



ANALYSIS OF COLLABORATIVE SCIENTIFIC PRODUCTION BETWEEN SPAIN AND CANADA 2017-2022



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EXECUTIVE SUMMARY

Main indicators of scientific production in Spain and Canada in the international context in the year 2022:

- Canada ranks eighth among the main producing countries in the world and participates in 3.4% of the world's scientific production. Spain occupies the eleventh position and participates in 3.1% of the world's scientific publications.
- 17.3% of Canada's scientific publications are in the top 10% of the world's most cited articles (10% excellence). In the case of Spain, it is 16.2%.
- Almost 59% of Canadian publications are produced in international collaboration and in the case of Spain, it is 51%.

Main indicators of collaborative scientific production between Spain and Canada in the period of 2017-2022:

- Spain and Canada have collaborated on 18,455 publications. Collaboration has been steadily increasing over the years, thus strengthening the scientific relationship between the two countries.
- Spain is Canada's ninth collaborating country and Canada ranks 12th among Spain's main collaborating partners.
- 35% of the publications in which Spain and Canada collaborate belong among the top 10% most cited publications in the world.
- 80% of the scientific production in which both countries participate is published in the most relevant journals in the world or in the first quartile (Q1).
- 45.3% of the publications in collaboration between Spain and Canada belong to the area of Medicine and specifically to the scientific disciplines of Oncology, Clinical Neurology and Cardiology and Cardiovascular Medicine.
- In the area of Medicine, Canada ranks eighth among Spain's main scientific partners and 44.2% of the scientific production in collaboration between the two countries in Medicine is among the most cited in the world (Top 10% most cited).
- The main scientific institutions of both countries are present in this collaboration:

In the case of Spain, the main institutions collaborating with Canada are, in this order, CSIC (Spanish National Research Council), the Autonomous University of Barcelona, the University of Barcelona and Carlos III Institute of Health. In the case of publications in the field of medicine, Carlos III Institute of Health is the leading Spanish institution in Spanish-Canadian collaboration.

In the case of Canada, it is noteworthy the University of Toronto, followed by the University of British Columbia, McGill and Montreal.



WORLD SCIENTIFIC PRODUCTION IN 2022

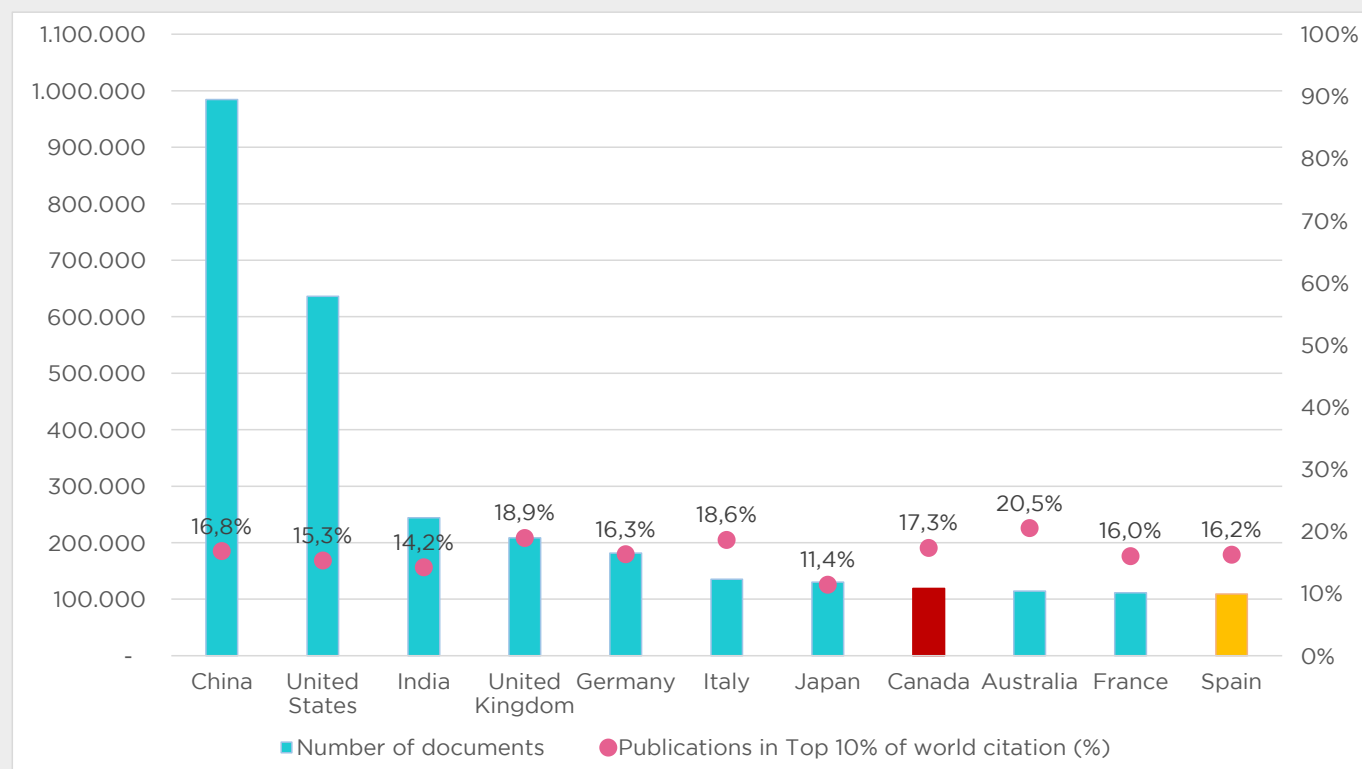
The world's main producing countries are, most notably, China and the United States.

In 2022, Canada accounted for 3.4% of the world's scientific production, occupying eighth position among the world's main producing countries¹, with 119,086 published documents.

Spain in 2022 accounted for 3.1% of the world's scientific output and ranked eleventh with 109,338 publications.

The scientific production of those countries that have published more than 100,000 documents² in 2022 is represented below.

Main producing countries in the world. 2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

¹Countries with more than 100,000 documents published during the year

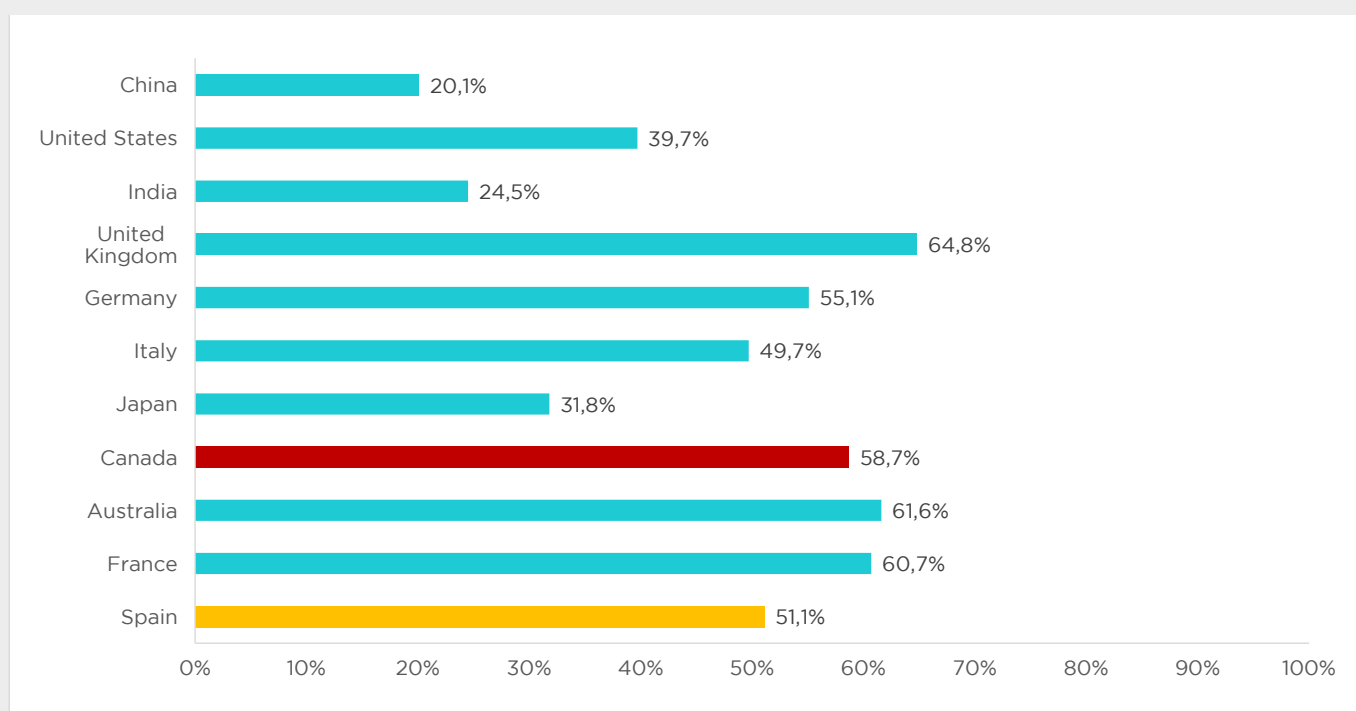
²Articles, reviews and conference papers

17.3% of Canada's scientific publications are among the top 10% of the world's most cited articles (10% excellence). In the case of Spain, it is 16.2%, a very similar percentage to Germany and France.

International cooperation in science and technology is one of the most effective tools available to countries to consolidate their scientific and technological capacity, improve the quality of their research and train highly qualified human resources.

Canada and Spain are among the group of eleven countries with more than 100,000 scientific papers in 2022 that publish more than half of their scientific output in collaboration with other countries. Specifically, 58.7% of Canadian publications are produced with international collaboration, and in the case of Spain, it is 51.1%.

**International collaborative publications (%)
of the world's main producing countries. 2022**



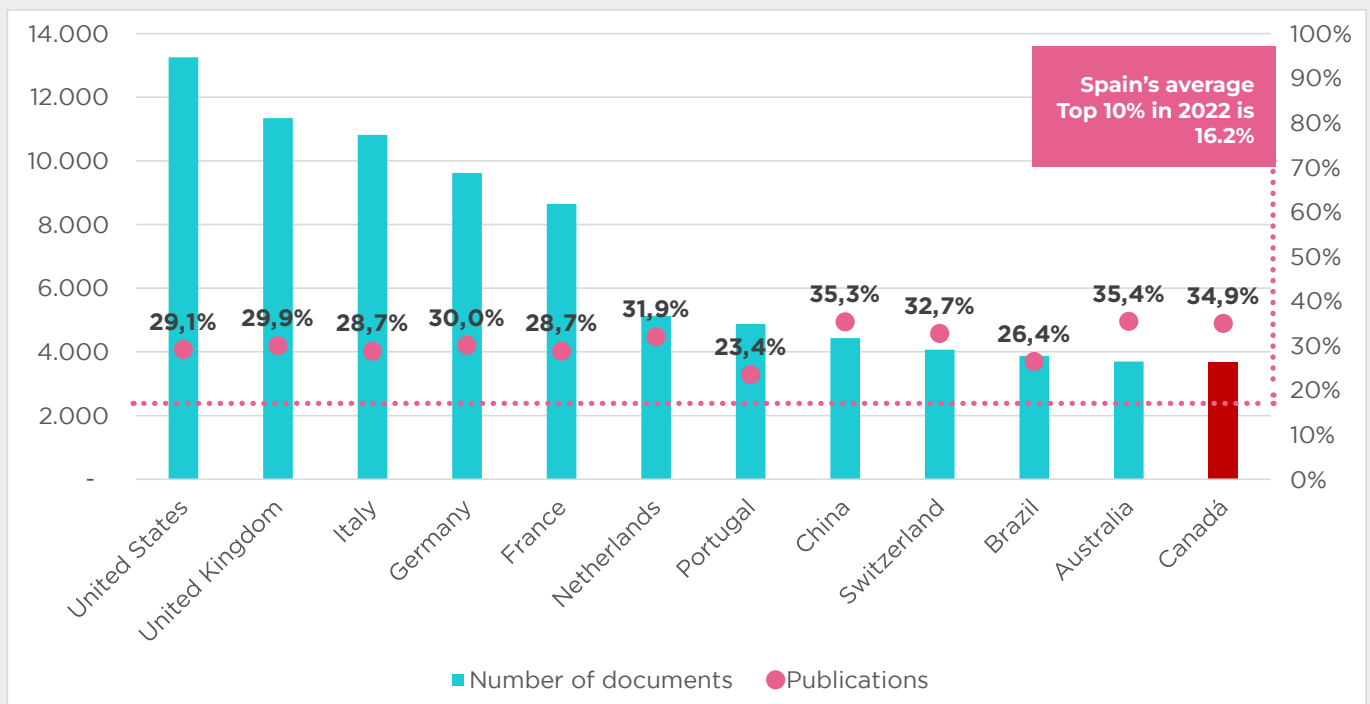
Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

SPAIN AND CANADA'S MAIN PARTNER COUNTRIES IN 2022

International collaborative projects are considered one of the strategic vectors for contributing to the excellence and maximum scientific competitiveness of countries.

Spain's top collaborating countries and the percentage of collaborative scientific production that belongs to the top 10% of the most cited publications in the world are shown below.

Spain's top collaborating countries. 2022
 Number of collaborative papers in Top 10% most cited in the world



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

Spain's collaborative output with our major scientific partners, which rank among the 10% most cited worldwide (or 10% Excellence), is 16.2%, much higher than the average for Spain in 2022. It is twice that rate for Spanish scientific production in collaboration with Australia, China, Canada and Switzerland.

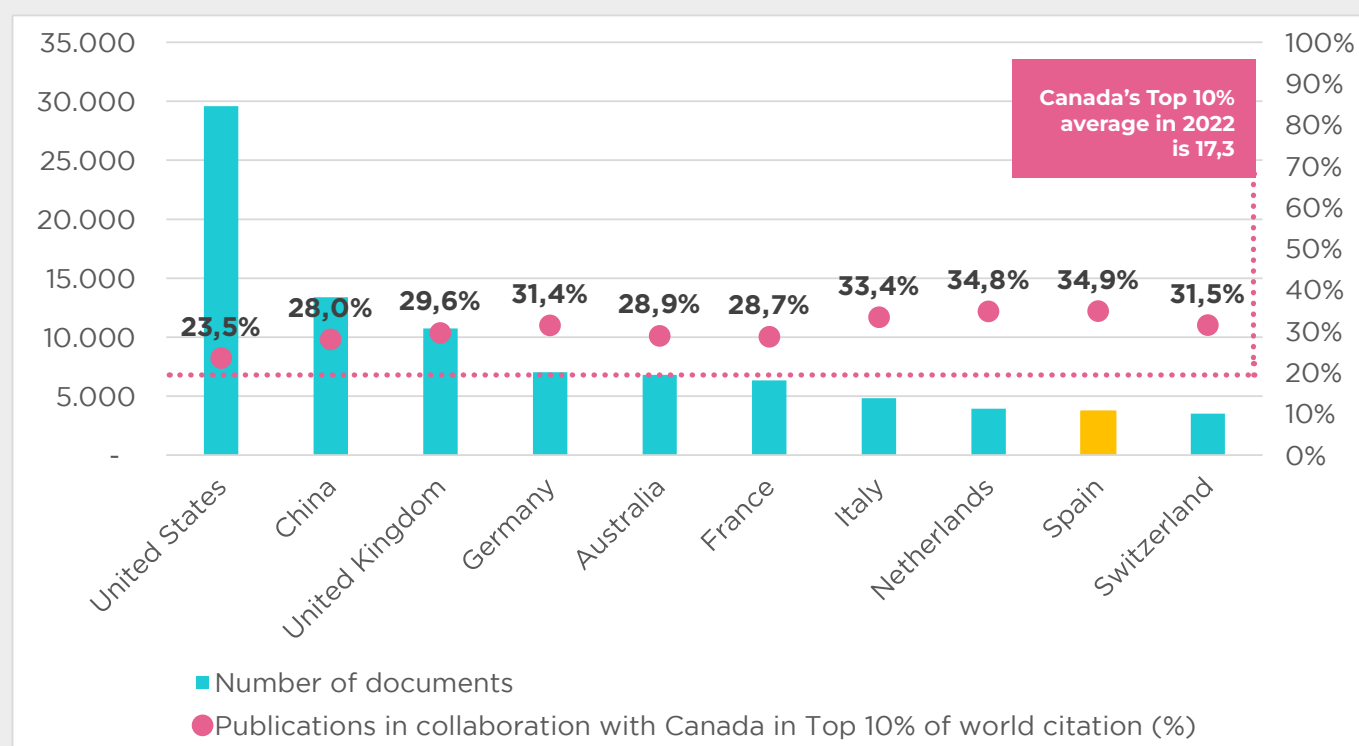
The United States, the United Kingdom, Italy, Germany and France are Spain's main scientific partners. Canada ranks 12th and 35% of the scientific output involving both countries is in the top 10% group of the world's most cited articles in 2022.

As far as Canada is concerned, its main and leading partner country is the United States. It is closely followed by China and the United Kingdom. Spain is Canada's ninth largest contributor.

In 2022, the Canadian scientific output in the top 10% of the world's most cited articles was 17.3%. This figure doubles in scientific production in collaboration with Spain and the Netherlands.

Canada's top collaborating countries. 2022

Number of collaborative papers in Top 10% most cited in the world



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

We can conclude that, although scientific production between Spain and Canada is not yet very numerous in terms of publications, these are very profitable for both countries due to the high level of citation they achieve worldwide.

We will now analyze the evolution of collaborative scientific production between the two countries, both in terms of quantity and citation excellence.

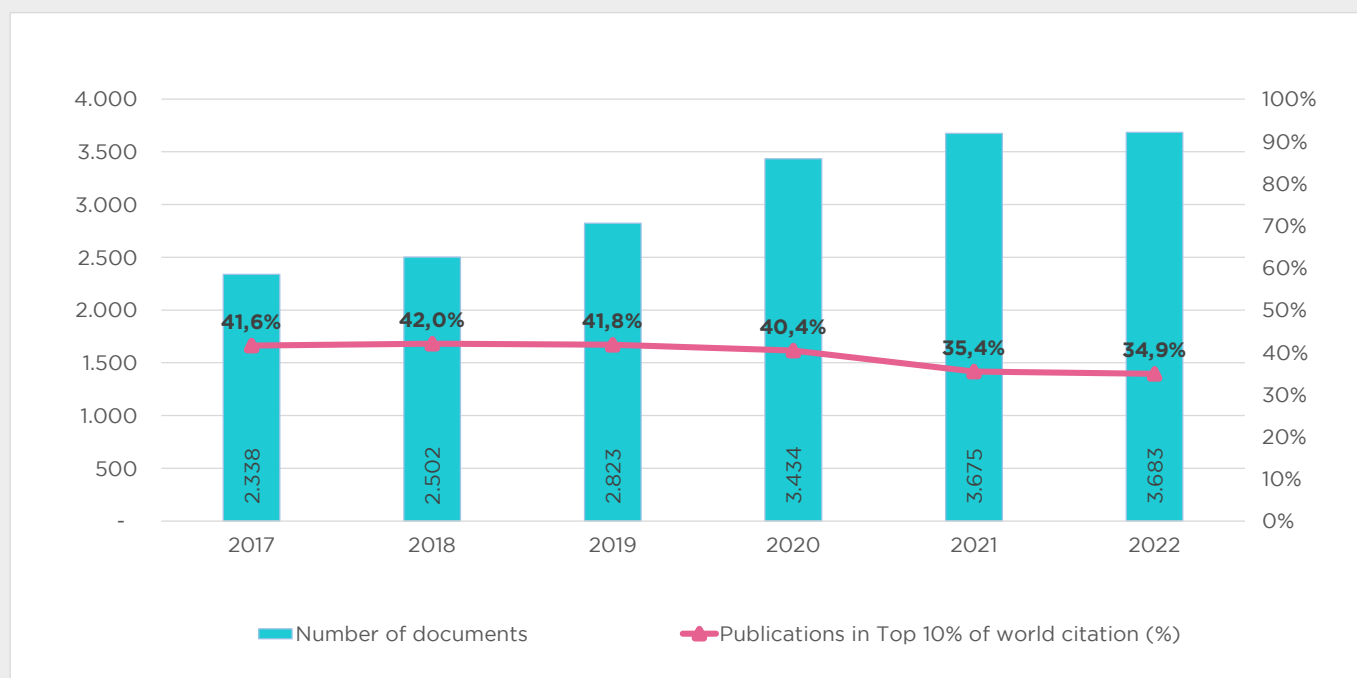
ANALYSIS OF COLLABORATIVE PUBLICATIONS BETWEEN SPAIN AND CANADA. PERIOD 2017-2022

In the period 2017-2022, Spain and Canada have collaborated on **18,455 publications**, achieving a very high worldwide citation.

In the 2017-2022 period as a whole, 35% of the publications involving Spain and Canada together were among the most cited in the world.

It should be considered that the more recent the publication date of a document is, the less likely it is to be cited; thus, belonging to the Top 10% or excellence group decreases by the more recent the publication date is. To properly assess an indicator related to citation, it should be at least two years since its publication date.

Evolution of Spanish-Canadian scientific production and Excellence 10%. 2017-2022

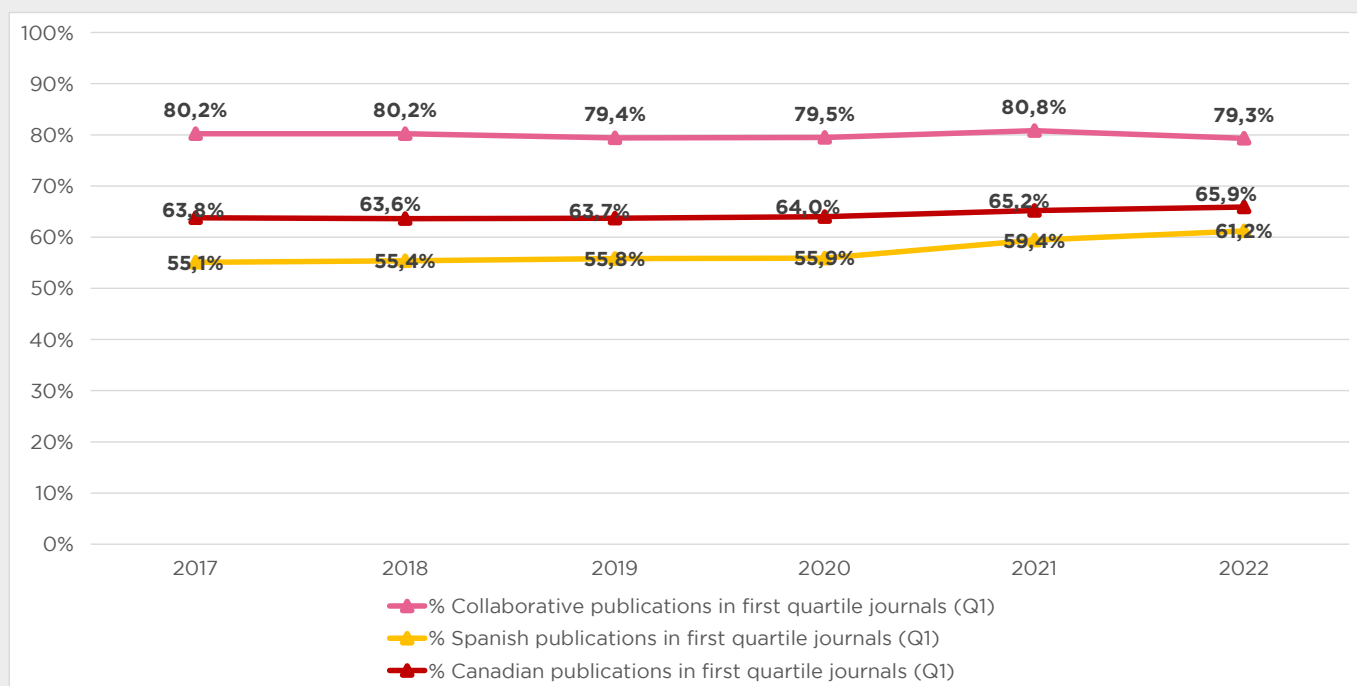


Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

Scientific collaboration is very profitable for both countries and the links between Spain and Canada in research cooperation should be further enhanced and strengthened.

If we look at the ranks of the journals where Spain and Canada collaborations are published, we find that, on average, in the period 2017-2022, 80% of them are published in the most relevant journals in the world or in the first quartile (Q1).

Publications in first quartile journals (Q1). 2017-2022



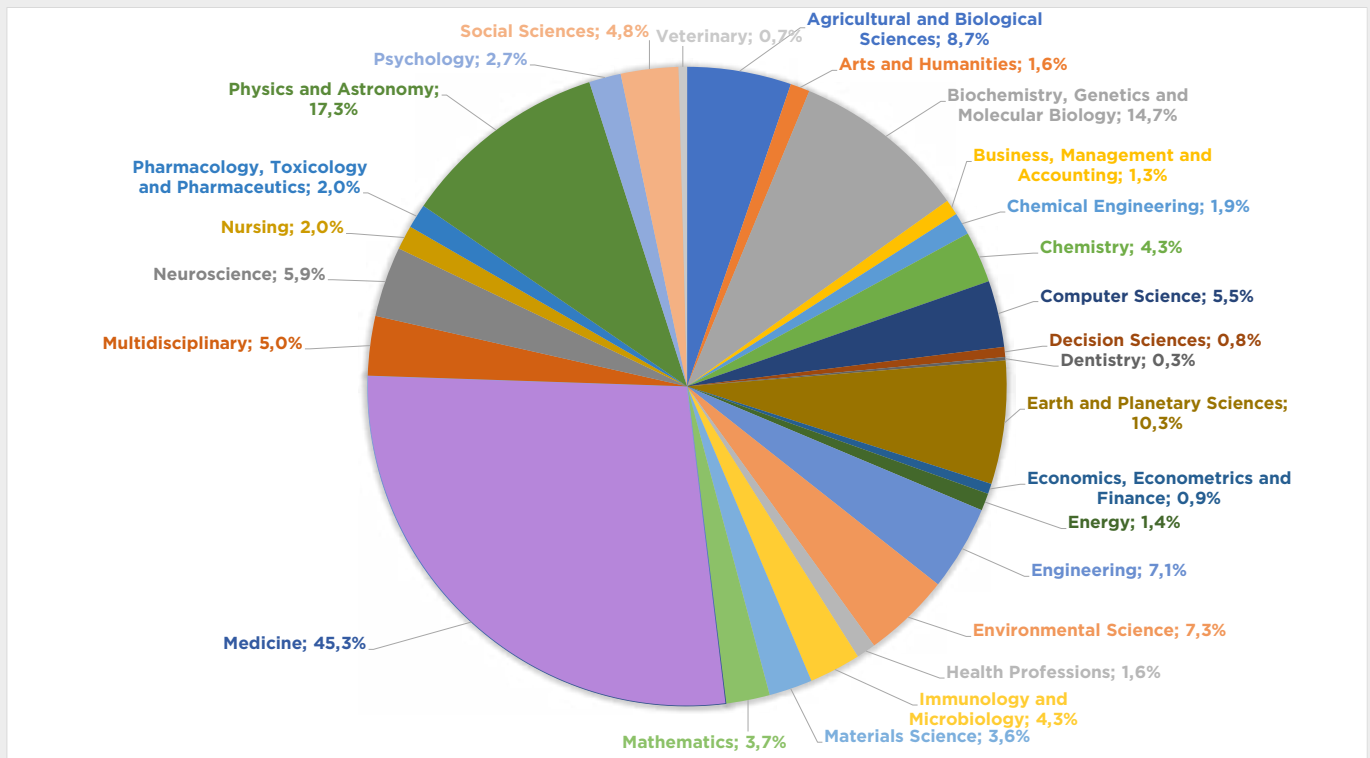
Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023



THEMATIC DISTRIBUTION OF COLLABORATIVE SCIENTIFIC PRODUCTION BETWEEN SPAIN AND CANADA. PERIOD 2017-2022

As for the main areas in which Spain and Canada collaborate in the period 2017-2022, **Medicine** is the top trend. 45.3% (8,373 documents) of Spanish-Canadian publications are published in this area.

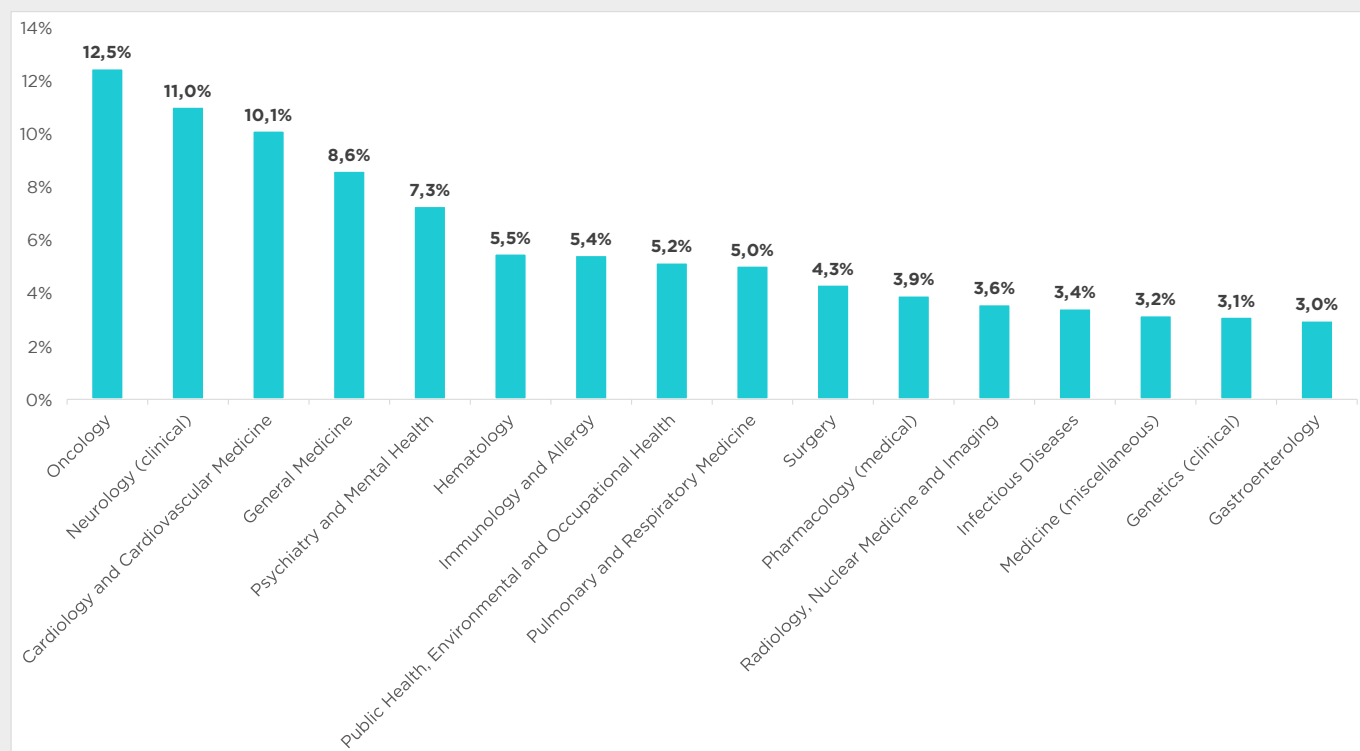
Thematic distribution of collaborative publications between Spain and Canada (%). 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

Within the area of Medicine, the disciplines with the highest number of collaborative papers are: **Oncology; Neurology (clinical); Cardiology and Cardiovascular Medicine; General Medicine; and Psychiatry and Mental Health.**

Thematic disciplines in the area of Medicine with the highest number of documents in Spanish-Canadian collaboration (%). 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

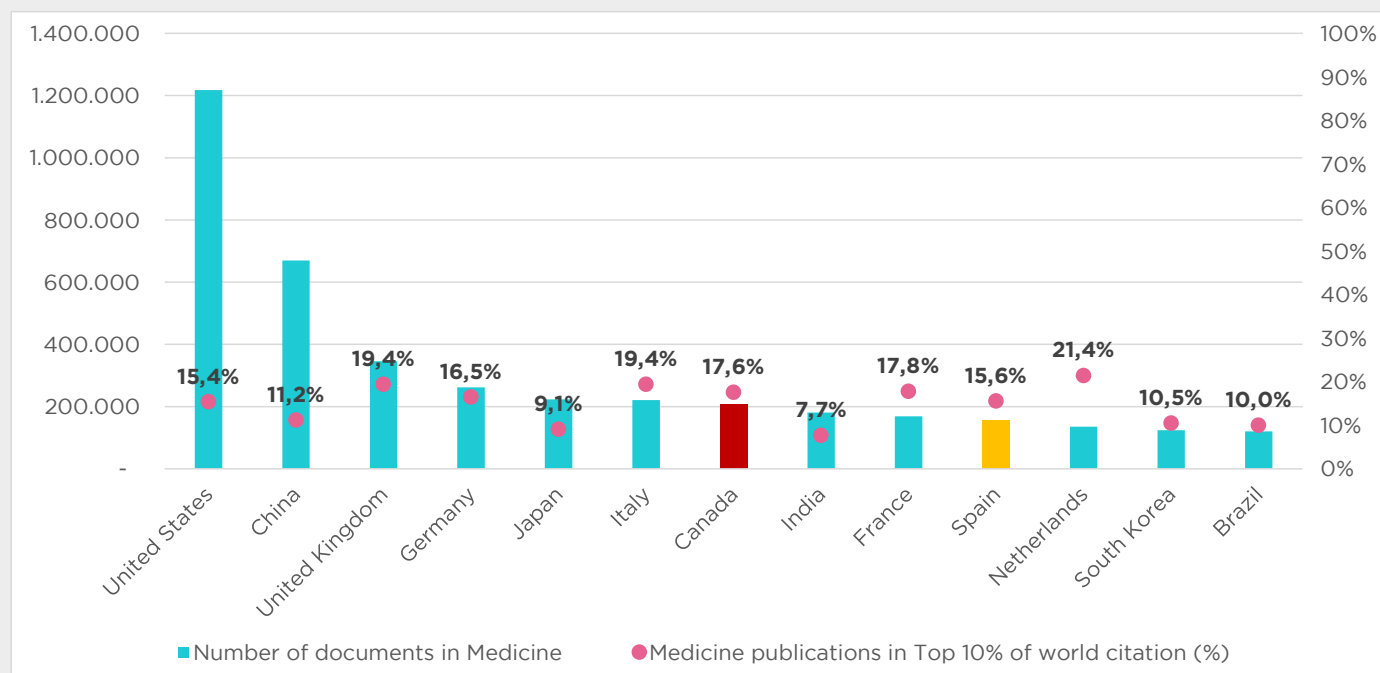


ANALYSIS OF THE GLOBAL SCIENTIFIC PRODUCTION IN MEDICINE AND THE COLLABORATION BETWEEN SPAIN AND CANADA IN THIS AREA. PERIOD 2017-2022

The table below shows the top countries producing scientific publications in Medicine, in the period 2017-2022, as well as the average percentage of publications of excellence (Top 10% most cited) achieved by each of these countries in this area.

Canada is ranked seventh in the world with the most publications in the field of medicine and Spain is ranked tenth.

Main producing countries in the world with publications in Medicine. 2017-2022

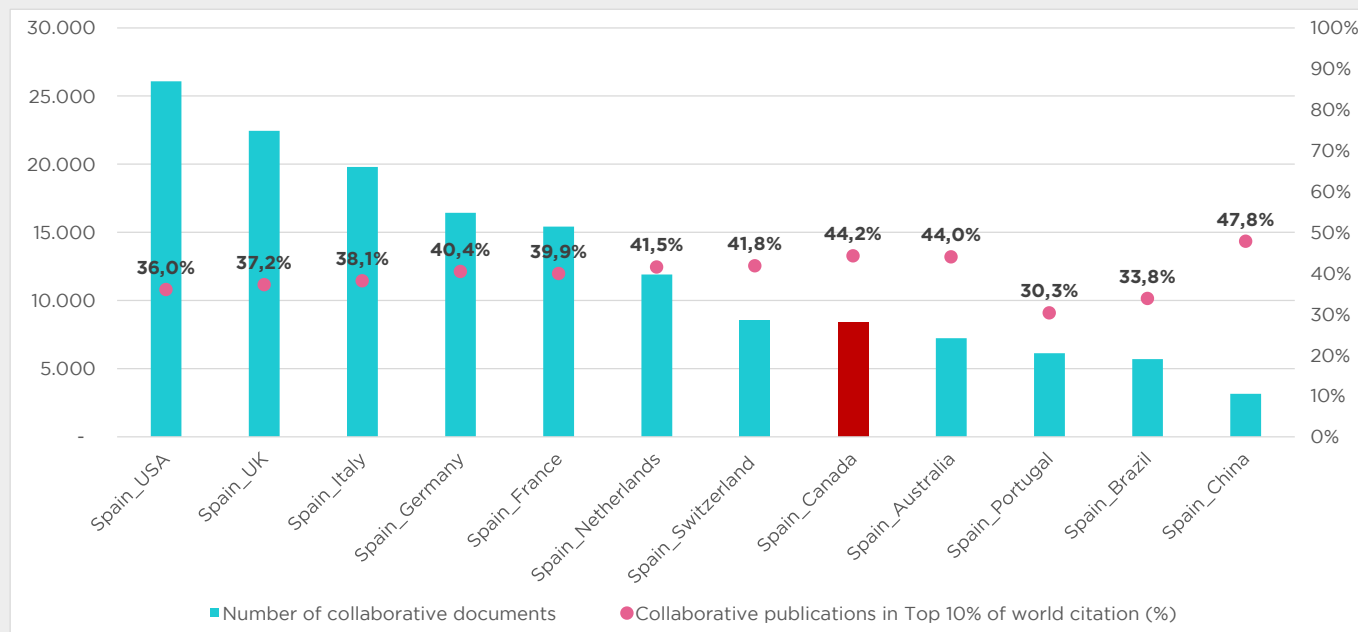


Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

The profitability of the collaboration between Spain and Canada in the area of Medicine is studied next, measured by the publications of excellence or from the Top 10% most cited documents worldwide in this area compared to its main collaborating countries.

For Spain, publications in the area of Medicine in collaboration with Canada rank eighth among its main partner countries in the world. 44.2% of the medical papers involving the two countries are in the top 10% of the world's most cited papers in this area. This is more than 4 percentage points above the average of excellence (Top 10% most cited) of all Spanish-Canadian collaboration.

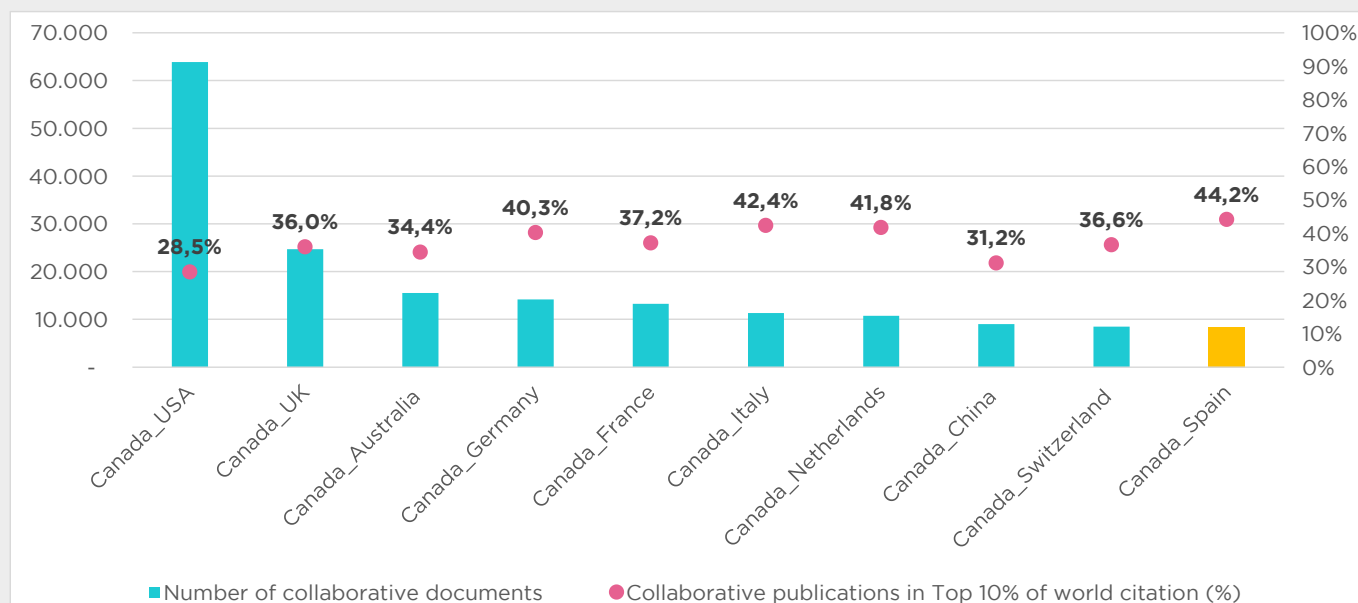
Spain's main partner countries. Area of Medicine. 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

In the case of Canada, publications in the area of Medicine in collaboration with Spain rank tenth among its main collaborating countries in the world.

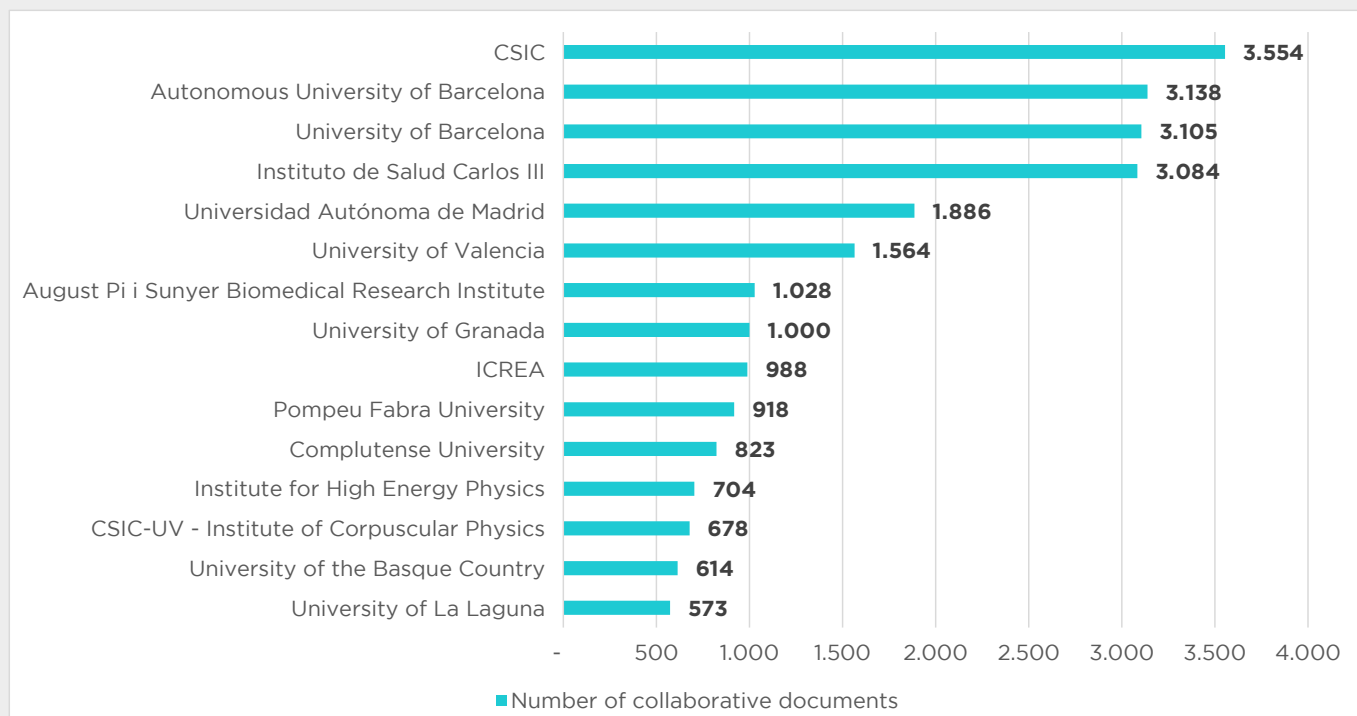
Canada's main partner countries. Area of Medicine. 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

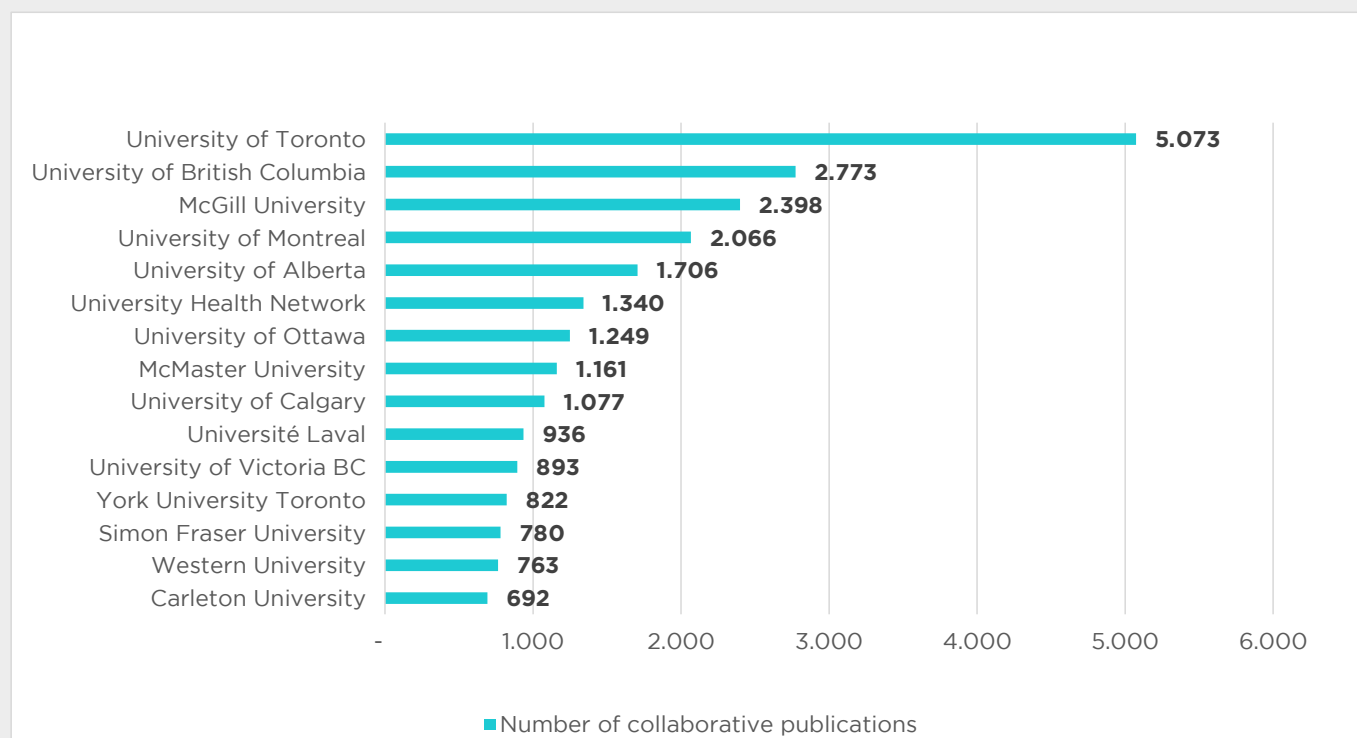
MAJOR INSTITUTIONS IN SPAIN AND CANADA INVOLVED IN COLLABORATIVE SCIENTIFIC PRODUCTION BETWEEN THE TWO COUNTRIES. PERIOD 2017-2022

Main Spanish institutions collaborating with Canada. 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

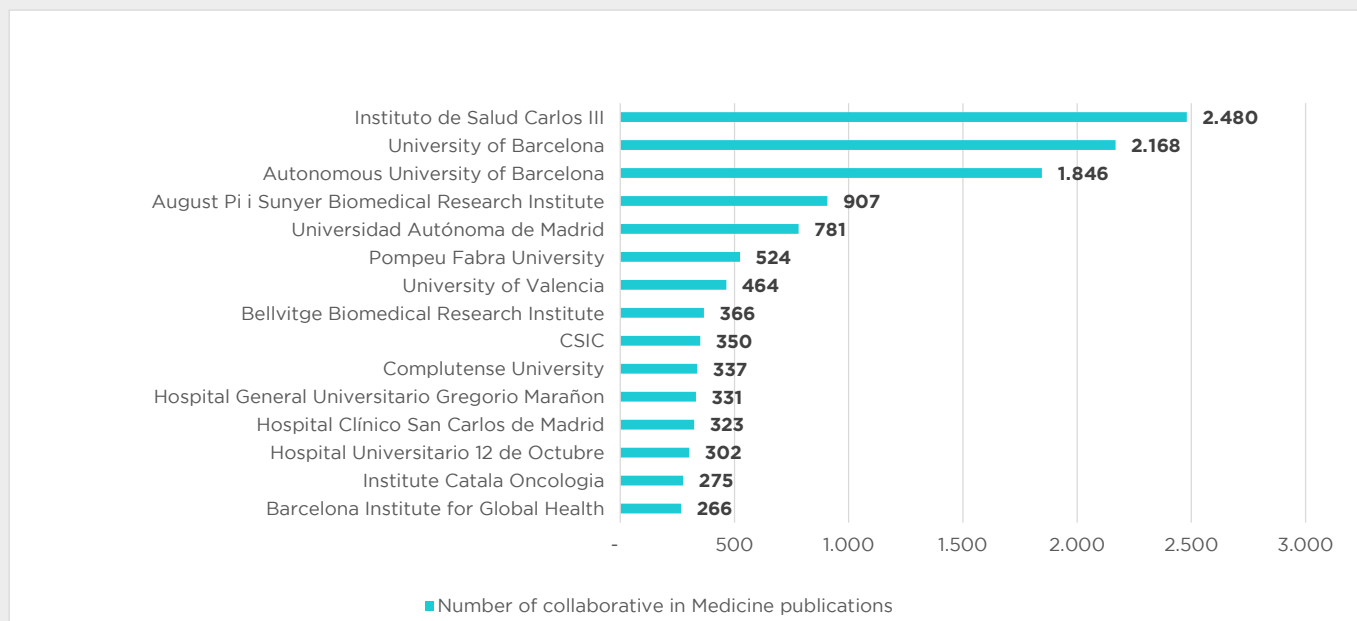
Main Canadian institutions collaborating with Spain. 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

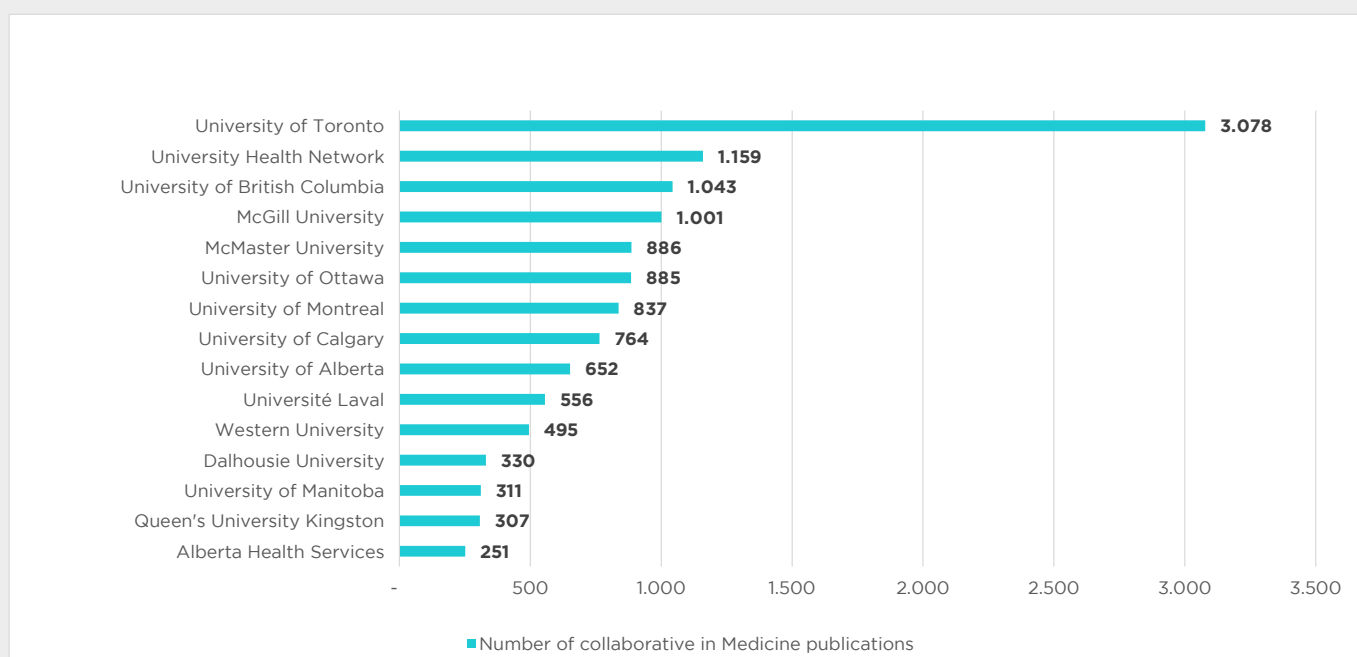
In the specific area of Medicine, the major institutions in Spain and Canada with collaborative publications between the two countries in this area are shown below.

Main Spanish institutions collaborating with Canada in the area of Medicine. 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

Main Canadian institutions collaborating with Spain in the area of Medicine. 2017-2022



Source: FECYT based on Scival with Scopus data from Elsevier. Accessed on 9 February 2023

