

Patentometric study of nanotechnology in Spain

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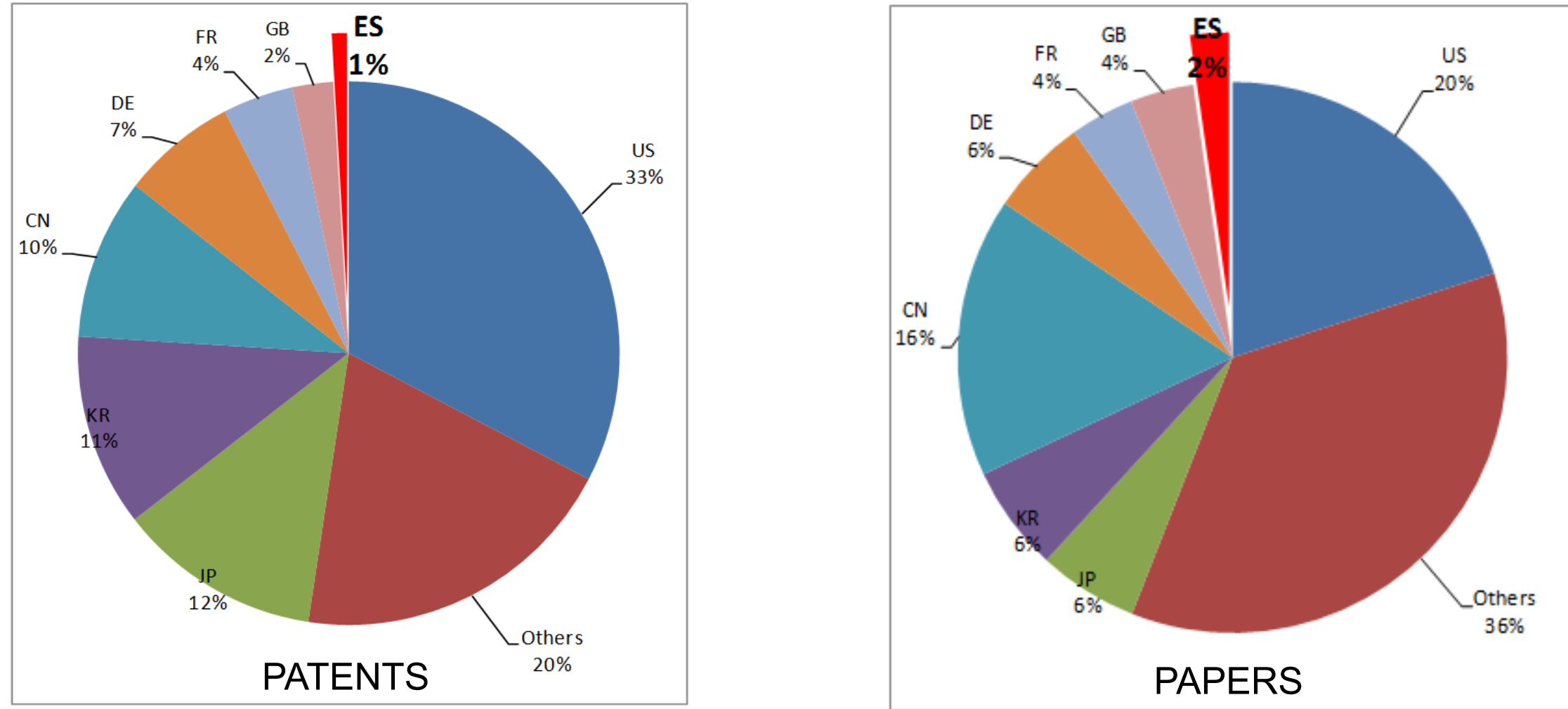
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In this work, which is based on a PhD thesis [1] in the framework of a funded project [2], a patentometric study of Spanish nanotechnology is done for the years 2004 to 2014. We identified relevant patent classifications and combined them with an established lexical query for nanotechnology [3]. By using *Espacenet* data source (DocDB) which had the best data coverage for the purpose [4] we retrieved more than 3400 patent records with Spanish authorship. After an exhaustive data harmonization process subsequently a detailed analysis was performed using the patent statistics software tool *Matheo Patent*. For a patent/paper comparison furthermore we used the scientific article database *Scopus*.

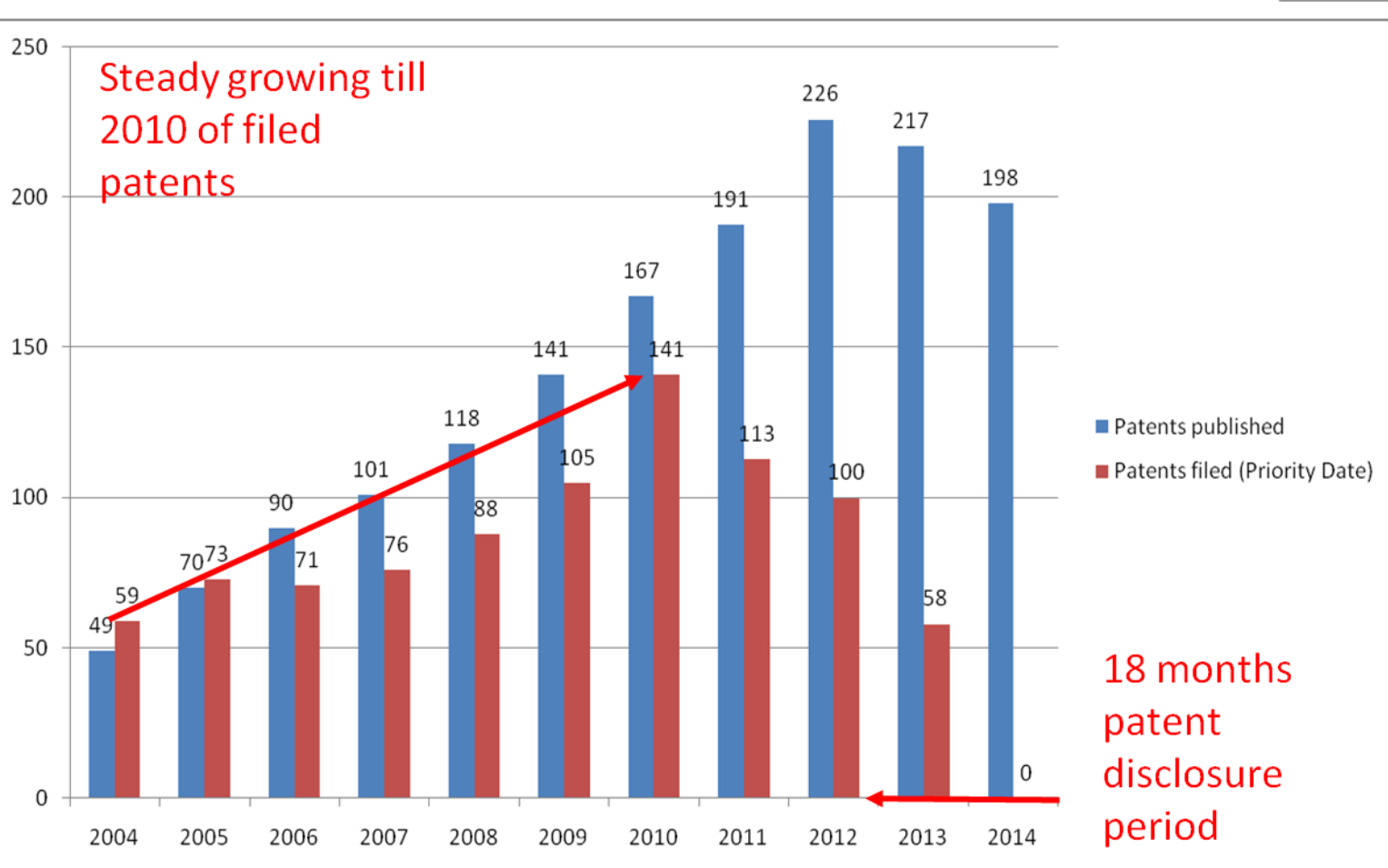
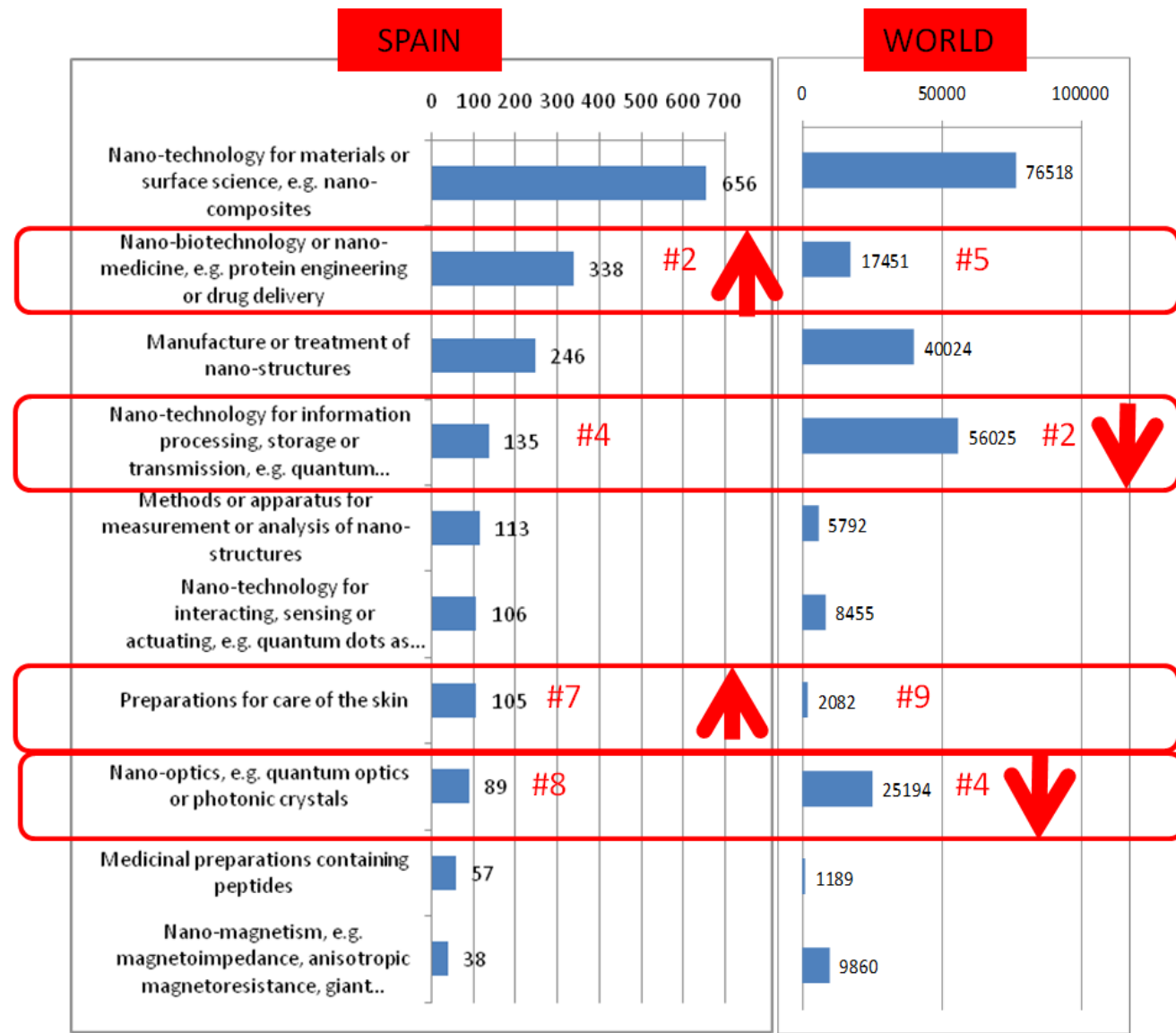
Spain vs. World

First, Spanish patenting in Nanotechnology was compared to worldwide patenting and publishing. By launching the search query to the total worldwide database and to applicant affiliations of seven important Nano output countries (Li 2007) we could see how the Spanish nanotechnology is behaving compared to an international basis.



Two types of countries could be identified: On the one hand a group comprising the United States, Japan and South Korea where the production of patents is relatively higher than the scientific production. On the other hand a group with the opposite behaviour, which includes especially China and to a lesser extent the UK and Spain. Spain intervenes at 1% of the

Regarding the Spanish Nanotechnology thematic profile we compared it with worldwide patenting and could identify an above average patenting in the field of nanomedicine and nano-biotechnology. On the contrary we found a deficit in patents related to nano-optics, nano-magnetism and nanotechnologies related to information and communication technologies (ICT). In the field of materials science related to nanocomposites, production is equivalent in relative terms to the rest of the world.

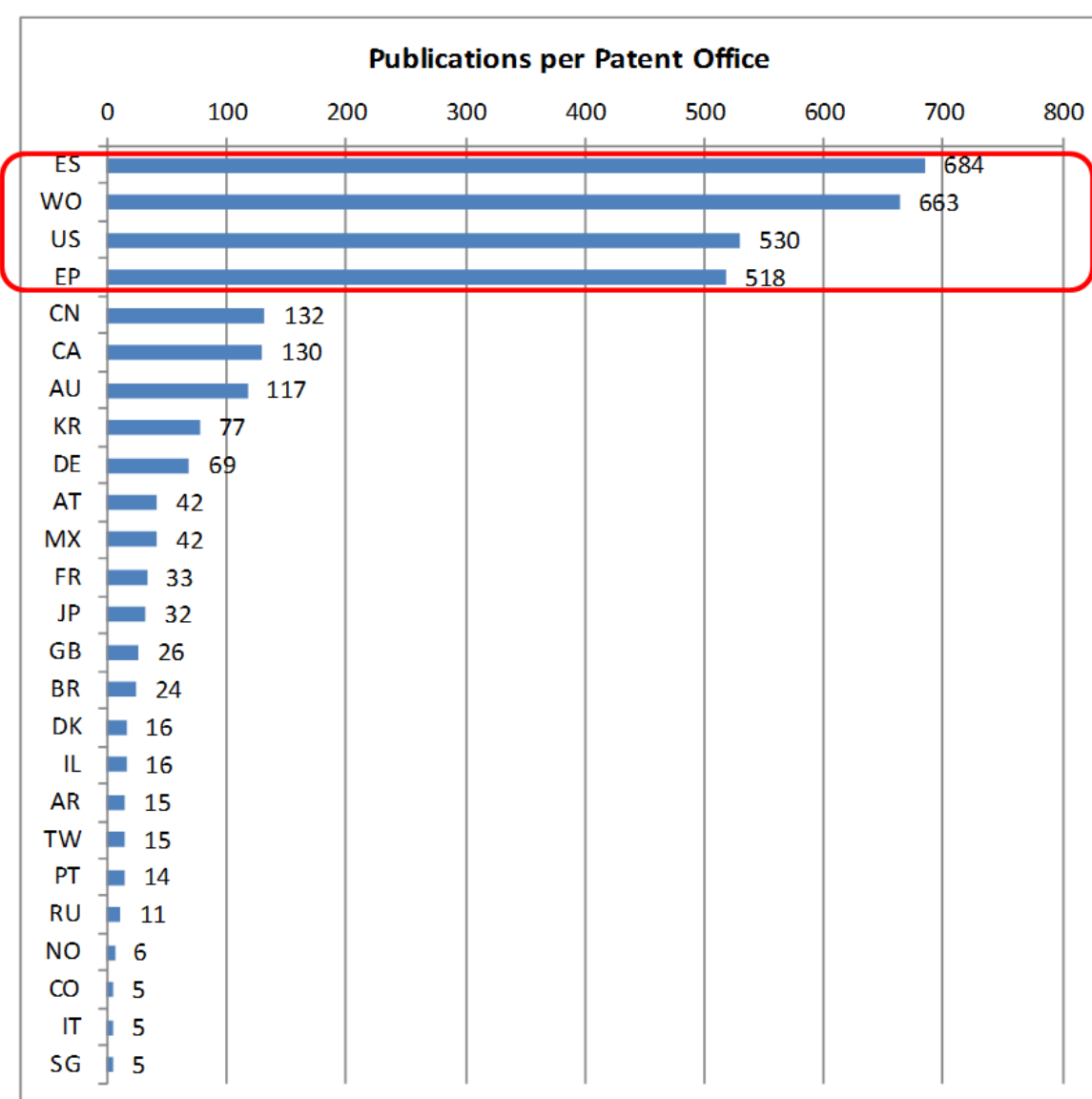


Temporal patenting evolution

Regarding the nanotechnology patenting output of Spain the temporal evolution has found to be steady for several years till 2010 where we could detect a slowdown in patent filing. The last 18 months show nearly no filings due to the non-disclosure period of the patent system.

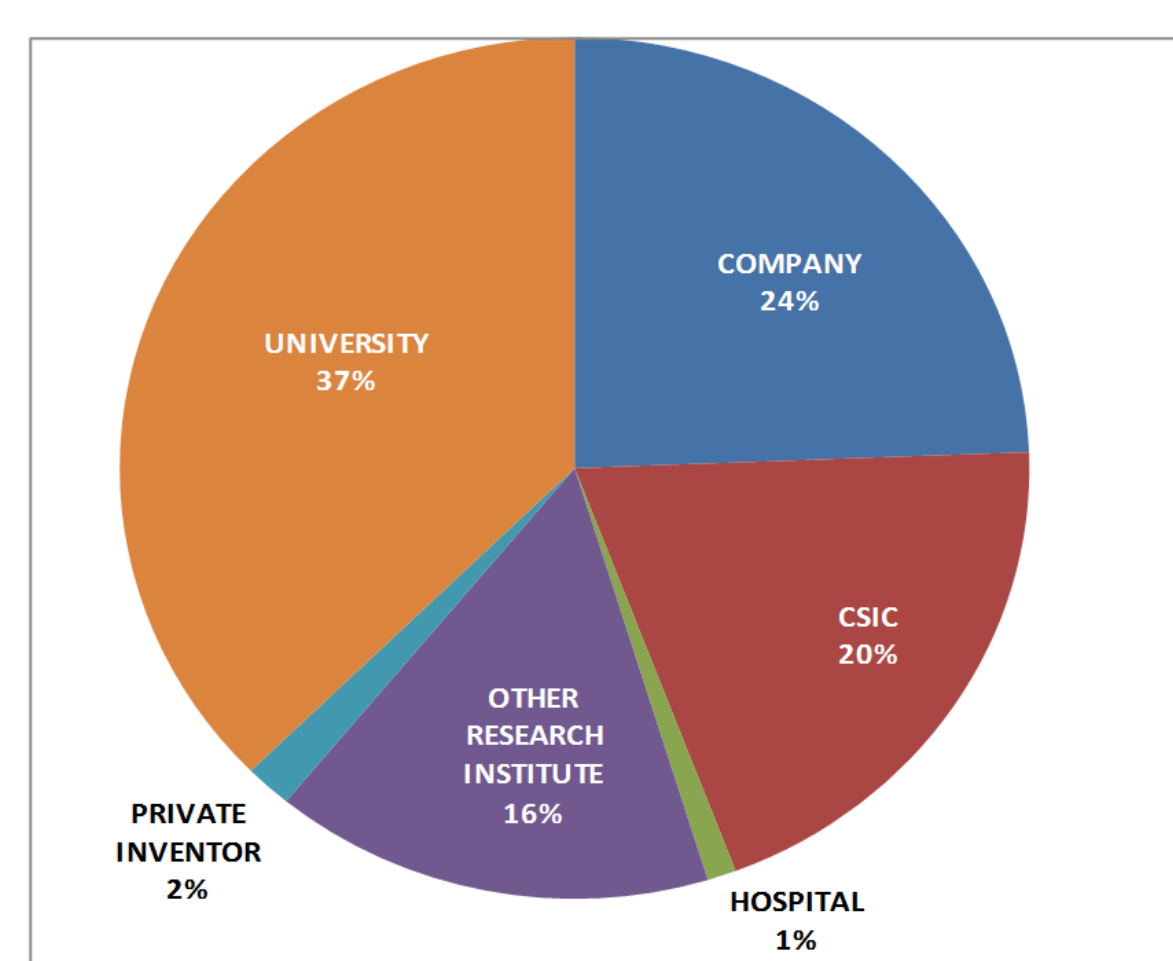
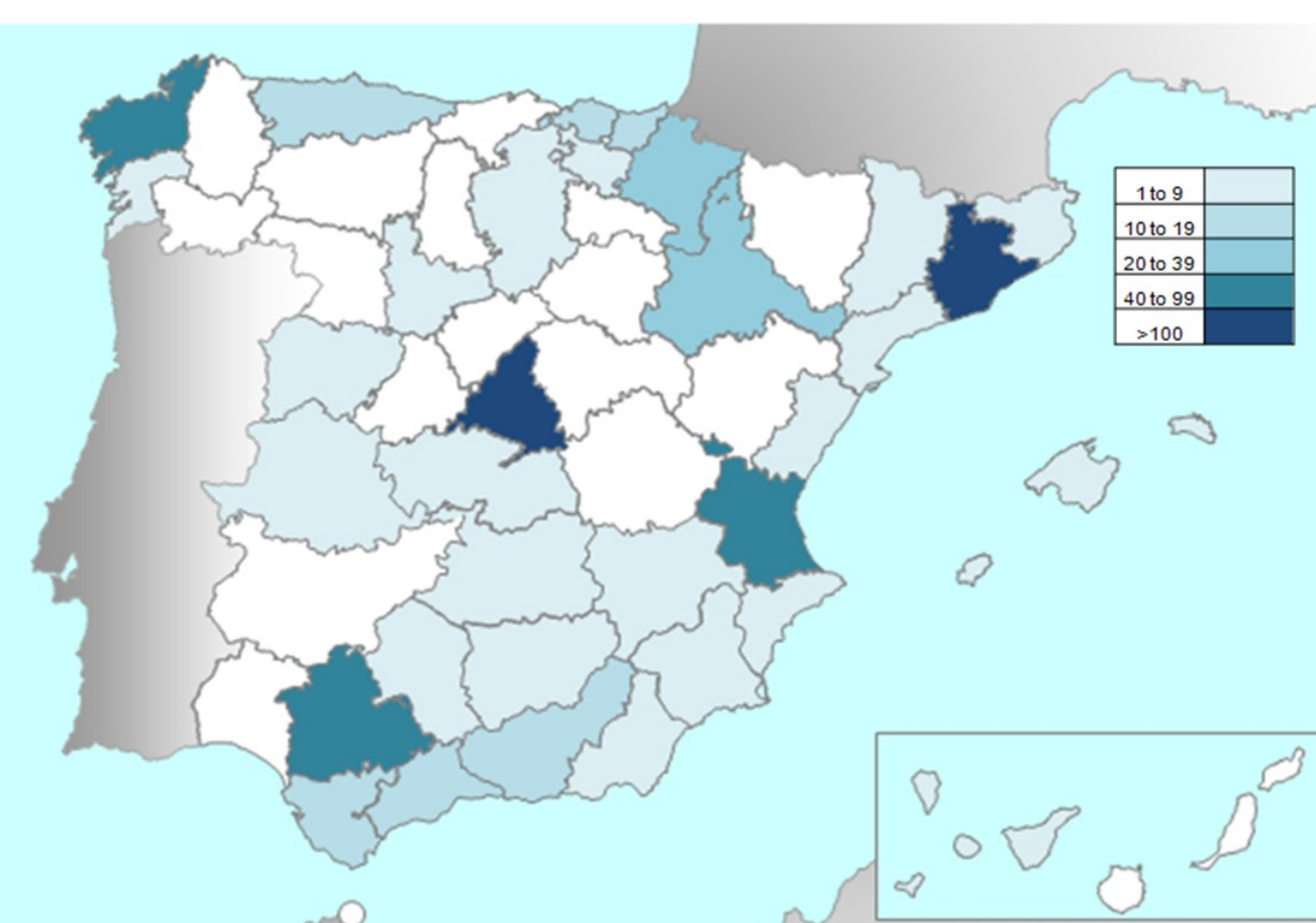
Publications per patent office

By identifying the patent authorities where the applicants file their patents we can see which countries or patent systems were considered of interest for the applicant to protect their invention. As expected from patents with Spanish authorship most patents were filed at the Spanish patent office (ES), but closely followed by filings of PCT applications (WO) at the World Intellectual Property Organization. The third and fourth most important patent filing destination was the US and the European Patent Office (EP). It is interesting to see that China, seems to have overtaken Japan as a more desirable



Top patenting regions & sectors

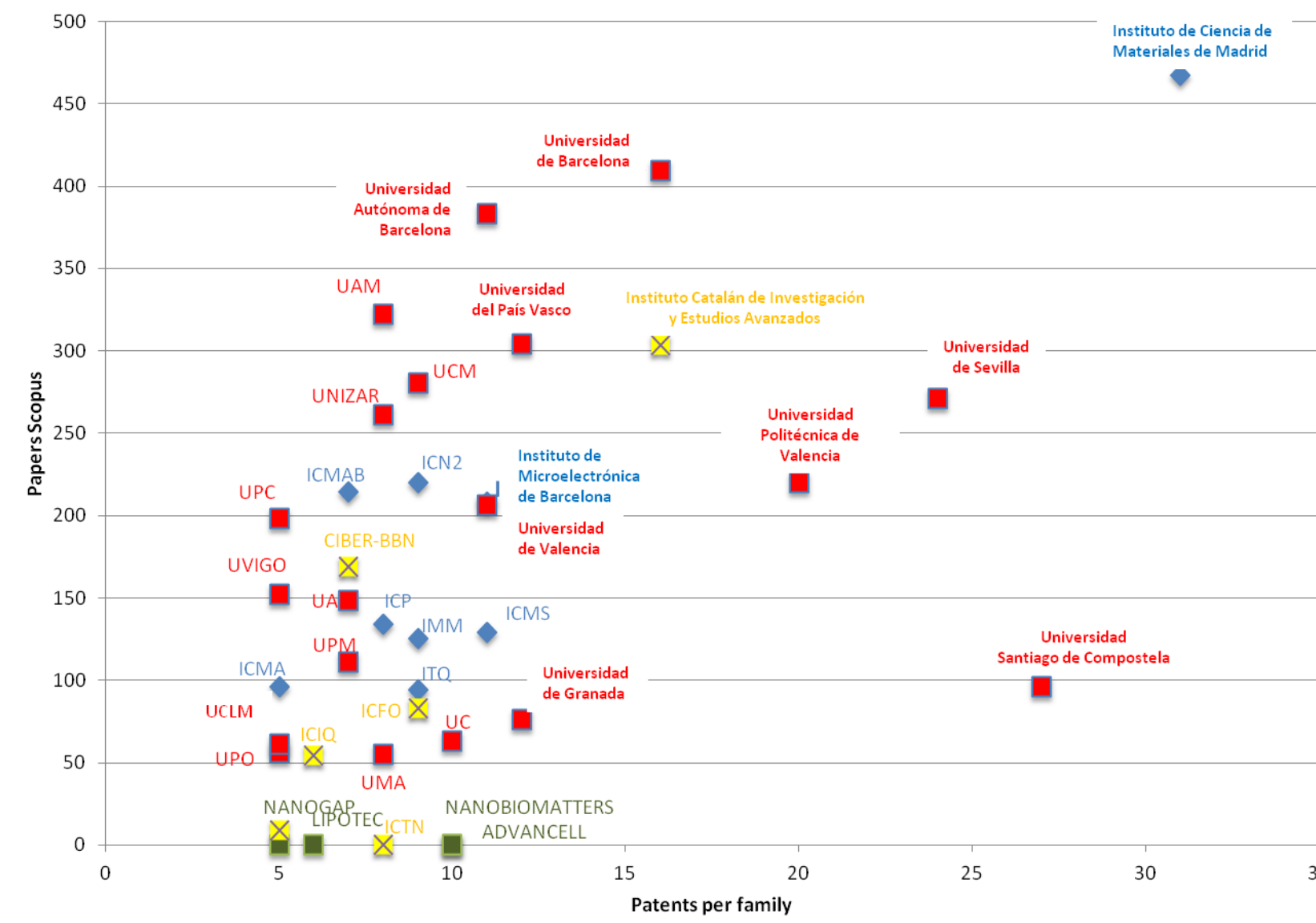
Five focal points of nanotechnology patent generation in Spain could be detected with Barcelona and Madrid leading, followed by Valencia, Sevilla and La Coruña.



If we analyze the patent output according to its applicant's sector affiliation the universities are prevalent (37%), followed by private enterprises (24%), the CSIC (20%) and other research centres (16%).

Patent output vs. scientific paper output

It was of interest to compare the patenting and scientific publishing behaviour in order to see some kind of correlation.



The top applicants, the Spanish universities of Santiago de Compostela (USC) and Seville (US) in the right side, followed with some distance from the Universidad Politecnica de Valencia (UPV). Although the USC has the highest patent output, it has a moderate paper output comparing to the other universities (in red).

The most productive entity in both, patent families and papers is the Instituto de Ciencia de Materiales de Madrid (ICMM). The most productive in paper publishing turned out to be the two universities of Barcelona (UB and UAB), although the latter have far less patents compared to the ICMM. Non university and CSIC research centres which we can point out is the Institució Catalana de Recerca i Estudis Avançats (ICREA) with a relatively high patent and paper output.

Patent internationalization ratio

In order to measure the effort of internationalization we describe an indicator, which is a ratio between the number of patent registrations (in different offices) and patent families (the invention or innovation itself) and can be used to measure the value of patents.

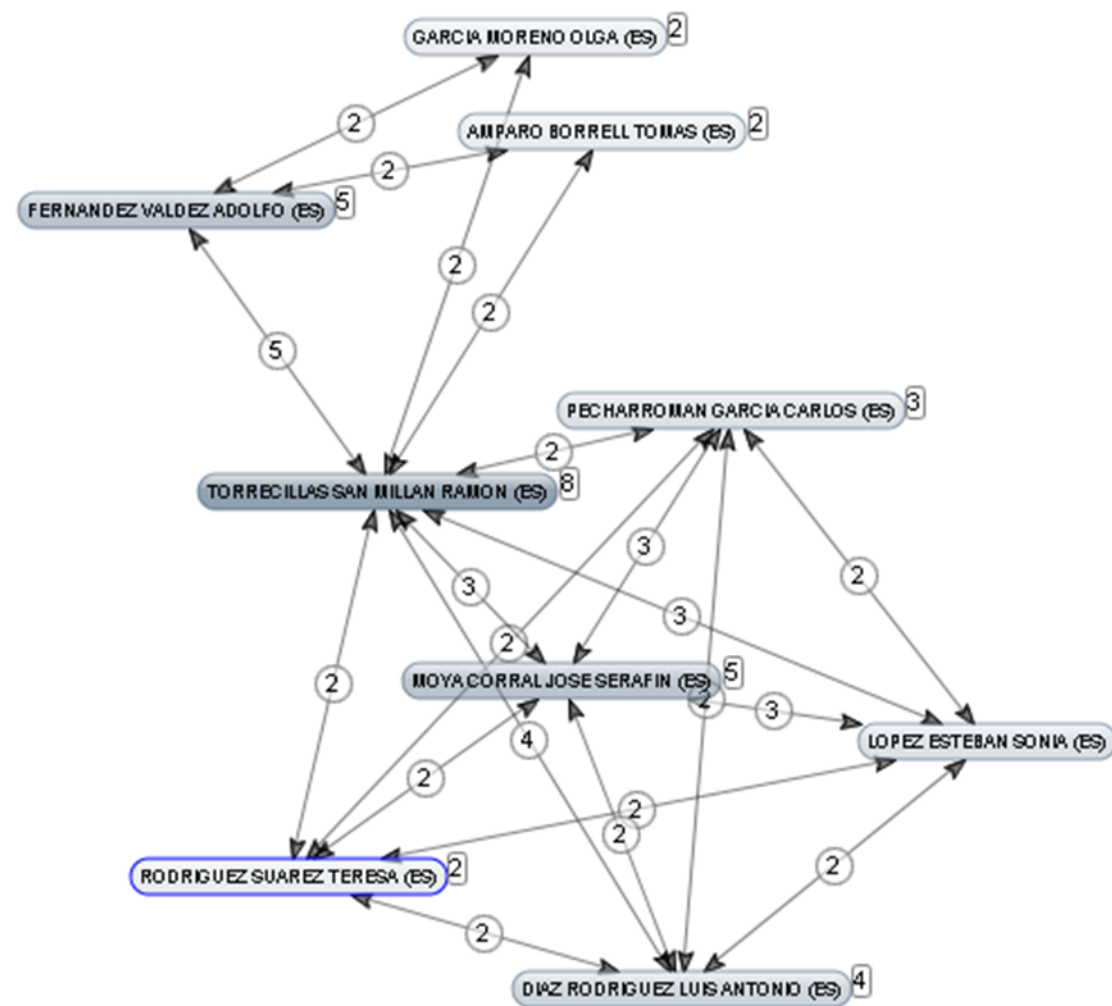
Applicants (All sectors)	Patent families	Patent records	Patent IR (records/family)
Salvat Lab SA	1	20	20
Grifols SA	2	35	17,5
Interquim SA	1	14	14
Silicalia SL	2	26	13
Dendrico SL	1	13	13
Ted Pharma SL	1	13	13
Nylstar SA	1	12	12
Hospital De La Santa Creu I Sant Pau	1	11	11
Hospital Universitari Germans Trias I Pujol	1	11	11
Tolsa SA	1	11	11
Advancell SA	10	104	10,4
Biolan Microbiosensores SL	1	10	10
HistoCell SL	1	10	10

When we analyze the rate of internationalization in Spain, we find that the highest values are presented by the companies, whose business model is based on the protection of such innovations and therefore are willing to such an effort. Some universities appear to have higher capacity of internationalization than the CSIC centres. The institutions which really stand out are the *Universidad de Sevilla* and the *Universidade de Santiago de Compostela*. Both have such a positive productive behaviour that a further study of their technology transfer offices (TTO) would be of interest.

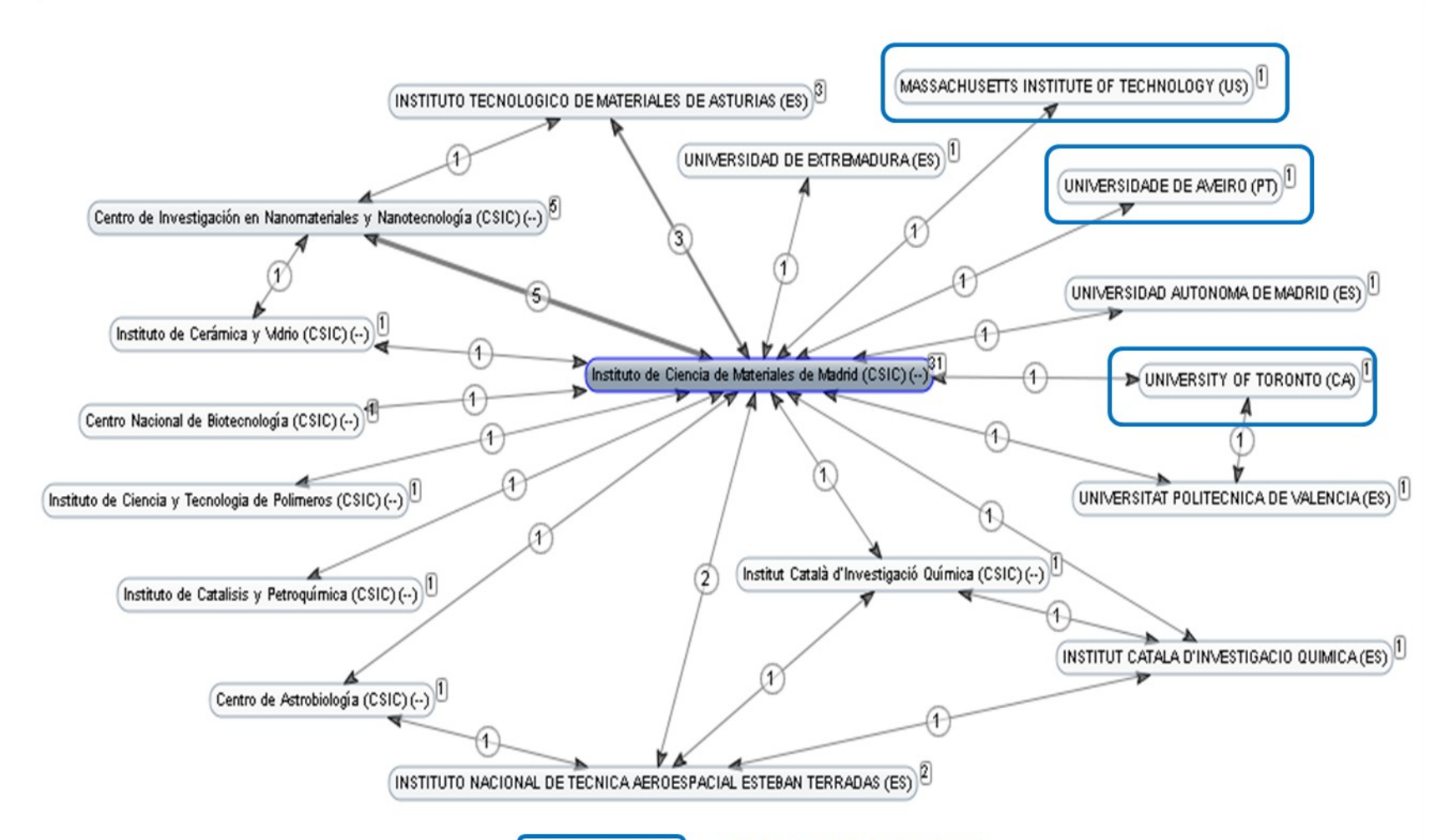
Collaboration networks

By analyzing the co-authoring and co-applicant behaviour of Spanish Nanotechnology patents, we could reveal collaboration patterns of institutions and researchers which are visualized via network maps.

Inventor collaboration network (example):



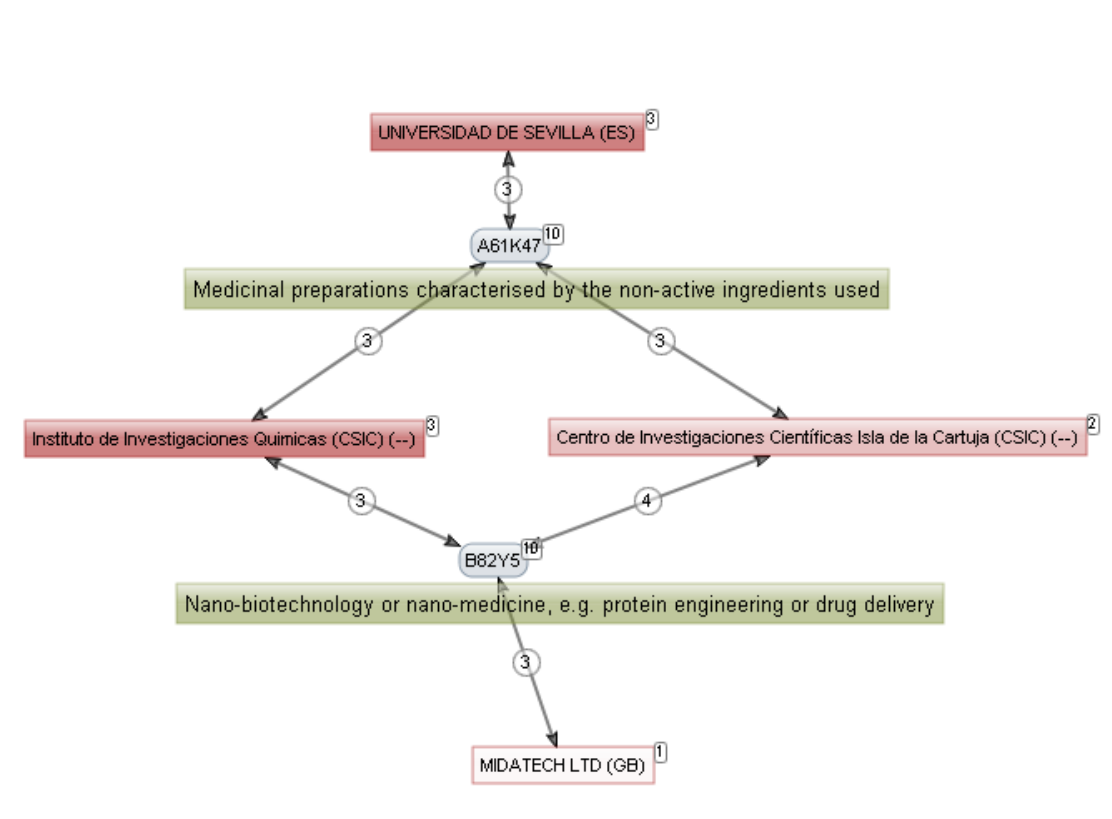
Applicant collaboration network (example):



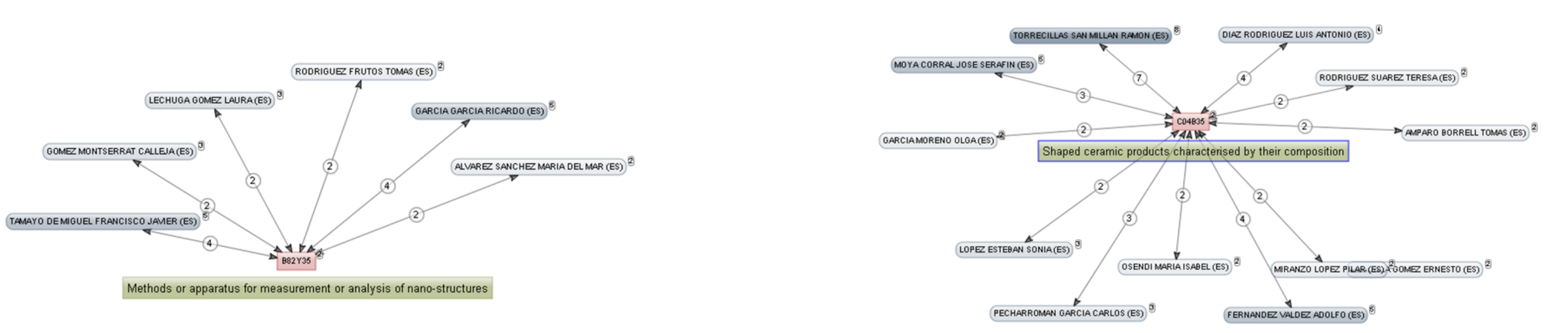
Technology networks

Finally, by analyzing the patent classifications we could define thematically the relationships of the most important patent applicants and inventors.

Applicant technology networks (examples)



Inventor Technology networks: (examples)



References

- Jürgens, B. (2016). Nanotechnology in Spain: technology watch by patents (Unpublished doctoral dissertation). University of Granada.
- Framework project "Vigilancia tecnológica de la nanotecnología Española a través de sus patentes", grant by Spanish Ministry of Science and Economy (Plan Nacional de I&D+i 2008-2011, project code: CSO2012-38801)
- Maghrebi, M., Abbasi, A., Amiri, S., Monsefi, R., & Harati, A. (2010). A collective and abridged lexical query for delineation of nanotechnology publications. *Scientometrics*, 86(1), 15-25.
- Jürgens, B., Herrero-Solana, V. (2015). Espacenet, Patentscope and Depatisnet: A comparison approach. *World Patent Information*. Vol. 42. doi:10.1016/j.wpi.2015.05.004