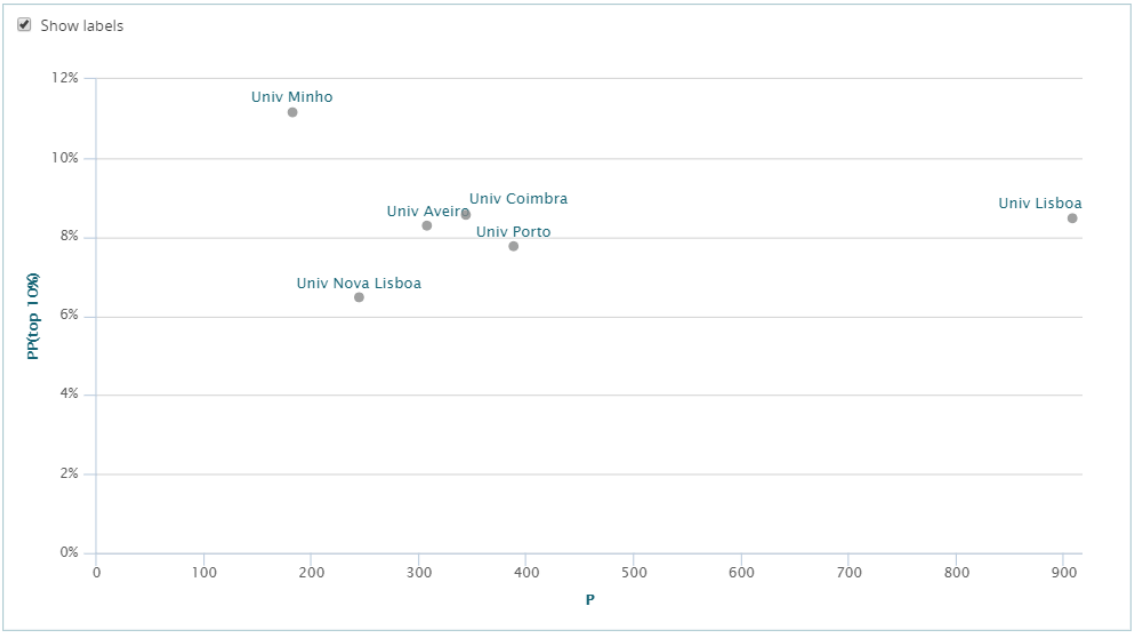
3.2.3 Mathematics and computer science

Type of indicators: Impact
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100; Calculate impact indicators using fractional counting

	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	# EU	# IbAm	#PT
Univ Lisboa	908	8.5%	1.0%	4.0%	48.4%	62	6	3	1
Univ Porto	388	7.8%	0.8%	3.9%	49.3%	245	71	17	2
Univ Coimbra	344	8.6%	1.3%	4.1%	46.6%	296	89	21	3
Univ Aveiro	308	8.3%	0.3%	3.0%	49.0%	337	107	25	4
Univ Nova Lisboa	244	6.5%	0.6%	3.0%	41.6%	435	151	31	5
Univ Minho	183	11.2%	1.8%	6.7%	45.9%	550	204	45	6
# IES						729	283	62	6

Gráfico 10: Leiden Ranking 2018 – Mathematics and computer science, impact



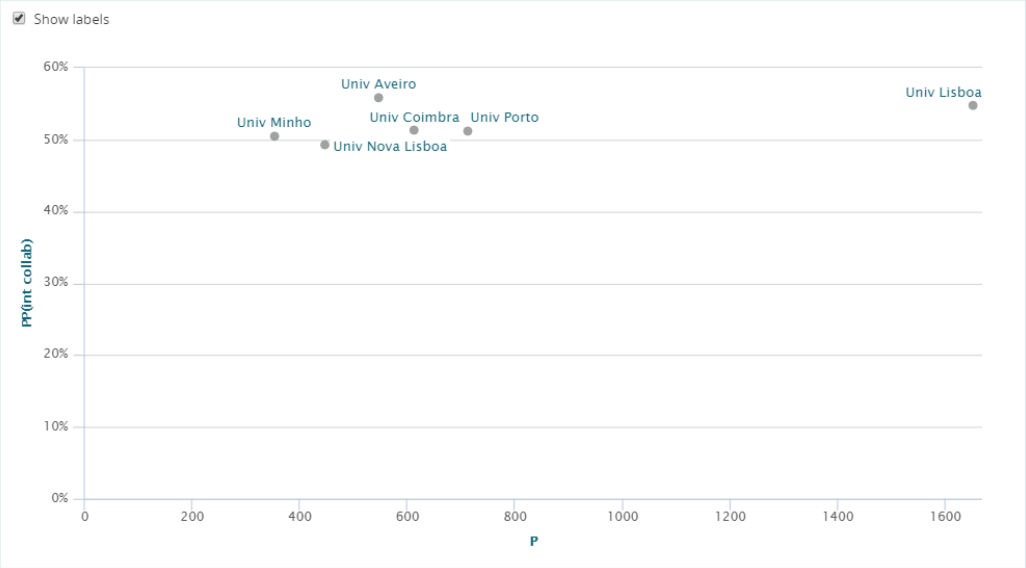
Fonte: CWTS, Leiden ranking 2018, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100

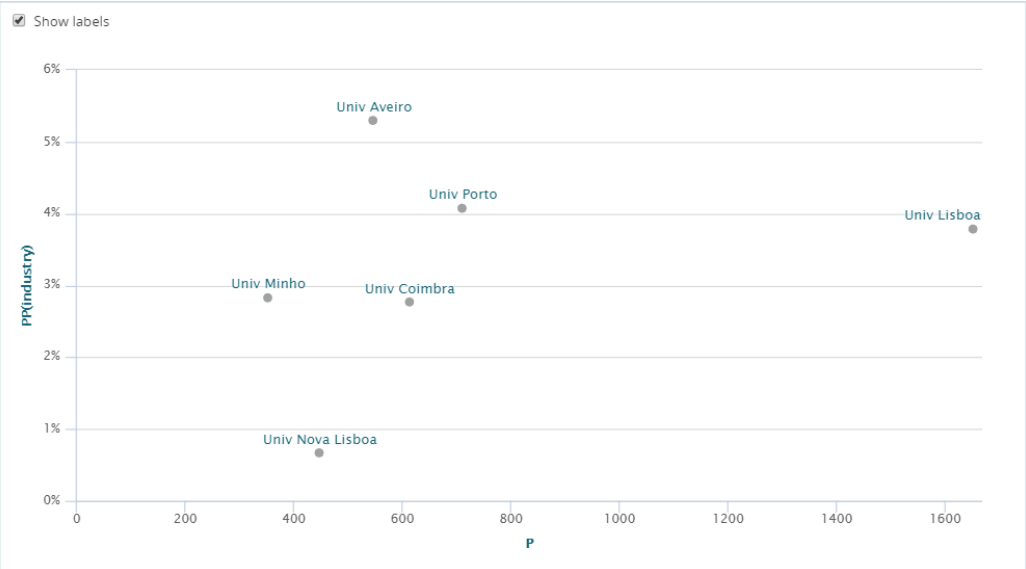
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	# EU	# IbAm	#PT
Univ Lisboa	1652	3.8%	76.9%	54.8%	14.4%	24.6%	51	6	3	1
Univ Porto	712	4.1%	77.7%	51.2%	17.9%	25.7%	224	67	15	2
Univ Coimbra	614	2.8%	75.8%	51.3%	12.5%	26.0%	278	90	19	3
Univ Aveiro	548	5.3%	76.7%	55.8%	11.2%	27.7%	335	107	24	4
Univ Nova Lisboa	448	0.7%	78.6%	49.3%	20.8%	21.4%	426	151	29	5
Univ Minho	354	2.8%	79.8%	50.5%	15.8%	19.8%	512	187	39	6
# IES							814	310	69	6

Gráfico 11: Leiden Ranking 2018 – Mathematics and computer science, international collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

Gráfico 12: Leiden Ranking 2018 – Mathematics and computer science, industry collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

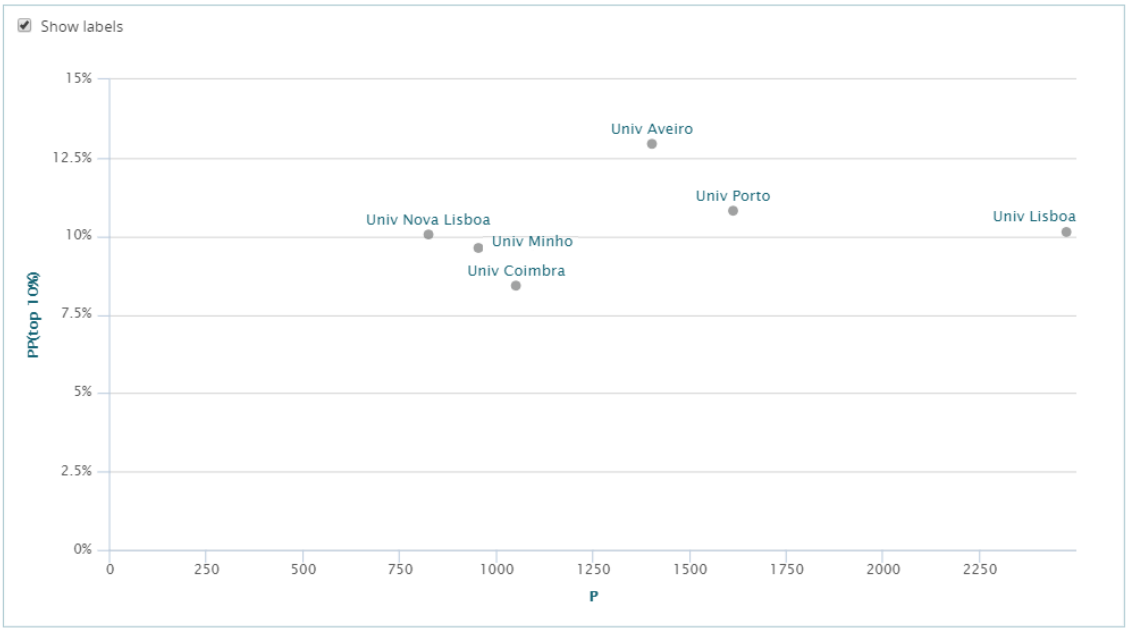
3.2.4 Physical sciences and engineering

Type of indicators: Impact
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100; Calculate impact indicators using fractional counting

	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	# EU	# IbAm	#PT
Univ Lisboa	2474	10.1%	1.0%	5.5%	51.9%	91	14	2	1
Univ Porto	1613	10.8%	1.0%	5.2%	56.5%	176	40	5	2
Univ Aveiro	1404	12.9%	1.4%	6.8%	56.7%	219	58	10	3
Univ Coimbra	1052	8.4%	1.2%	4.3%	49.1%	307	92	21	4
Univ Minho	955	9.6%	1.0%	4.5%	53.0%	350	108	22	5
Univ Nova Lisboa	824	10.1%	1.1%	5.3%	48.3%	419	130	26	6
# IES						886	325	71	6

Gráfico 13: Leiden Ranking 2018 – Physical sciences and engineering, impact



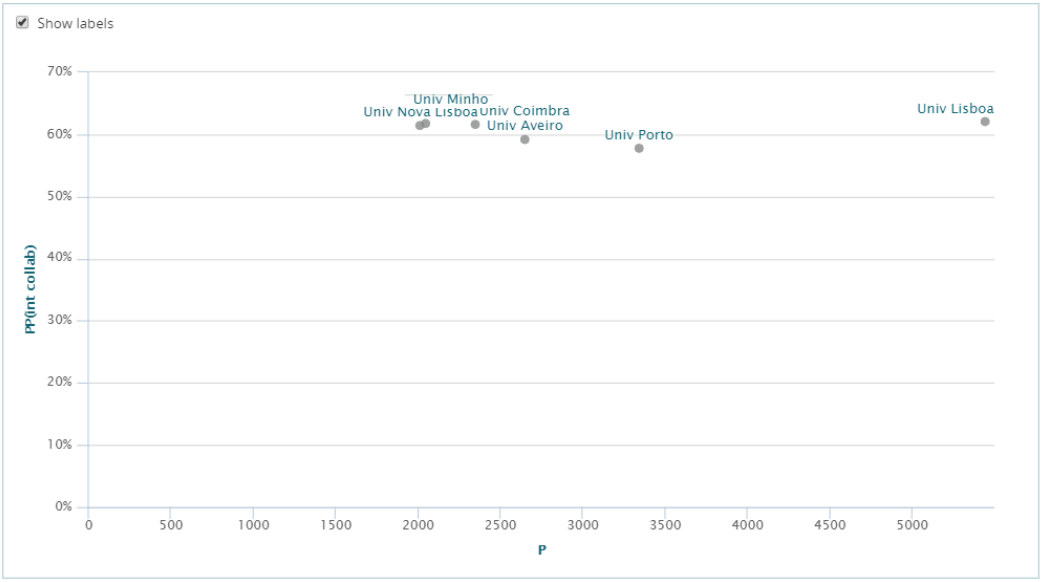
Fonte: CWTS, Leiden ranking 2018, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100

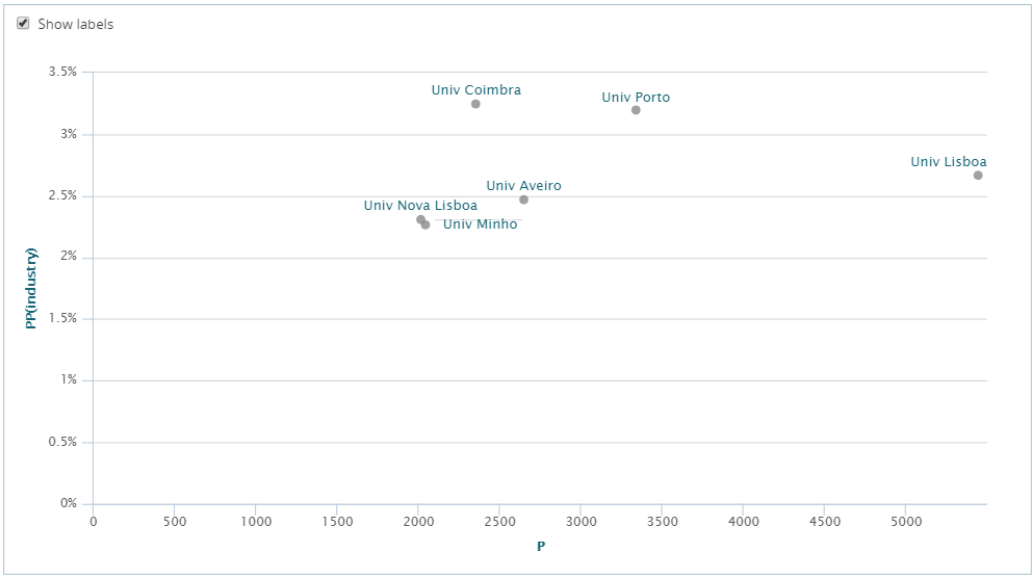
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	# EU	# IbAm	#PT
Univ Lisboa	5443	2.7%	81.9%	62.1%	11.3%	32.5%	72	18	2	1
Univ Porto	3342	3.2%	81.5%	57.8%	14.4%	29.7%	178	58	8	2
Univ Aveiro	2653	2.5%	82.0%	59.2%	10.8%	29.0%	249	93	14	3
Univ Coimbra	2351	3.2%	82.9%	61.6%	9.5%	37.0%	289	108	18	4
Univ Minho	2046	2.3%	81.9%	61.8%	12.4%	37.1%	339	132	23	5
Univ Nova Lisboa	2014	2.3%	86.1%	61.4%	15.8%	33.3%	351	138	26	6
# IES							919	340	71	6

Gráfico 14: Leiden Ranking 2018 – Physical sciences and engineering, international collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

Gráfico 15: Leiden Ranking 2018 – Physical sciences and engineering, industry collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

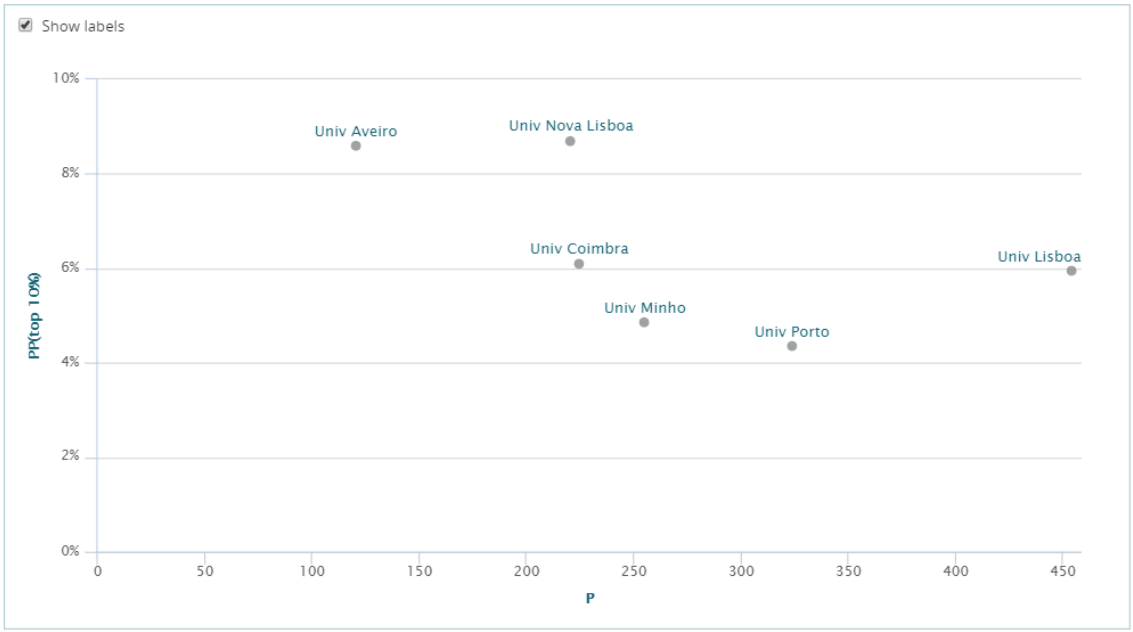
3.2.5 Social sciences and humanities

Type of indicators: Impact
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100; Calculate impact indicators using fractional counting.

	P	PP (top 10%)	PP (top 1%)	PP (top 5%)	PP (top 50%)	# World	# EU	# IbAm	#PT
Univ Lisboa	454	5.9%	0.2%	2.5%	42.7%	202	68	5	1
Univ Porto	324	4.4%	0.1%	2.1%	37.8%	298	112	12	2
Univ Minho	255	4.9%	0.3%	1.4%	45.1%	343	129	15	3
Univ Coimbra	225	6.1%	0.2%	3.1%	43.0%	381	148	18	4
Univ Nova Lisboa	221	8.7%	1.8%	5.8%	47.4%	391	154	21	5
Univ Aveiro	120	8.6%	0.2%	2.4%	39.9%	517	215	39	6
# IES						553	240	43	6

Gráfico 16: Leiden Ranking 2018 – Social sciences and humanities, impact



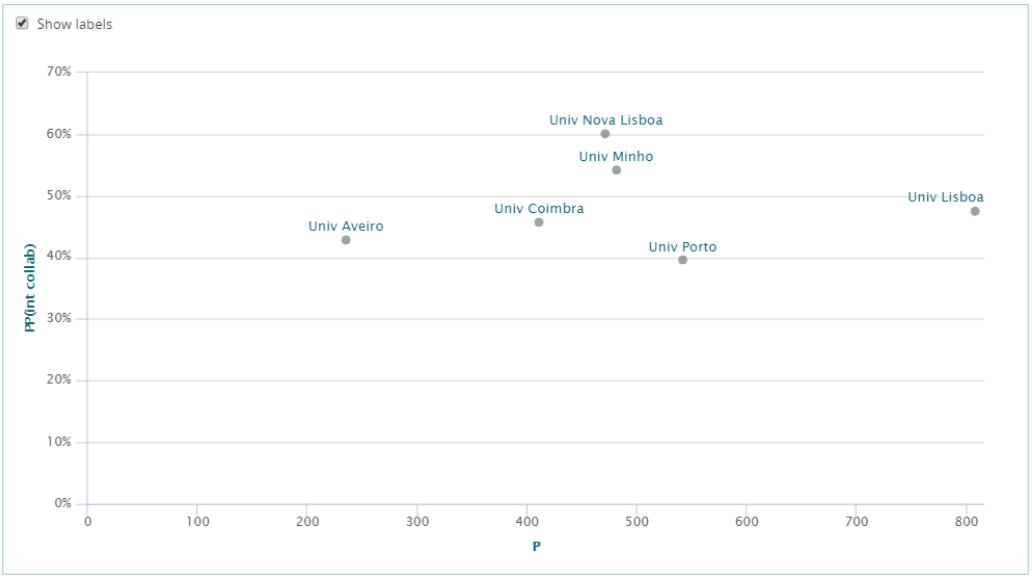
Fonte: CWTS, Leiden ranking 2018, chart view

Type of indicators: Collaboration
Indicator used for ranking: P

Parâmetros: Time period: 2013-2016. Min. publication output=100

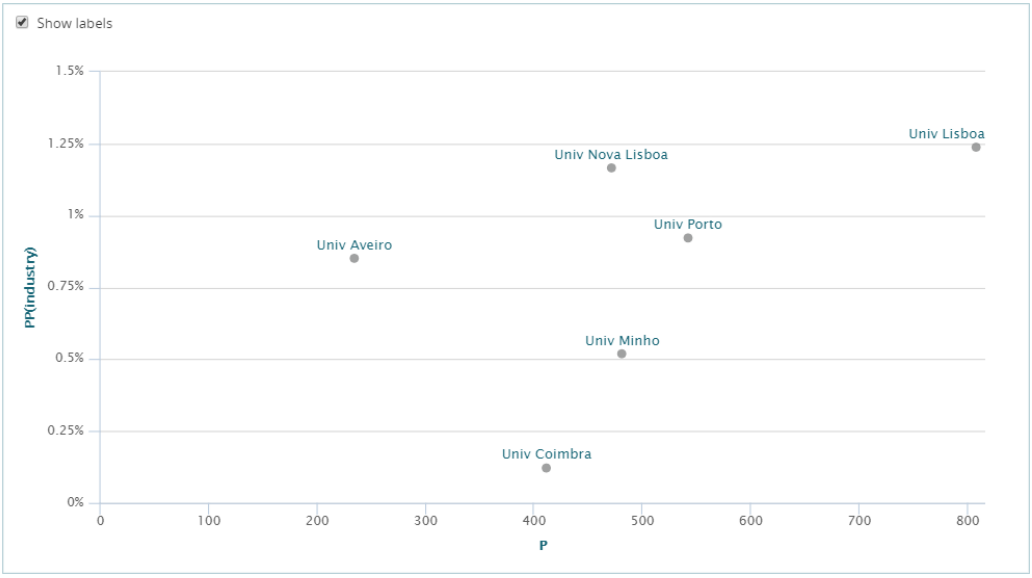
	P	PP (industry)	PP (collab)	PP (int collab)	PP (<100 km)	PP (>5000 km)	# World	# EU	# IbAm	#PT
Univ Lisboa	808	1.2%	70.8%	47.5%	13.5%	23.6%	212	74	4	1
Univ Porto	542	0.9%	71.1%	39.6%	22.6%	18.0%	315	118	11	2
Univ Minho	482	0.5%	78.1%	54.2%	12.7%	26.3%	339	130	15	3
Univ Nova Lisboa	472	1.2%	81.2%	60.1%	12.5%	28.2%	344	132	16	4
Univ Coimbra	411	0.1%	74.7%	45.7%	13.3%	19.7%	382	148	18	5
Univ Aveiro	235	0.9%	79.4%	42.8%	19.6%	20.4%	506	214	35	6
# IES							673	295	54	6

Gráfico 17: Leiden Ranking 2018 – Social sciences and humanities, international collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

Gráfico 18: Leiden Ranking 2018 – Social sciences and humanities, industry collaboration



Fonte: CWTS, Leiden ranking 2018, chart view

4. Anexo I: Uso responsável dos Rankings

"Responsible use

University rankings should be used in a responsible manner. Below we present ten principles developed by CWTS that are intended to guide the responsible use of university rankings. These principles apply to university rankings in general. They are not restricted to the Leiden Ranking. The principles were introduced in a **blog post**published in 2017. A summary of the principles was published in ***Research Europe***.

Design of university rankings

1. A generic concept of university performance should not be used
The **THE ranking** claims to "provide the definitive list of the world's best universities". Similar claims are sometimes made by other major university rankings. This is highly problematic. Different users of university rankings are interested in different dimensions of university performance, and therefore a shared notion of 'best university' does not exist. Whether a university is doing well or not depends on the dimension of university performance that one is interested in. Some universities for instance may be doing well in teaching, while others may be doing well in research. There is no sensible way in which a good performance in one dimension can be weighed against a less satisfactory performance in another dimension.
The problematic nature of a generic concept of university performance is also visible in the composite indicators that are used in university rankings such as **ARWU**, **THE**, and **QS**. These composite indicators combine different dimensions of university performance in a rather arbitrary way. The fundamental problem of these indicators is the poorly defined concept of university performance on which they are based.
The Leiden Ranking considers only the scientific performance of universities and does not take into account other dimensions of university performance, such as teaching performance. More specifically, based on the publications of a university in international scientific journals, the Leiden Ranking focuses on the scientific impact of a university and on the participation of a university in scientific collaborations. Different aspects of the scientific performance of universities are quantified separately from each other in the Leiden Ranking. No composite indicators are constructed.

2. A clear distinction should be made between size-dependent and size-independent indicators of university performance
Size-dependent indicators focus on the overall performance of a university. Size-independent indicators focus on the performance of a university relative to its size or relative to the amount of resources it has available. Size-dependent indicators can be used to identify universities that make a large overall contribution to science or education. Size-independent indicators can be used to identify universities that make a large contribution relative to their size. Size-dependent and size-independent indicators serve different purposes. Combining them in a composite indicator, as is done for instance in the ARWU ranking, therefore makes no sense. In the Leiden Ranking, size-dependent and size-independent indicators are clearly distinguished from each other.
Users of university rankings should be aware that constructing proper size-independent indicators is **highly challenging**. These indicators require accurate data on the size of a university, for instance internationally standardized data on a university's number of researchers or its amount of research funding. This data is very difficult to obtain. In the Leiden Ranking, no such data is used. Instead, size-independent indicators are constructed by using the number of publications of a university as a surrogate measure of university size.

3. Universities should be defined in a consistent way
In order to make sure that universities can be properly compared, they should be defined as much as possible in a consistent way. When a university ranking relies on multiple data sources (bibliometric databases, questionnaires, statistics provided by universities themselves, etc.), the definition of a university should be consistent between the different data sources. However, even when relying on a single data source only, achieving consistency is a **major challenge**. For instance, when working with a bibliometric data source, a major difficulty is the consistent treatment of hospitals associated with universities. There is a large worldwide variation in the way in which hospitals are associated with universities, and there can be significant discrepancies between the official relation of a hospital with a university and the local perception of this relation. Perfect consistency at an international level cannot be achieved, but as much as possible a university ranking should make sure that universities are defined in a consistent way. Rankings should also explain the approach they take to define

universities. The Leiden Ranking offers such an **explanation**. Unfortunately, major university rankings such as ARWU, THE, and QS do not make clear how they define universities.

4. University rankings should be sufficiently transparent
Proper use of a university ranking requires at least a basic level of understanding of the design of the ranking. University rankings therefore need to be sufficiently transparent. They need to explain their methodology in sufficient detail. University rankings such as ARWU, THE, and QS offer a methodological explanation, but the explanation is quite general. The Leiden Ranking provides a significantly more detailed **methodological explanation**. Ideally, a university ranking should be transparent in a more far-reaching sense by making available the data underlying the ranking. This for instance could enable users of a ranking to see not only how many highly cited publications a university has produced, but also which of its publications are highly cited. Or it could enable users to see not only the number of publications of a university that have been cited in patents, but also the specific patents in which the citations have been made. Most university rankings, including the Leiden Ranking, do not reach this level of transparency, both because of the proprietary nature of some of the underlying data and because of commercial interests of ranking producers.

Interpretation of university rankings

5. Comparisons between universities should be made keeping in mind the differences between universities
Each university is unique in its own way. Universities have different missions and each university has a unique institutional context. Such differences between universities are reflected in university rankings and should be taken into account in the interpretation of these rankings. A university in the Netherlands for instance can be expected to be more internationally oriented than a university in the US. Likewise, a university focusing on engineering research can be expected to have stronger ties with industry than a university active mainly in the social sciences. To some extent, university rankings correct for differences between universities in their disciplinary focus. So-called field-normalized indicators are used for this purpose, but these indicators are used only for specific aspects of university performance, for instance for quantifying scientific impact based on citation statistics. For other aspects of university performance, no correction is made for the disciplinary profile of a university. The collaboration indicators in the Leiden Ranking for instance do not correct for this. In the interpretation of the indicators provided in a university ranking, one should carefully consider whether the disciplinary profile of a university has been corrected for or not.

6. Uncertainty in university rankings should be acknowledged
University rankings can be considered to be subject to various types of uncertainty. First, the indicators used in a university ranking typically do not exactly represent the concept that one is interested in. For instance, citation statistics provide insight into the scientific impact of the research of a university, but they reflect this impact only in an approximate way. Second, a university ranking may have been influenced by inaccuracies in the underlying data or by (seemingly unimportant) technical choices in the calculation of indicators. Third, there may be uncertainty in a university ranking because the performance of a university during a certain time period may have been influenced by coincidental events and may therefore not be fully representative of the performance of the university in a more general sense. It is important to be aware of the various types of uncertainty in university rankings. To some extent it may be possible to quantify uncertainty in university rankings (e.g., using **stability intervals** in the Leiden Ranking), but to a large extent one needs to make an intuitive assessment of this uncertainty. In practice, this means that it is best not to pay attention to small performance differences between universities. Likewise, minor fluctuations in the performance of a university over time can best be ignored. The focus instead should be on structural patterns emerging from time trends.

7. An exclusive focus on the ranks of universities in a university ranking should be avoided; the values of the underlying indicators should be taken into account
The term 'university ranking' is somewhat unfortunate, since it implies a focus on the ranks of universities, which creates the risk of overlooking the values of the underlying indicators. Focusing on the ranks of universities can be misleading because universities with quite similar values for a certain indicator may have very different ranks. For instance, when universities in the Leiden Ranking are ranked based on their proportion of highly cited publications, the university at rank 300 turns out to have just 10% fewer highly cited publications than the university at rank 200. By focusing on the ranks of universities, one university may seem to perform much better than another, while the performance difference may in fact be relatively small.
Users of university rankings should also be aware that the rank of a university may drop when the number of universities included in a university ranking is increased. Such a drop in rank may be

incorrectly interpreted as a decline in the performance of the university. The value of the underlying indicator may show that there actually has been no performance decline and that the drop in rank is completely due to the increase in the number of universities included in the ranking.

Use of university rankings

8. Dimensions of university performance not covered by university rankings should not be overlooked
University rankings focus on specific dimensions of university performance, typically dimensions that are relatively easy to quantify. The Leiden Ranking for instance has a quite narrow scope focused on specific aspects of the scientific performance of universities. Some other university rankings have a broader scope, with **U-Multirank** probably being the most comprehensive ranking system. However, there is no university ranking that fully covers all relevant dimensions of university performance. Teaching performance and societal impact are examples of dimensions that are typically not very well covered by university rankings. Within the dimension of scientific performance, scientific impact and collaboration can be captured quite well, but scientific productivity is much more difficult to cover. Dimensions of university performance that are not properly covered by university rankings should not be overlooked. Users of university rankings should be aware that even the most comprehensive rankings offer only a partial perspective on university performance. The information needs of users should always be leading, not the information supply by university rankings.

9. Performance criteria relevant at the university level should not automatically be assumed to have the same relevance at the department of research group level
Performance criteria that are relevant at the level of universities as a whole are not necessarily relevant at the level of individual departments or research groups within a university. It may for instance be useful to know how often articles published by a university are cited in the international scientific literature, but for a specific research group within the university, such as a research group in the humanities, this may not be a very useful performance criterion. Similarly, one may want to know how many publications of a university have been co-authored with industrial partners. However, for research groups active in areas with little potential of commercial application, this may not be the most appropriate performance criterion. It may be tempting for a university to mechanically pass on performance criteria from the university level to lower levels within the organization, but this temptation should be resisted. This is especially important when the distribution of resources within a university is partially dependent on key performance indicators, as is often the case.

10. University rankings should be handled cautiously, but they should not be dismissed as being completely useless
When used in a responsible manner, university rankings may provide relevant information to universities, researchers, students, research funders, governments, and other stakeholders. They may offer a useful international comparative perspective on the performance of universities. The management of a university may use information obtained from university rankings to support decision making and to make visible the strengths of the university. However, when doing so, the limitations of university rankings and the caveats in their use should be continuously emphasized."[10]

[10] **http://www.leidenranking.com/information/responsibleuse** , 16 de maio de 2018