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Academic research in innovation: a country analysis

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Abstract Many countries are investing a lot in innovation in order to modernize their economies. A key step in this process is the development of academic research in innovation. This article analyzes the leading countries in innovation research between 1989 and 2013 from an academic perspective. The aim of the study is to identify the most relevant countries in this field and the leading trends that are occurring during the last years. The work also introduces a general perspective analyzing the research developed in several supranational regions. The main advantage of this contribution is that it gives a global overview of the current academic state of the art in the area. The analysis focuses on the most productive and influential countries in innovation research classifying the results in periods of 5 years. The leading journals in the field are also studied individually identifying the most productive countries in each of the journals. The results show that the publications of each country are biased by the country origin of the journal. The USA and the UK are the leading countries in this field being the UK the most productive one in per capita terms among the big countries.

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Introduction

Innovation research is a quite new topic in academia (Fagerberg and Verspagen 2009) because it did not receive serious attention until the twentieth century with the work of Schumpeter (1934). Today, many countries give a lot of importance to this field with a strong emphasis on the connection with research & development (R&D) (Audretsch and Feldman 1996; Teece et al. 1997) . The leading management associations also recognize the importance of this area with the inclusion of one fundamental section on innovation among its main topics. For example, the Academy of Management has the Technology and Innovation Management Division and the Strategic Management Society has the Knowledge and Innovation Group. Moreover, there are some journals strictly dedicated to this field including the Journal of Product Innovation Management, Technovation, Industry and Innovation: Management, Policy & Practice. Additionally, there are many journals that dedicate a huge number of pages to this area including Research Policy, R&D Management, Technological Forecasting and Social Change and Technology Analysis and Strategic Management.

From an academic perspective, it is important to classify all the material published in a research field in order to be concerned on the leading trends occurring in the discipline. This problem is usually assessed with bibliometrics which is the research field that studies quantitatively the bibliographic material (Broadus 1987). This concept is becoming very popular thanks to the development of computers and internet (Ding et al. 2014). Bibliometric studies are very common in the scientific community in a wide range of fields including economics (Coupé 2003), accounting (Merigó and Yang 2016), entrepreneurship (Landström et al. 2012), and management (Podsakoff et al. 2008).

Bibliometric studies are also common in innovation research. Several authors analyze different issues including the most cited papers, leading journals, authors and universities. A general overview was presented by Fagerberg et al. (2012). They consider a wide range of issues including the most cited works, the most relevant contributors and universities, the leading journals and the most popular topics. Martin (2012) analyzes the most cited works by studying the evolution of the field since the origins. Shafique (2013) also provides a list of the 100 most influential publications although he considers other issues including the most relevant journals. His results are focused on leading management and economics journals but the specialized journals do not appear in the analysis with the exception of Research Policy and the Journal of Product Innovation Management. Thongpapanl (2012) also studies the leading innovation journals but with a focus on the specialized ones. He develops a cross-citation analysis in order to identify the number of citations given by each of the specialized journals to the other ones. From a general perspective, he also finds the top management journals among the leading ones in the field. This work follows the previous research developed by Cheng et al. (1999), Linton and Thongpapanl (2004) and Linton and Embrechts (2007). Similar results are also found by Cancino et al. (2015) although they divide the analysis in periods of 5 years in order to see the evolution throughout time. The results indicate that before the leading management journals were more influential. But recently, the specialized journals are gaining importance strongly motivated by the growth of research worldwide that includes a strong increase in the number of researchers that are producing more articles.

Some other studies focus on the most productive and influential authors and institutions. Fagerberg et al. (2012) considers this issue from a general perspective. Thieme (2007) studies the top innovation management scholars by using fourteen leading management, marketing and innovation journals. Yang and Tao (2012) extends Thieme's approach considering the results between 1991 and 2010. They also study the leading universities in the field. This approach follows the analysis developed by Linton (2004) that studies the leading business schools distinguishing between the US and the rest of the World. Some other authors develop bibliometric studies focusing on one specific journal including Technovation (Merino et al. 2006) and the Journal of Product Innovation Management which includes several works by Biemans et al. (2007, 2010) that studied the journal between 1984 and 2003 and Durisin et al. (2010) between 1984 and 2004. There are also some articles that study the innovation research of one country from a general perspective including Toivanen (2014) that studies the case of Brazil. Some other authors have developed bibliometric methods for measuring the degree of technological innovation (Yeo et al. 2015). However, there is no study that analyzes innovation research from a general perspective considering the most productive and influential countries in this academic field.

Thus, the aim of this article is to develop a country analysis identifying the most productive and influential ones taking into account several bibliometric indicators. First, the study presents a continental perspective in order to see how the supranational regions are evolving throughout time. Second, the work presents a global perspective analyzing the countries with the highest number of articles and citations. Next, the analysis divides the results in periods of 5 years in order to see how the results are evolving throughout time. Fourth, the study considers the leading countries in seven specialized journals that are very influential in innovation research and some other leading management journals. The main contribution of this approach is that it provides a general overview of the leading countries in innovation research. Thus, by looking at the tables it is easy to identify the countries that strongly investigate in innovation. In general, the results indicate that the USA and the UK are the most influential countries in this discipline. The results of the UK are particularly remarkable because in per capita terms they are much higher than the USA. Netherlands and Canada also present very good results according to their size. This study may be useful for many purposes. For example, it can be of great interest for journal editors in order to understand the places where there is potential of growth of the discipline. Potential students may also benefit from this analysis because they may get a general picture of regions with strong research so they can find adequate places to pursue a graduate program. Policy makers may be interested in this approach in order to identify leading countries in innovation research. The per capita perspective is very useful in this context because it permits to compare countries with different population size. Finally, this study can also provide global companies with a deeper understanding of the best ecosystems in order to install their R&D centers.

The rest of the article is organized as follows. "Methods" section presents the bibliometric methods used in the analysis. "Results" section presents the results of the country analysis and "Conclusions" section summarizes the main findings and conclusions of the study.

Methods

Web of Science (WoS) is a database that classifies the articles published in some selected journals that are considered of the highest quality worldwide. Currently, it includes more than 15,000 journals and 50,000,000 publications from any of the known sciences. Some

other databases for classifying scientific research are Scopus and Google Scholar. However, this study only considers the WoS for classifying the bibliographic material. In order to find the studies on innovation research available in WoS, the search process uses the keyword "innovation" between 1989 and 2013. Since the work aims to focus on a managerial perspective, only some research areas are considered including Business & Economics, Public Administration, Government & Law, Geography, Urban Studies, Area Studies, Sociology, History and Philosophy of Science, Social Work, Social Issues, Behavioral Sciences, Asian Studies, Social Sciences and Other Topics, Transportation, Operations Research & Management Science, and Computer Science. The search obtains 40,865 articles. However, in order to focus only on research studies, the search filters this material only considering articles, reviews, notes and letters obtaining 36,644 studies. This search was carried out in December 2014 and March 2015. Observe that we strictly focus on the concept of innovation in order to be more accurate in the topic. The advantage is that we really focus in this area. The disadvantage is that some related studies that do not use the keyword innovation may not be included in the analysis.

The study classifies the material by using a bibliometric approach (Merigó et al. 2015a). Bibliometrics is the research discipline that studies the bibliographic material quantitatively (Broadus 1987) providing a general overview of a research topic according to a wide range of measures. Usually, the bibliographic material is classified according to the number of publications or citations (Emrouznejad and Marra 2014; Yu and Shi 2015). However, there are also other measures for analyzing the data such as the *h*-index (Hirsch 2005) that combines the number of publications with the number of citations. In summary, if a set of articles have an *h*-index of 10; it means that ten studies of the set have received ten or more citations. Note that in the literature, there are many other indicators for assessing the information (Bertocchi et al. 2015) such as the *g*-index (Egghe 2006) and the *hg*-index (Alonso et al. 2009). Note that in this study we rank the countries with the *h*-index and in the case of a tie, according to the number of citations. It has some weaknesses because it does not measure appropriately exceptional cases such as very highly cited papers.

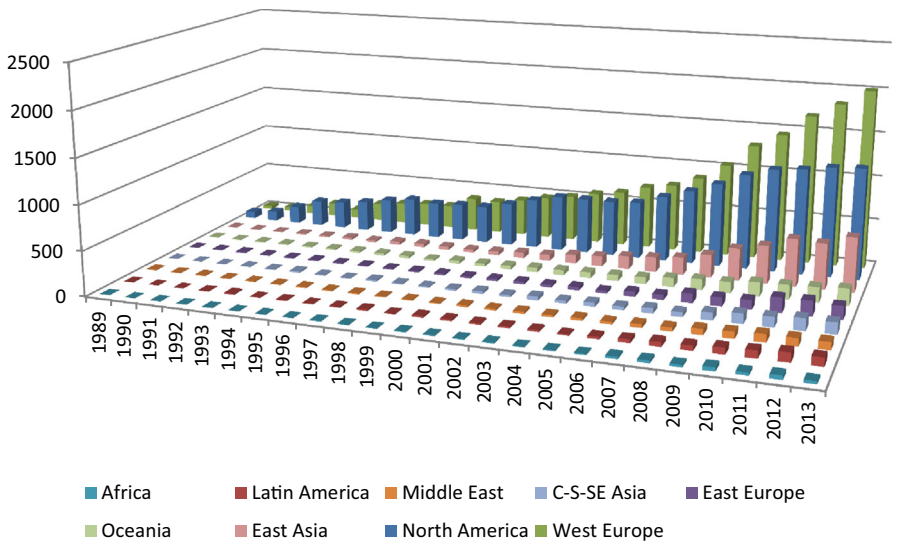

Fig. 1 Annual number of articles in innovation published by each region

However, from a general perspective, it works quite well, especially for huge volumes of publications as it happens with countries because exceptional cases become less relevant with huge volumes of documents.

The results of the bibliometric analysis are classified by using a country analysis. First, the countries are grouped in supranational regions in order to see the publication evolution of these regions throughout time (Zacca-González et al. 2014). This study considers nine regions: North America, Latin America, Western Europe, Eastern Europe, Africa, Middle East, Central, South and Southeast Asia, East Asia and Oceania. Next, the work focuses on individual countries developing a global ranking. The analysis follows the current political definitions of a country. However, when looking to the 90s, some differences occur due to the political changes that happened in this period that affect China, the old Soviet Union, Germany and Czechoslovakia. Each article is assigned to an author/s that has an institutional affiliation that includes the country of the institution. Each article gives one unit to each of the countries included in the study. Note that this may bring some deviations since some articles may have more affiliations than other ones. However, since each country has many researchers we do not expect important deviations in this context because the aim of the study is to provide a general overview identifying those countries that are publishing research in this field.

The work also develops an individual analysis of journals (Merigó et al. 2015b) in order to see those countries that publish the highest number of articles in each of the leading journals in the area. The analysis divides two general sets of journals because the leading material in innovation research is being published in these two key directions (Cancino et al. 2015). The first one includes the leading specialized journals in innovation. The second group of journals is leading management journals that do not publish so many studies in innovation although the small number of articles published in these journals is very influential. Since the number of articles is lower in this group, some journals are grouped together in order to obtain a higher publication number in the rankings. Table 1 of the Online Supplement presents the journals included in each group.

Interesting results may also arise when comparing publications and citations after controlling by country size. As a result, we use each country total population to calculate

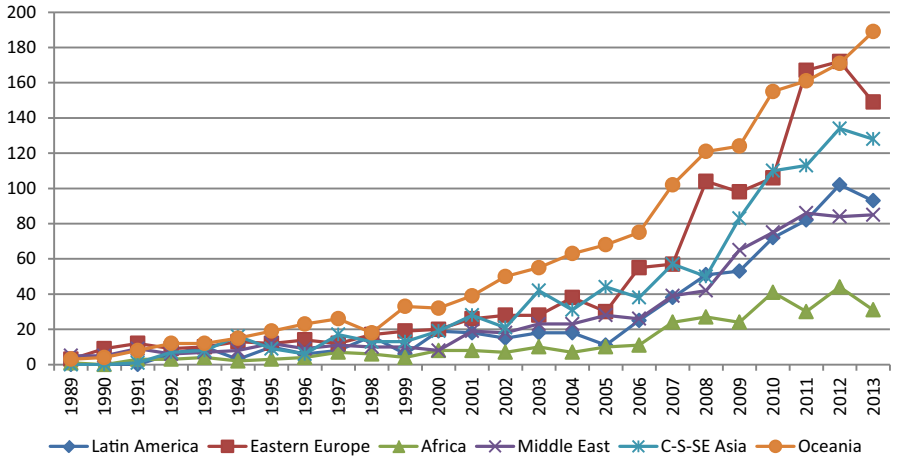

Fig. 2 Annual number of articles in innovation published by less productive regions

Table 1 Most influential countries in innovation research

R	Country	TPI	TCI	HI	≥250	≥100	≥50	TP	Pop	P/Pop	C/Pop
1	USA	13,775	478,261	268	293	1023	2056	10,446,251	316,017	0.044	1.513
2	UK	5455	108,201	132	34	189	487	2,719,498	64,100	0.085	1.688
3	Canada	1965	47,323	95	29	92	198	1,360,660	35,540	0.055	1.332
4	Netherlands	2070	37,761	79	11	56	179	700,428	16,879	0.123	2.237
5	Germany	2208	34,481	79	4	60	152	2,148,208	80,767	0.027	0.427
6	France	1390	27,862	74	11	52	115	1,511,784	66,078	0.021	0.422
7	Italy	1678	23,050	67	3	37	100	1,124,841	60,784	0.028	0.379
8	Sweden	861	19,248	60	10	24	74	472,585	9738	0.088	1.977
9	China	1416	17,297	57	5	22	66	1,684,979	1,375,475	0.001	0.013
10	Spain	1703	15,926	55	3	11	65	839,421	46,508	0.037	0.342
11	Australia	1342	16,207	54	2	21	66	842,288	23,685	0.057	0.684
12	Denmark	606	11,804	50	5	23	51	264,684	5656	0.107	2.087
13	Belgium	574	10,611	48	3	22	48	363,605	11,225	0.051	0.945
14	Israel	341	9581	45	8	14	40	301,299	8268	0.041	1.159
15	Switzerland	615	8861	45	1	16	35	485,086	8184	0.075	1.083
16	Austria	401	6463	45	1	10	33	253,131	8527	0.047	0.758
17	South Korea	728	8911	43	4	16	32	570,380	50,424	0.014	0.177
18	Japan	652	10,599	41	2	12	28	1,981,580	127,080	0.005	0.083
19	Singapore	352	7023	41	3	14	29	138,300	5470	0.064	1.284
20	Taiwan	1144	9574	40	1	3	23	367,914	23,417	0.049	0.409
21	Finland	584	7185	38	3	5	20	220,734	5470	0.107	1.313
22	Norway	438	5680	38	0	6	28	183,198	5156	0.085	1.102
23	New Zealand	255	3196	27	1	4	13	155,175	4545	0.056	0.703
24	Turkey	214	2101	27	0	1	6	312,072	76,668	0.003	0.027
25	Portugal	314	2640	26	0	3	8	145,177	10,478	0.030	0.252
26	Greece	244	2294	26	0	3	6	195,382	10,993	0.022	0.209

Table 1 continued

R	Country	TPI	TCI	HI	≥250	≥100	≥50	TP	Pop	P/Pop	C/Pop
27	India	316	2044	22	0	1	5	692,278	1,263,390	0.000	0.002
28	Brazil	277	1835	20	1	1	4	471,075	203,534	0.001	0.009
29	Ireland	201	1740	20	0	2	3	179,855	4610	0.044	0.377
30	Mexico	110	787	16	0	0	2	167,934	119,713	0.001	0.007
31	Thailand	104	706	15	0	0	1	70,452	64,871	0.002	0.011
32	South Africa	157	938	14	0	0	3	157,632	54,002	0.003	0.017
33	Slovenia	115	794	14	0	1	2	49,235	2065	0.056	0.385
34	Hungary	68	1457	13	2	4	6	130,194	9879	0.007	0.147
35	Chile	79	640	12	0	1	3	80,350	17,819	0.004	0.036
36	Malaysia	112	577	12	0	1	1	63,231	30,420	0.004	0.019
37	Cyprus	33	536	11	0	1	1	9303	1117	0.030	0.480
38	Argentina	76	482	11	0	1	1	138,967	42,670	0.002	0.011
39	Poland	100	444	11	0	0	1	350,511	38,496	0.003	0.012
40	Lithuania	64	398	11	0	0	1	24,865	2927	0.022	0.136
41	Luxembourg	26	279	10	0	0	1	6886	543	0.048	0.514
42	Czech Republic	119	345	9	0	0	0	173,254	10,522	0.011	0.033
43	Saudi Arabia	28	301	9	0	0	2	64,474	30,770	0.001	0.010
44	U. Arab Emirates	45	260	9	0	0	0	15,025	9446	0.005	0.028
45	Colombia	51	251	9	0	0	1	32,842	47,892	0.001	0.005
46	Iran	54	237	9	0	0	0	172,968	77,939	0.001	0.003
47	Russia	81	268	8	0	0	1	619,167	146,233	0.001	0.002
48	Kenya	27	221	8	0	0	1	20,762	41,800	0.001	0.005
49	Estonia	45	189	8	0	0	0	20,115	1316	0.034	0.144
50	Romania	81	185	6	0	0	1	86,501	19,943	0.004	0.009

HI, TCI, TPI, *h*-index and number of cites and studies in innovation; ≥250, ≥ 100, ≥50, number of articles with more than 250, 100 and 50 cites; TP, total papers of the country in WoS; Pop, Population in thousands; P/Pop, C/Pop, papers and cites divided by population

Table 2 Leading countries in innovation between 1989 and 1993

R	Country	TPI	TCI	HI	TCI/TPI	PI (%)	TP	*H*	P/Pop	C/Pop
1	USA	880	64,430	110	73.22	0.07	1,250,223	1149	3.39	247.88
2	UK	160	6547	34	40.92	0.05	293,193	611	2.77	113.43
3	Canada	115	5064	26	44.03	0.07	162,209	488	3.99	175.63
4	Netherlands	55	1837	17	33.4	0.08	71,850	370	3.60	120.14
5	Israel	29	2010	16	69.31	0.08	37,644	273	5.51	382.06
6	Germany (Fed/Dem)	70	1026	14	14.66	0.03	241,585	523	0.86	12.64
7	France	46	511	12	11.11	0.03	182,456	462	0.78	8.65
8	Italy	35	518	11	14.8	0.03	101,000	352	0.62	9.11
9	Australia	32	572	10	17.88	0.04	76,176	331	1.81	32.38
10	Sweden	17	3432	8	201.88	0.03	55,457	344	1.95	393.64
11	Japan	24	380	7	15.83	0.01	248,731	467	0.19	3.05
12	India	9	121	7	13.44	0.01	76,189	164	0.01	0.13
13	China (+Hong Kong)	11	112	6	10.18	0.02	48,022	187	0.01	0.10
14	Belgium	9	189	5	21	0.03	33,283	259	0.89	18.74
15	Austria	8	107	5	13.38	0.04	21,732	233	1.01	13.53
16	Spain	9	139	4	15.44	0.01	60,280	234	0.23	3.55
17	New Zealand	7	78	4	11.14	0.04	15,792	188	1.96	21.84
18	South Africa	6	20	4	3.33	0.03	18,569	138	0.16	0.53
19	Switzerland	5	99	3	19.8	0.01	47,939	377	0.72	14.27
20	Norway	7	60	3	8.57	0.04	17,163	200	1.62	13.91
21	Greece	6	37	3	6.17	0.05	12,322	125	0.57	3.54
22	Thailand	5	31	3	6.2	0.19	2630	92	0.09	0.53
23	Indonesia	3	194	2	64.67	0.31	965	54	0.02	1.03
24	Portugal	3	156	2	52	0.06	5124	103	0.30	15.66
25	South Korea	3	41	2	13.67	0.03	10,933	121	0.07	0.93
26	Finland	6	13	2	2.17	0.03	22,868	233	1.18	2.57
27	Hungary	3	7	2	2.33	0.02	15,162	151	0.29	0.68
28	Nigeria	1	193	1	193	0.02	5498	59	0.01	1.87
29	Poland	4	22	1	5.5	0.01	30,195	165	0.10	0.57
30	Russia (+USSR)	7	15	1	2.14	0.00	178,380	234	0.05	0.10
31	Luxembourg	1	14	1	1	0.48	208	23	2.52	35.22
32	Czechoslovakia	21	10	1	0.48	1.30	1618	133	2.03	0.97
33	Mexico	3	10	1	3.33	0.03	9446	129	0.03	0.11
34	Kenya	1	10	1	10	0.04	2472	86	0.04	0.39
35	Nicaragua	1	6	1	6	1.37	73	15	0.22	1.35
36	Brazil	6	5	1	0.83	0.03	20,929	158	0.04	0.03
37	Taiwan	3	3	1	1	0.02	18,124	133	0.14	0.14
38	Colombia	2	1	1	0.5	0.20	1008	66	0.06	0.03
39	Egypt	2	1	1	0.5	0.02	9445	73	0.03	0.02
40	Lebanon	1	1	1	1	0.25	402	32	0.34	0.34

The table includes the journals with the highest number of papers in innovation in this period but ranked according to the *h*-index

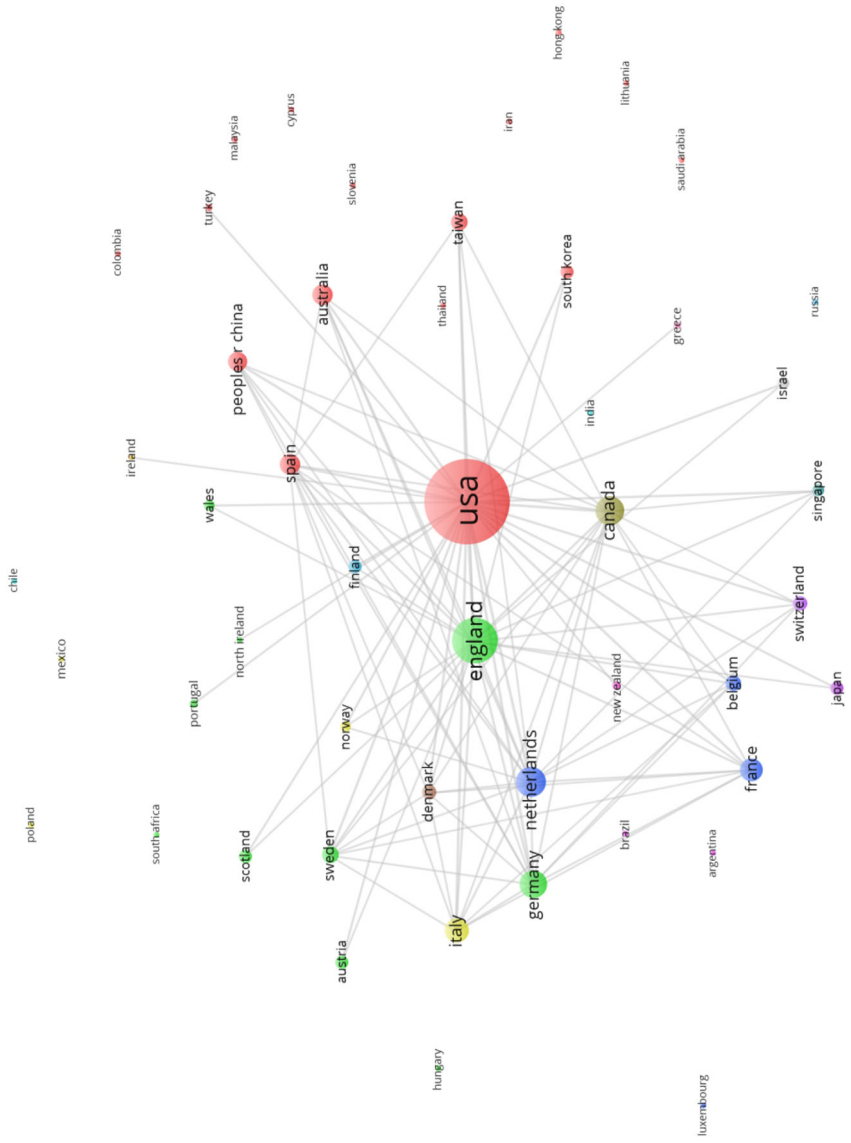

Fig. 3 Bibliographic coupling of the 10,000 most cited papers in innovation research

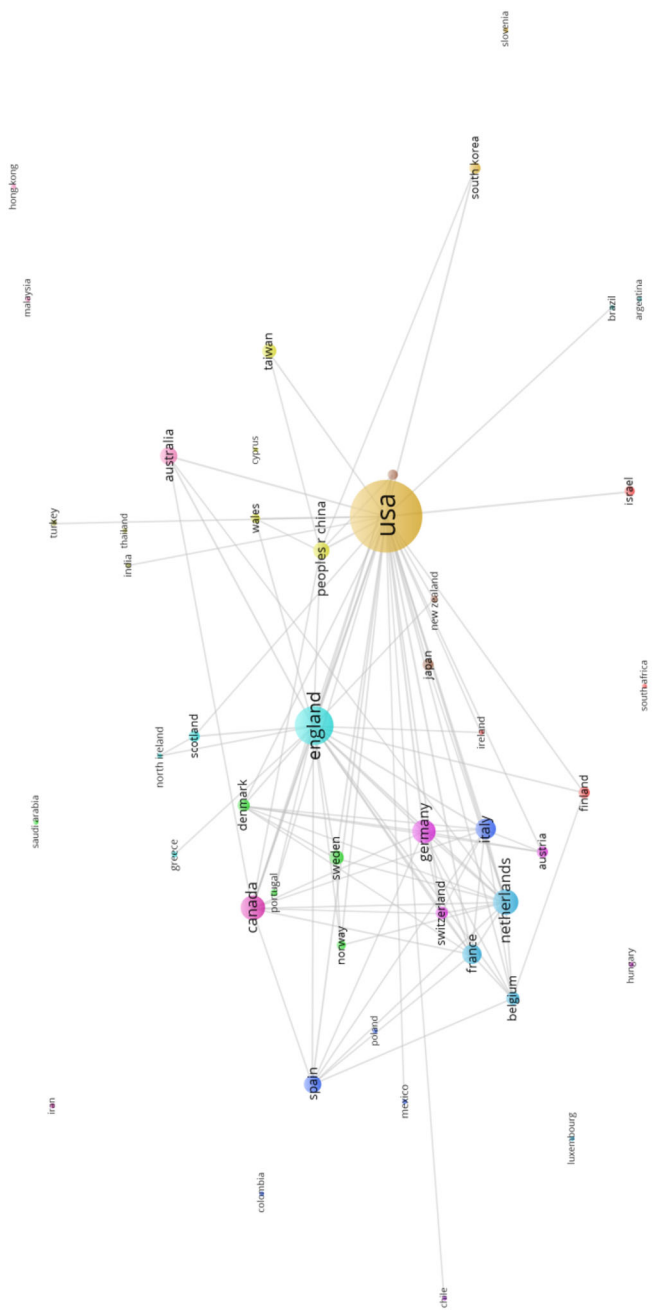

Fig. 4 Country co-authorship of the 10,000 most cited papers in innovation research

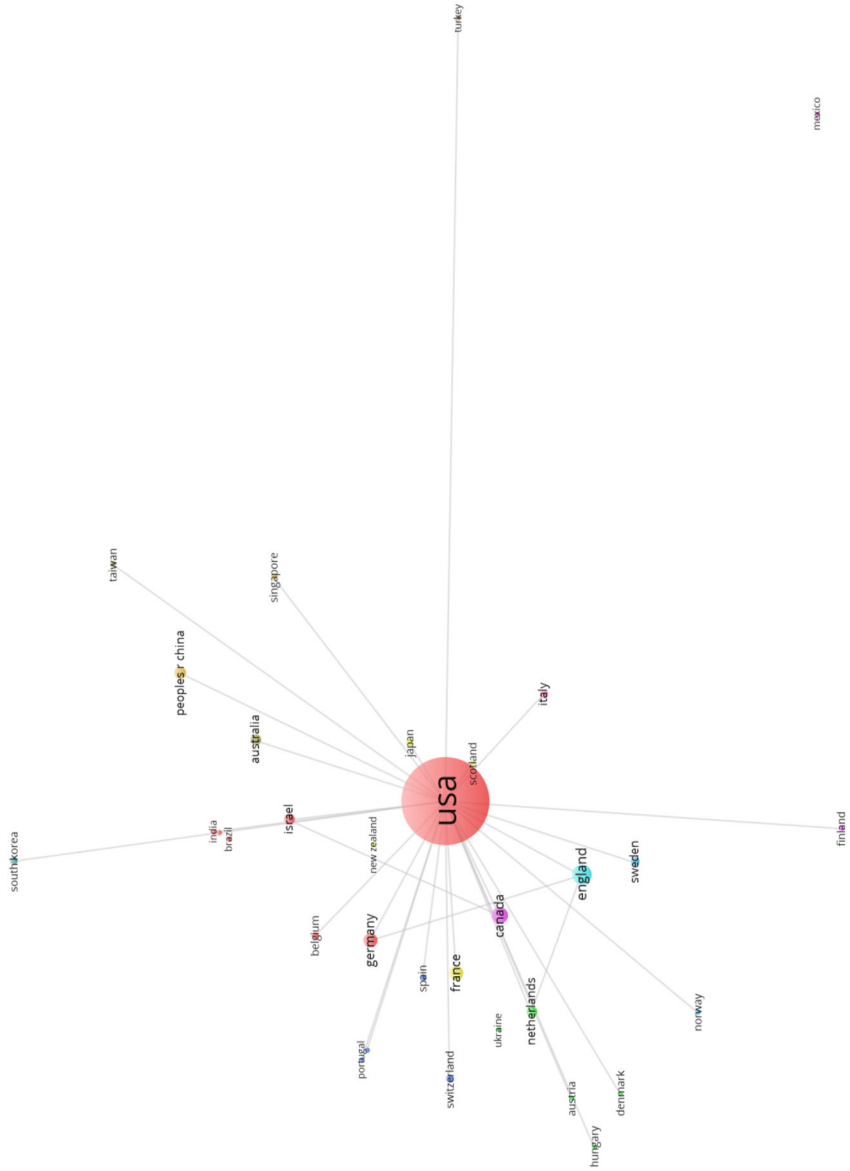

Fig. 5 Co-authorship of the USA for its 2000 most cited papers in innovation

the total number of publications and citations per capita. This is important because there are many well developed countries that are very productive but since they are very small their results do not become significant at a global scale. Therefore, the per capita analysis permits to identify the productivity of a country taking into account the difference in population.

The study also uses the VOS viewer software in order to map the countries through a bibliographic coupling and co-authorship analysis (Van Eck and Waltman 2010). Recall that bibliographic coupling occurs when two documents cite a third common study (Martyn 1964). Co-authorship shows the volume of publications of a set of variables and how they are connected between them. Observe that in this work, the analysis is focused on countries so we look for bibliographic coupling and co-authorship of countries.

An important limitation when carrying out a country analysis in academic research is that many people that work in one country may have a different nationality. This is very common in well developed countries such as the USA and Western Europe because they recruit many researchers from abroad and at different periods of time. The aim of this study is to identify the scientific production and influence developed inside a country. Therefore, it does not matter the nationality of the researchers involved. However, this problem should

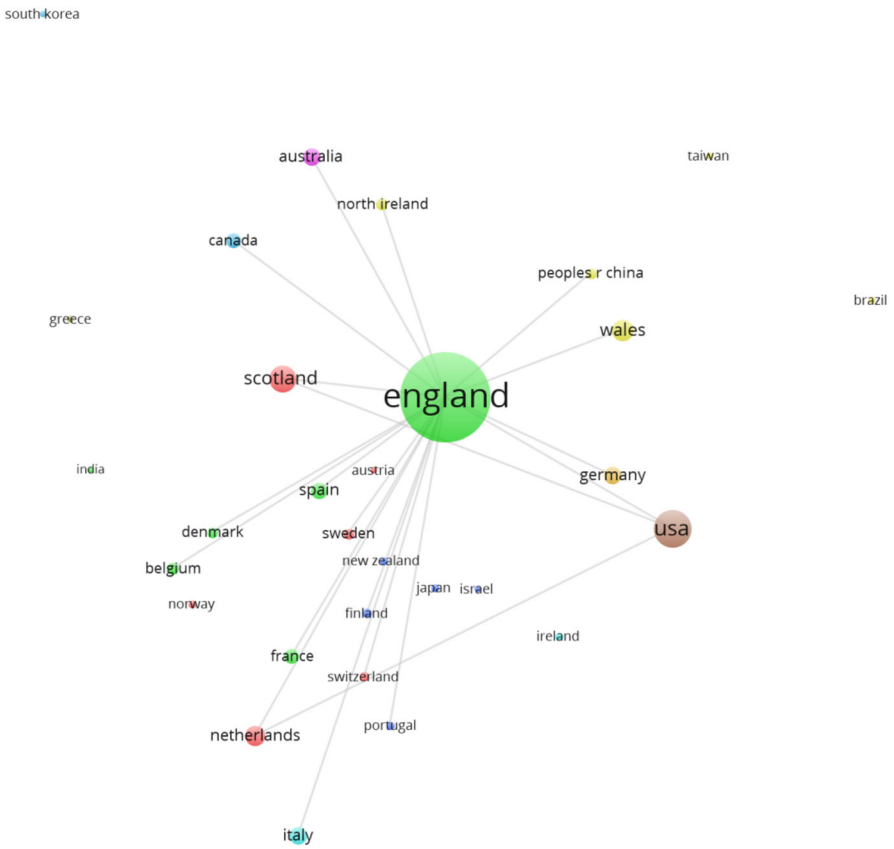

Fig. 6 Co-authorship of the UK for its 2000 most cited papers in innovation

be taken into account because this issue may have different implications depending on the future evolution of the research infrastructures of the World.

Results

This section presents the results of the study. First, it presents a supranational perspective throughout time. Next, the analysis develops a global overview of the leading countries in innovation research. Third, the results are divided in periods of 5 years in order to see the evolution of the leading countries throughout time. The section ends analyzing the leading countries in some selected leading journals that are divided in two groups: Specialized journals and leading management ones.

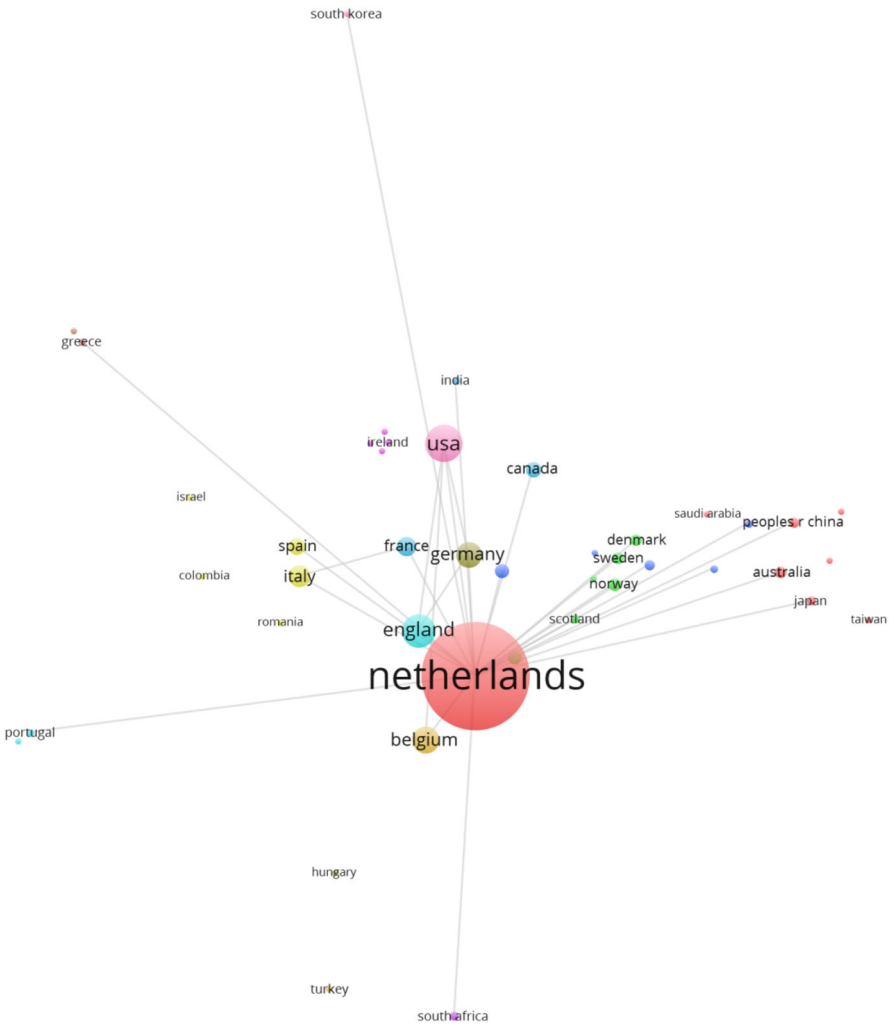

Fig. 7 Co-authorship of the Netherlands for its 2000 most cited papers in innovation

Analysis of supranational regions

Many regions are developing important research on innovation around the World. Figure 1 presents the number of articles published annually by nine selected regions.

In the 90s, North America was clearly leading the field. However, throughout time Western Europe has become more relevant and today publishes more studies than North America. Note that in terms of population the productivity of both regions is quite similar because Western Europe (including Scandinavian countries) has more people than North America. However, the results obtained by Western Europe are remarkable compared to other fields. East Asia is also growing significantly and during the last years it has clearly become the third most influential region. The rest of the regions do not publish a huge number of articles and cannot be easily classified in Fig. 1. Therefore, Fig. 2 presents a more specific analysis of the results of these regions.

Oceania is also publishing an important number of studies according to its population although the absolute numbers are not enough relevant in order to be considered in Fig. 1.

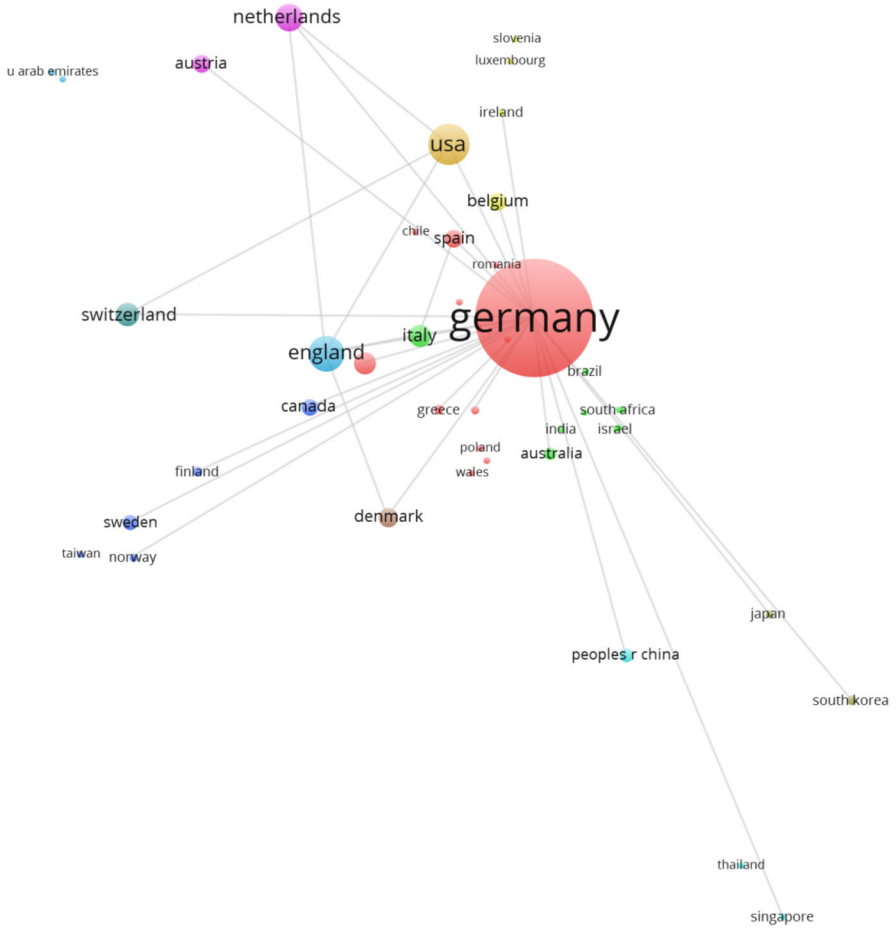

Fig. 8 Co-authorship of Germany for its 2000 most cited papers in innovation

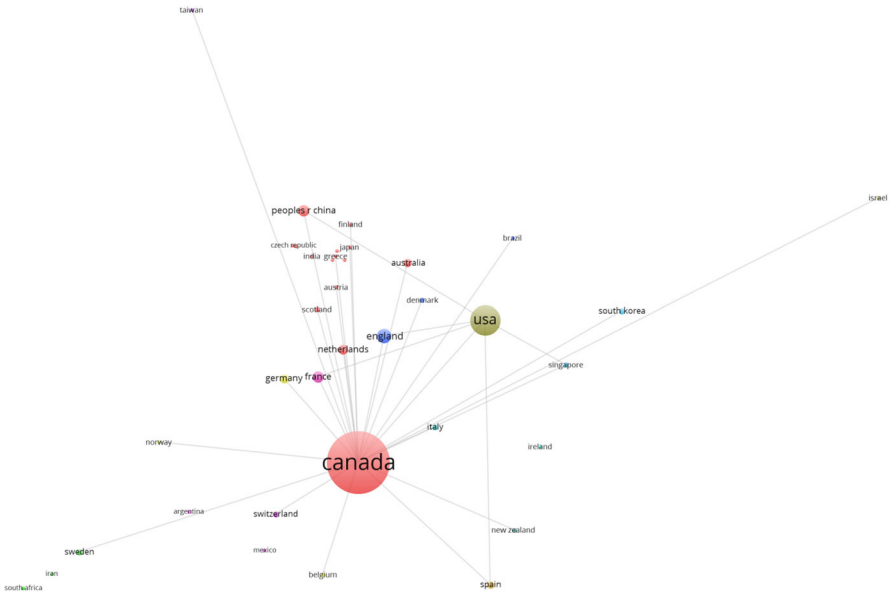

Fig. 9 Country co-authorship of Canada in innovation

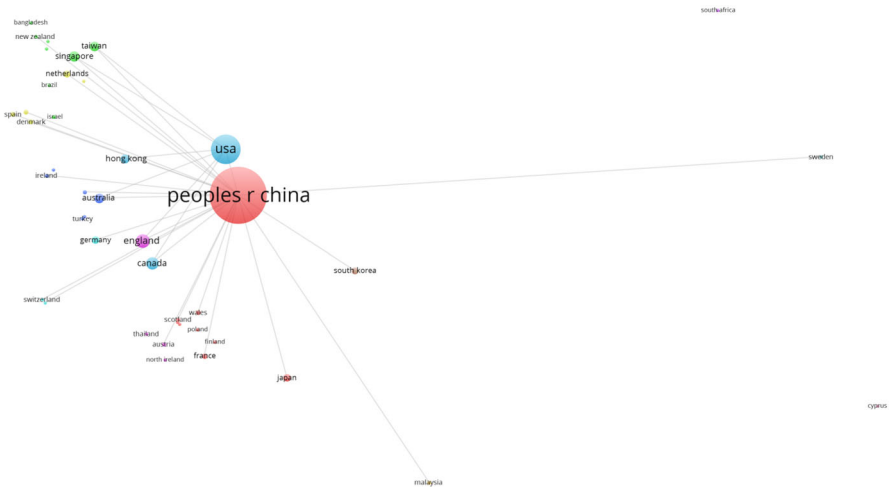

Fig. 10 Country co-authorship of China in innovation

During the last years, Eastern Europe is showing an important growth although the numbers are still low compared to the expectations for the future (Karamourzov 2012; Zavadskas et al. 2011). Note that Eastern Europe includes the countries of the old communist bloc, Greece and the Balkan countries. The next region according to the total number of publications is Central, South and South East Asia. However, these regions are very huge in terms of population because it encompasses about one-third of the World's population. Therefore, the productivity per person is very low and still needs to increase a

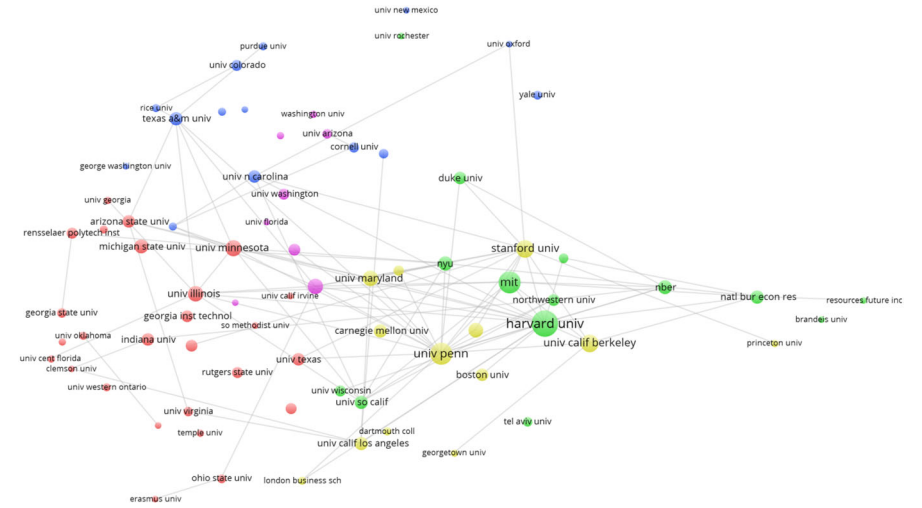

Fig. 11 Bibliographic coupling of US universities for its 2000 most cited papers

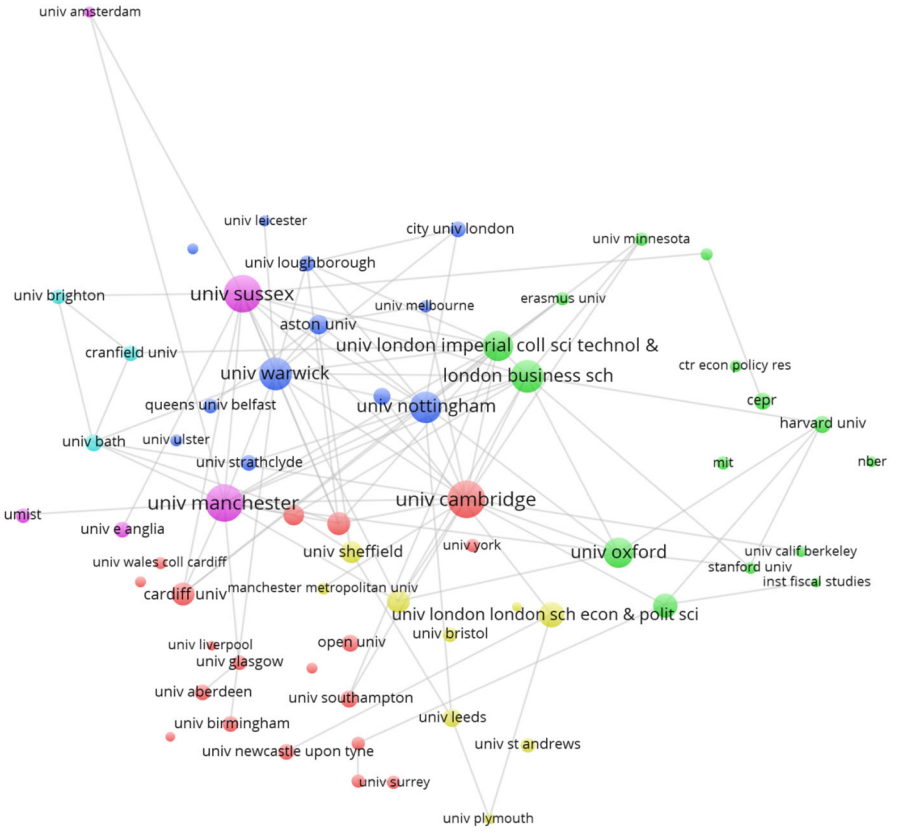

Fig. 12 Bibliographic coupling of UK universities for its 2000 most cited papers

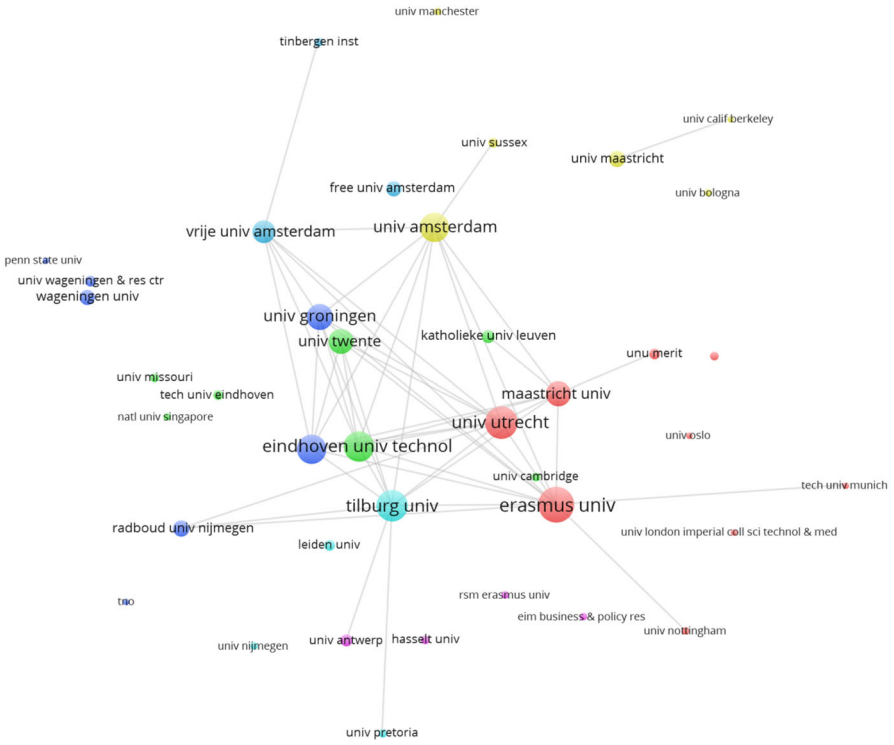

Fig. 13 Bibliographic coupling of Dutch universities for its 2000 most cited papers

lot in the future. Latin America and Middle East obtain similar results although the population of Latin America is bigger so the Middle East shows a higher productivity per person. Finally, Africa obtains the lowest results especially because of the low degree of development in the region (Tijssen 2007). In the future, the expectations are that developing nations will increase their research capacities together with their economic development although today they are far away from the developed nations (Finardi 2015).

Leading countries in innovation research

Many countries are publishing substantial research on innovation. In this section, let us look into the productivity and influence of the top 50 countries between 1989 and 2013. Table 1 presents the fifty most productive countries in innovation research. The countries are ranked according to their *h*-index although the number of studies, citations and the ratio citations/publications are also included. Moreover, the table also includes the number of articles with more than 250, 100 and 50 citations and the productivity per person.

The USA is the most productive and influential country in innovation research. However, the UK and Netherlands obtain better results in per capita terms. Some other smaller countries also obtain very remarkable results after controlling for population including Sweden, Denmark, and Finland. China is the first Asian country in the ranking although its productivity per person is very low (Panat 2014). His results in innovation still need a lot of improvement and are far away from the general standards it has achieved in natural and

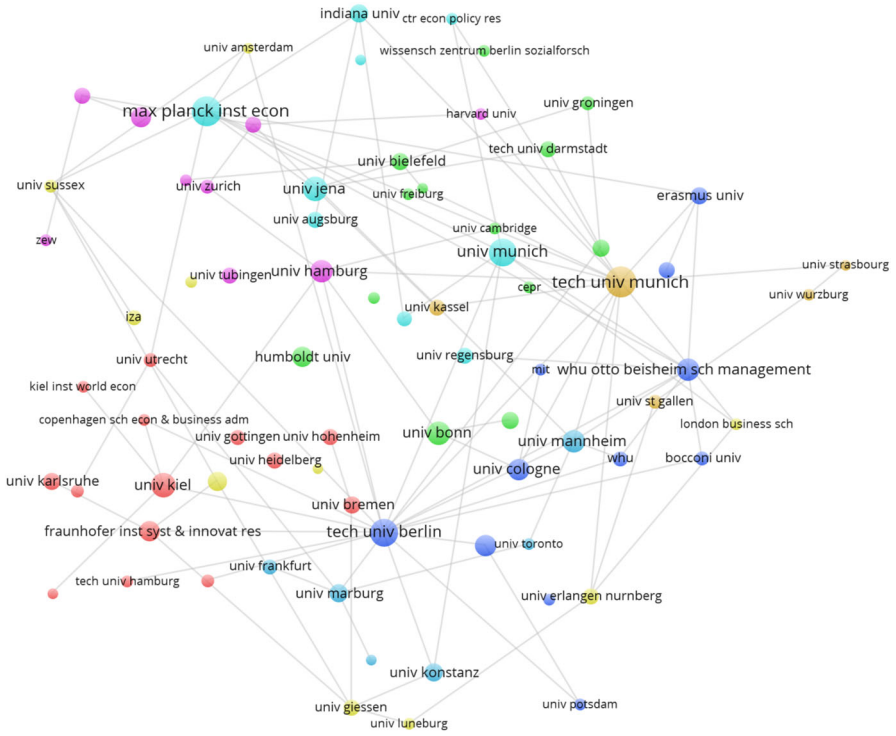

Fig. 14 Bibliographic coupling of German universities for its 2000 most cited papers

technical sciences where it is currently recognized as the second most productive country of the World (Mongeon and Paul-Hus 2016). Some developing nations also appear in the ranking including Turkey, India, Brazil, and Mexico. However, none of them reach a significant position in the field yet and are well below the general positions they are reached in other scientific disciplines. Japan also obtains very weak results which are in accordance with the results it usually obtains in social sciences.

In order to analyze more deeply the publications in innovation, let us develop a bibliographic coupling analysis through the use of VOS viewer software. In this case, the study focuses on the country affiliation of the articles. Figure 3 presents the bibliographic coupling of countries in innovation research for the 10,000 most cited documents. There is a threshold of five papers and the figure presents the 100 most representative connections. Note that the results follow WoS data which usually divides the UK in England, Scotland, Wales and North Ireland, and China and Hong Kong.

The USA is the most productive country so obviously it has the biggest bibliographic coupling structure. However, it is worth noting that England and the Netherlands obtain very good results according to their size.

Next, let us analyze co-authorship in innovation research between countries. Figure 4 presents the co-authorship structure of the 10,000 most cited articles in innovation studies for the case of countries. Recall that with co-authorship we can see the volume of publications of a country and the main connections it has with other countries.

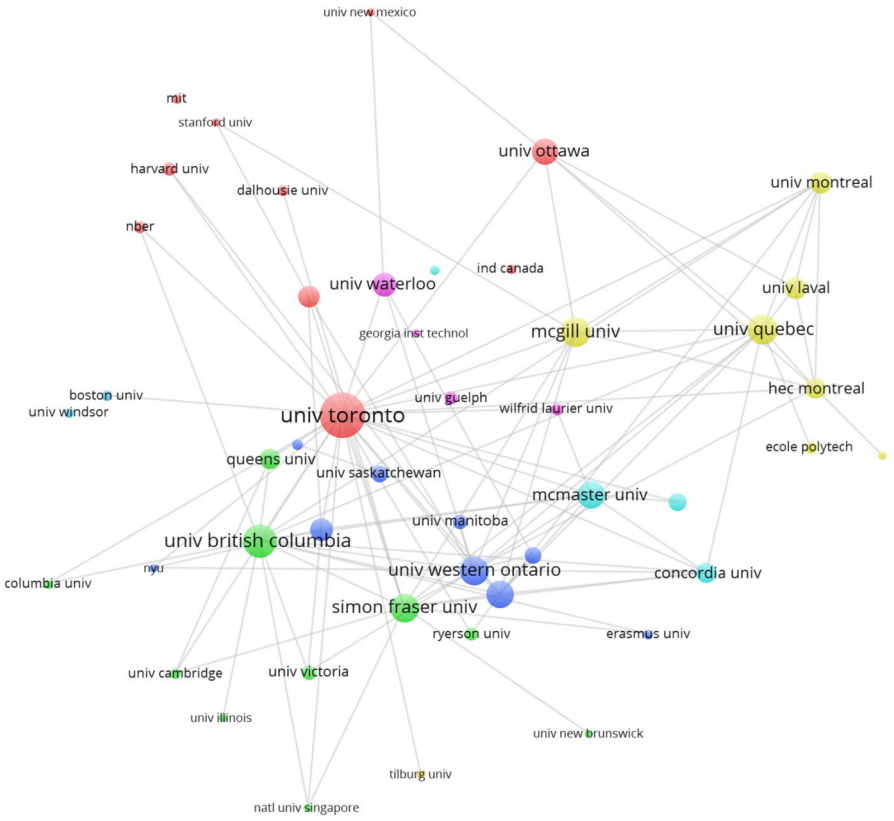

Fig. 15 Bibliographic coupling of Canadian universities

The USA and England have the biggest co-authorship network. The results indicate that co-authorship occurs more frequently between countries of the same region such as the Western European countries, the UK, East Asia, the Scandinavian countries, and so on.

In order to deepen in the co-author analysis, let us look into six representative countries: USA, UK; Netherlands, Germany, Canada and China. The work considers the leading co-authors of these countries and bibliographic coupling of universities inside each country. In the second case, the analysis identifies the leading institutions in the country and their main international collaborators. Figures 5, 6, 7, 8, 9 and 10 present the leading country coauthors of these countries.

As we can see, the leading countries tend to appear in the figures although it is clear that the geographical position of the country also facilitates the collaboration with neighboring countries. Next, let us look into bibliographic coupling of universities in these countries. Figures 11, 12, 13, 14, 15 and 16 show the results.

The leading institutions of these countries in innovation research are seen in the figures. Moreover, some foreign universities also appear in the figures. These institutions are the leading university coauthors of these countries. Note that only the publications of the universities of the specific country considered are studied in the analysis. Therefore, it is very difficult for foreign institutions to appear in the graphs.

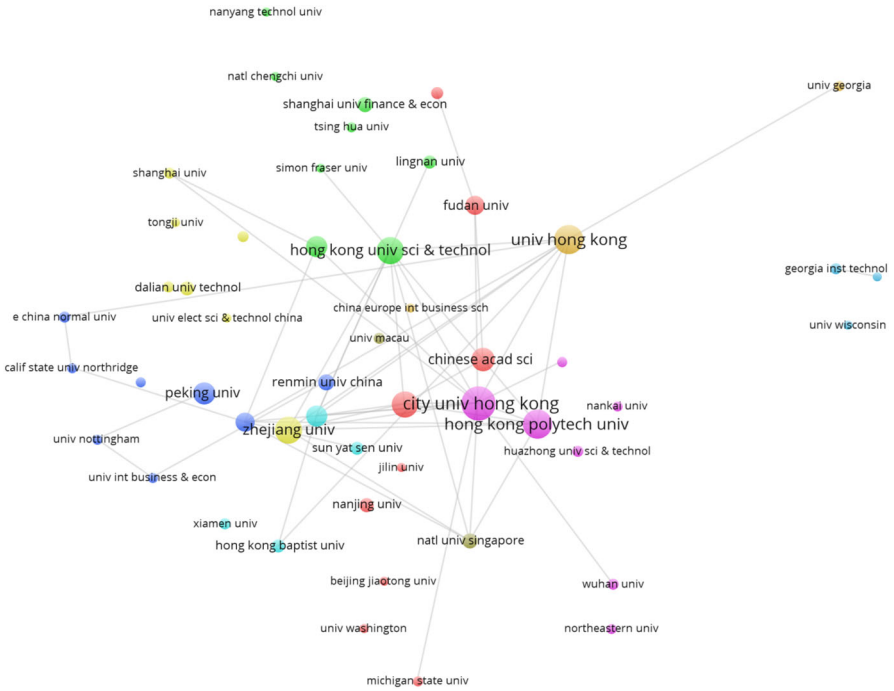

Fig. 16 Bibliographic coupling of Chinese universities

Temporal analysis of the leading countries

An interesting question to analyze regarding the country rankings is the evolution throughout time. Usually, the evolution depends on the economic situation of the country that permits to focus more on research or not. Table 2 presents the most productive and influential countries in innovation research between 1989 and 1993.

The USA is the most relevant country during this period. Even in productivity per capita, only Israel, Sweden, Canada and Netherlands obtain similar results than the USA. The UK is the second most productive and influential country although the productivity per capita is a bit lower than the previous countries. The rest of the countries are significantly below these countries. Table 3 presents the results for the period 1994–1998.

The USA is again the most productive and influential country although the differences with the UK are reduced significantly. Now the UK presents similar per capita results than the USA. Again Canada, Netherlands, Israel and Sweden present similar standards than the USA and the UK although their absolute numbers are much lower. In this period, China increases significantly his results. However, the rest of developing nations still have to improve a lot. Table 4 presents the top 50 countries between 1999 and 2003.

The results are similar to the previous periods although the absolute numbers are higher for most of the countries because now there are more journals available in WoS so more material is being published. In any case, this is also in accordance with the general assumption that research is growing throughout time around the World. Table 5 shows the leading countries between 2004 and 2008.

Table 3 Leading countries in innovation between 1994 and 1998

R	Country	TPI	TCI	HI	TCI/TPI	PI (%)	TP	*H*	P/Pop	C/Pop
1	USA	1813	125,118	174	69.01	0.13	1,364,164	1226	6.57	453.57
2	UK	592	19,362	66	32.71	0.16	364,048	685	10.12	331.05
3	Canada	209	11,278	41	53.96	0.12	179,109	550	6.91	372.85
4	Netherlands	130	4267	35	32.82	0.14	92,975	451	8.28	271.66
5	Italy	132	3443	33	26.08	0.09	144,045	448	2.32	60.50
6	France	131	5869	31	44.8	0.06	234,395	545	2.18	97.52
7	Germany	153	4260	27	27.84	0.05	305,230	600	1.86	51.92
8	China (+Hong Kong)	59	3296	23	55.86	0.07	89,477	254	0.05	2.65
9	Belgium	55	1991	22	36.2	0.12	46,462	323	5.39	195.14
10	Israel	44	3225	20	73.3	0.10	46,183	337	7.37	540.11
11	Australia	88	1856	19	21.09	0.09	102,002	405	4.70	99.19
12	Sweden	39	2960	18	75.9	0.06	70,869	383	4.41	334.43
13	Japan	52	4629	17	89.02	0.02	325,719	530	0.41	36.62
14	Spain	34	1228	15	36.12	0.04	95,377	319	0.86	30.92
15	Finland	38	677	14	17.82	0.12	32,241	287	7.37	131.37
16	Switzerland	29	510	14	17.59	0.05	63,630	448	4.08	71.73
17	South Korea	38	1475	13	38.82	0.10	37,311	182	0.82	31.87
18	Denmark	29	594	12	20.48	0.08	35,667	312	5.47	111.99
19	Singapore	16	808	10	50.5	0.14	11,042	146	4.07	205.74
20	Norway	21	688	9	32.76	0.09	23,110	236	4.74	155.25
21	New Zealand	14	482	9	34.43	0.07	20,507	214	3.67	126.34
22	Brazil	24	248	9	10.33	0.07	34,746	196	0.14	1.46
23	Austria	15	286	7	19.07	0.05	30,835	265	1.88	35.85
24	India	33	219	7	6.64	0.04	82,026	202	0.03	0.22
25	Greece	15	121	7	8.07	0.08	19,501	171	1.38	11.17
26	Ireland	13	236	6	18.15	0.11	11,805	179	3.50	63.57
27	South Africa	9	78	5	8.67	0.05	19,474	153	0.21	1.86
28	Portugal	10	53	5	5.3	0.10	10,062	149	0.98	5.22
29	Chile	6	319	4	53.17	0.08	7723	134	0.40	21.16
30	Thailand	7	52	3	7.43	0.17	4004	109	0.11	0.85
31	Argentina	6	40	3	6.67	0.04	16,505	156	0.17	1.11
32	Turkey	3	45	3	15	0.02	17,738	126	0.05	0.73
33	Nigeria	4	14	3	3.5	0.10	4044	58	0.03	0.12
34	Hungary	6	441	2	73.5	0.03	17,674	175	0.58	42.95
35	Mexico	4	73	2	18.25	0.02	17,575	152	0.04	0.73
36	Czech Republic	7	39	2	5.57	0.04	19,158	153	0.68	3.79
37	Poland	3	16	2	5.33	0.01	39,607	195	0.08	0.41
38	Kenya	3	10	2	3.33	0.11	2709	101	0.10	0.34
39	Slovakia	19	8	2	0.42	0.18	10,475	108	3.52	1.48
40	Russia	7	5	2	0.71	0.01	137,605	259	0.05	0.03

Table 4 Leading countries in innovation between 1999 and 2003

R	Country	TPI	TCI	HI	TCI/TPI	PI (%)	TP	*H*	P/Pop	C/Pop
1	USA	2491	154,687	185	62.1	0.18	1,408,912	1192	8.59	533.20
2	UK	921	31,616	84	34.33	0.23	394,955	718	15.44	530.05
3	Canada	267	11,591	56	43.41	0.14	184,634	540	8.43	365.92
4	Netherlands	298	10,516	55	35.29	0.29	103,864	478	18.37	648.12
5	France	223	11,497	51	51.56	0.09	258,941	560	3.58	184.71
6	Germany	283	8838	50	31.23	0.08	357,191	651	3.43	107.08
7	Italy	233	7070	44	30.34	0.13	176,634	478	4.07	123.36
8	Australia	182	4364	34	23.98	0.15	119,731	433	9.15	219.35
9	Sweden	101	5005	33	49.55	0.13	80,514	417	11.27	558.70
10	PR China	94	2895	31	30.8	0.05	182,304	349	0.07	2.25
11	Spain	114	2735	28	23.99	0.09	127,579	386	2.70	64.83
12	Belgium	66	2509	28	38.02	0.12	55,917	353	6.36	241.80
13	Singapore	52	2116	26	40.69	0.24	21,397	197	12.64	514.24
14	Denmark	78	3860	25	49.49	0.19	41,630	351	14.47	716.06
15	South Korea	86	2951	25	34.31	0.11	81,877	274	15.95	547.44
16	Japan	90	2135	23	23.72	0.02	379,146	548	0.70	16.72
17	Finland	64	2463	22	38.48	0.16	39,351	314	12.28	472.47
18	Austria	53	1833	22	34.58	0.13	40,286	312	6.53	225.70
19	Israel	52	1105	19	21.25	0.10	52,382	348	7.77	165.18
20	Switzerland	56	1939	17	34.62	0.07	74,994	469	7.63	264.20
21	Portugal	38	850	15	22.37	0.20	18,939	191	3.63	81.27
22	Brazil	38	795	14	20.92	0.06	60,980	239	0.21	4.37
23	India	53	678	14	12.79	0.06	96,300	258	0.05	0.62
24	Taiwan	40	790	14	19.75	0.07	56,069	221	1.77	34.95
25	Greece	35	700	13	20	0.12	28,750	203	3.18	63.53
26	New Zealand	34	498	12	14.65	0.14	24,004	224	8.44	123.66
27	Ireland	21	298	10	14.19	0.14	15,329	197	5.25	74.56
28	Turkey	11	248	9	22.55	0.03	39,329	171	0.17	3.76
29	South Africa	15	206	9	13.73	0.07	20,957	180	0.32	4.44
30	Hungary	10	690	7	69	0.05	21,992	211	0.99	68.12
31	Cyprus	9	367	7	40.78	0.88	1020	64	9.02	367.68
32	Chile	9	178	7	19.78	0.08	11,207	164	0.56	11.13
33	Mexico	9	194	6	21.56	0.03	27,425	193	0.08	1.80
34	Slovenia	8	229	5	28.62	0.10	8229	127	4.01	114.74
35	Malaysia	7	45	5	6.43	0.14	5114	101	0.28	1.81
36	Thailand	9	115	4	12.78	0.12	7804	124	0.14	1.78
37	Nigeria	6	75	4	12.5	0.15	4013	66	0.05	0.57
38	Slovakia	21	54	4	2.57	0.21	10,210	119	3.91	10.05
39	Argentina	11	54	4	4.91	0.05	23,414	168	0.29	1.42
40	Russia	16	50	4	3.12	0.01	133,990	269	0.11	0.35

Table 5 Leading countries in innovation between 2004 and 2008

R	Country	TPI	TCI	HI	TCI/TPI	PI (%)	TP	*H*	P/Pop	C/Pop
1	USA	3407	109,112	134	32.03	0.21	1,614,336	994	11.20	358.81
2	UK	1399	38,133	83	27.26	0.32	442,143	642	22.63	616.97
3	Canada	495	14,740	61	29.78	0.21	240,888	507	14.89	443.36
4	Germany	521	13,982	60	26.84	0.13	403,920	579	6.35	170.28
5	Netherlands	516	14,568	59	28.23	0.40	130,311	436	31.38	885.83
6	Italy	378	8118	46	21.48	0.16	229,177	458	6.43	138.00
7	Spain	400	7191	45	17.98	0.22	178,878	396	8.70	156.48
8	France	297	7581	44	25.53	0.10	291,379	513	4.61	117.77
9	Australia	352	6825	44	19.39	0.22	157,986	426	16.57	321.19
10	PR China	293	6440	43	21.98	0.07	425,859	390	0.22	4.86
11	Sweden	187	5486	37	29.34	0.21	90,510	387	20.28	595.03
12	Taiwan	276	4954	36	17.95	0.30	92,632	224	11.98	215.05
13	Belgium	151	4308	35	28.53	0.21	72,212	366	14.10	402.24
14	Denmark	141	5428	33	38.5	0.29	49,464	337	25.67	988.06
15	Switzerland	146	3372	33	23.1	0.15	94,267	441	19.09	440.92
16	Austria	116	2966	33	25.57	0.23	49,385	296	13.91	355.77
17	Singapore	103	3413	29	33.14	0.30	34,773	244	21.28	705.25
18	Finland	152	2676	28	17.61	0.34	45,298	270	28.61	503.63
19	South Korea	151	2752	27	18.23	0.10	145,289	293	3.08	56.22
20	Japan	187	2450	27	13.1	0.05	394,086	460	1.46	19.18
21	Israel	91	2356	26	25.89	0.16	58,310	301	12.45	322.35
22	Norway	96	2189	26	22.8	0.26	37,124	263	20.13	459.08
23	New Zealand	79	1520	18	19.24	0.26	30,186	221	18.51	356.06
24	Greece	67	1052	18	15.7	0.15	46,063	212	5.99	94.04
25	Portugal	58	793	17	13.67	0.18	32,074	214	5.49	75.11
26	Turkey	52	804	16	15.46	0.06	84,598	180	0.74	11.43
27	Ireland	48	711	15	14.81	0.20	24,395	229	10.69	158.37
28	Brazil	52	549	15	10.56	0.05	108,802	255	0.27	2.86
29	India	68	591	13	8.69	0.04	152,434	249	0.06	0.50
30	South Africa	40	409	12	10.23	0.14	28,696	205	0.81	8.25
31	Mexico	29	315	12	10.86	0.07	39,249	182	0.25	2.74
32	Thailand	25	289	11	11.56	0.15	16,732	145	0.38	4.37
33	Slovenia	29	308	10	10.62	0.24	12,269	122	14.35	152.38
34	Lithuania	25	292	10	11.68	0.36	6965	84	7.82	91.30
35	Argentina	19	250	8	13.16	0.07	28,947	183	0.48	6.30
36	Poland	30	170	7	5.67	0.04	79,367	261	0.79	4.46
37	Hungary	18	161	7	8.94	0.07	26,243	199	1.79	16.04
38	Czech Republic	27	105	7	3.89	0.08	34,784	204	2.60	10.11
39	Chile	15	111	6	7.4	0.09	17,462	161	0.89	6.59
40	Estonia	12	81	6	6.75	0.27	4520	114	8.97	60.58

Table 6 Leading countries in innovation between 2009 and 2013

R	Country	TPI	TCI	HI	TCI/TPI	PI (%)	TP	*H*	P/Pop	C/Pop
1	USA	5182	44,974	69	8.68	0.28	1,880,846	590	16.39	142.26
2	UK	2391	17,911	46	7.52	0.45	533,092	410	37.30	279.44
3	Netherlands	1068	9206	39	8.62	0.60	177,134	303	63.56	547.84
4	Germany	1182	8414	37	7.12	0.24	490,374	375	14.66	104.36
5	Canada	875	7037	36	8.04	0.29	305,577	342	24.89	200.15
6	Spain	1148	6049	31	5.27	0.44	261,836	279	24.61	129.67
7	PR China	961	5654	29	5.88	0.11	845,848	310	0.71	4.17
8	Italy	908	5653	29	6.23	0.31	295,070	311	15.18	94.48
9	France	697	4194	28	6.02	0.20	349,110	333	10.56	63.52
10	Switzerland	381	3766	28	9.88	0.30	126,847	293	47.14	466.00
11	Taiwan	818	4590	27	5.61	0.61	134,345	162	35.00	196.37
12	Sweden	516	3515	25	6.81	0.46	112,260	257	53.79	366.43
13	Australia	685	3657	24	5.34	0.29	237,535	293	29.61	158.10
14	Denmark	359	2937	24	8.18	0.52	69,569	231	63.95	523.18
15	Belgium	295	2366	23	8.02	0.30	97,003	243	26.35	211.34
16	Norway	271	1915	21	7.07	0.50	54,458	183	53.30	376.66
17	South Korea	450	2297	20	5.1	0.20	230,067	224	8.96	45.74
18	Austria	210	1728	20	8.23	0.32	65,457	204	24.78	203.92
19	Finland	322	1911	19	5.93	0.59	55,005	198	59.20	351.33
20	Japan	297	1524	18	5.13	0.07	396,647	283	2.33	11.97
21	Israel	131	1368	18	10.44	0.20	64,325	192	16.25	169.74
22	Singapore	180	1193	18	6.63	0.35	51,595	197	33.34	220.96
23	Turkey	148	1207	16	8.16	0.12	126,762	131	1.98	16.11
24	Portugal	206	979	15	4.75	0.37	55,591	158	19.69	93.60
25	New Zealand	121	855	14	7.07	0.29	41,513	157	27.06	191.24
26	Ireland	119	639	14	5.37	0.32	37,256	172	25.90	139.06
27	India	155	602	11	3.88	0.06	240,924	180	0.12	0.48
28	Greece	121	562	11	4.64	0.21	56,840	161	10.97	50.94
29	Malaysia	97	342	11	3.53	0.26	37,810	97	3.26	11.51
30	Slovenia	73	319	11	4.37	0.39	18,684	95	35.43	154.82
31	Brazil	154	366	9	2.38	0.08	182,676	179	0.77	1.83
32	Thailand	58	272	9	4.69	0.19	30,535	107	0.87	4.06
33	Mexico	65	249	9	3.83	0.12	53,768	140	0.53	2.04
34	South Africa	85	306	8	3.6	0.18	47,399	144	1.60	5.78
35	Iran	52	253	8	4.87	0.05	106,985	105	0.67	3.27
36	Argentina	40	178	8	4.45	0.10	40,951	136	0.97	4.29
37	Poland	57	247	7	4.33	0.05	108,181	177	1.48	6.41
38	Russia	41	135	7	3.29	0.03	144,410	171	0.29	0.94
39	Colombia	40	168	7	4.2	0.26	15,445	94	0.83	3.48
40	Czech Republic	61	228	6	3.74	0.12	50,282	157	5.80	21.67

Table 7 Leading countries in innovation in Research Policy and Strategic Management Journal

R	Research Policy					Strategic Management Journal				
	Country	TPI	TCI	HI	CI/PI	Country	TPI	TCI	HI	CI/PI
1	USA	355	19,425	71	54.72	USA	291	52,139	108	179.17
2	UK	349	13,786	62	39.50	France	23	4410	18	191.74
3	Netherlands	150	6295	41	41.97	UK	23	2890	17	125.65
4	Germany	143	4920	39	34.41	Canada	19	2693	14	141.74
5	Italy	121	4352	36	35.97	Singapore	11	501	9	45.55
6	France	107	3365	32	31.45	Denmark	8	986	6	123.25
7	Spain	89	2314	26	26.00	PR China	7	630	6	90.00
8	Sweden	47	2050	22	43.62	Italy	8	570	6	71.25
9	Japan	43	1070	22	24.88	Australia	7	702	5	100.29
10	Denmark	49	2207	20	45.04	Sweden	5	1054	4	210.80
11	Switzerland	41	1170	20	28.54	Netherlands	7	805	4	115.00
12	Canada	53	1164	20	21.96	Spain	5	226	4	45.20
13	Australia	31	1690	19	54.52	Finland	3	735	3	245.00
14	Belgium	31	1294	16	41.74	South Korea	3	541	3	180.33
15	Finland	26	1308	15	50.31	Japan	3	402	3	134.00
16	Norway	25	966	15	38.64	Switzerland	3	352	3	117.33
17	South Korea	23	865	14	37.61	Germany	5	269	3	53.80
18	PR China	33	765	14	23.18	Norway	3	67	3	22.33
19	Austria	26	442	13	17.00	Austria	3	79	2	26.33
20	Taiwan	19	385	10	20.26	Russia	2	68	2	34.00
21	Portugal	22	269	10	12.23	Chile	1	195	1	195.00
22	Brazil	14	518	9	37.00	Argentina	1	117	1	117.00
23	Israel	13	461	9	35.46	Indonesia	1	110	1	110.00
24	Singapore	13	295	8	22.69	Belgium	1	58	1	58.00
25	India	7	129	6	18.43	India	1	28	1	28.00
26	Hungary	5	352	5	70.40	New Zealand	1	16	1	16.00
27	Ireland	7	238	5	34.00	Taiwan	1	8	1	8.00
28	New Zealand	6	119	5	19.83	Israel	1	9	1	9.00
29	Greece	6	141	4	23.50	Turkey	1	6	1	6.00
30	Mexico	5	51	3	10.20	–				

Again the results are quite similar although the productivity still increases a lot motivated by the increasing popularity of innovation research and more journals available in WoS. It is remarkable the growth of Taiwan from the position 24 in the previous period to the 12th position. Finally, Table 6 presents the results of the last period from 2009 to 2013.

Again the results are similar than before although it is remarkable the growth of Spain and China to the sixth and seventh position respectively. In this period the UK is more productive in per capita terms although in absolute numbers, the USA is the most productive and influential country.

In order to see better the connections and collaborations between countries throughout time, several figures of the Online Supplement present bibliographic coupling and co-authorship between countries throughout time. For doing so the figures follow the structure

Table 8 Leading countries in innovation in Journal of Product Innovation Management and Technovation

R	Journal of Product Innovation Management					Technovation				
	Country	TPI	TCI	HI	CI/PI	Country	TPI	TCI	HI	CI/PI
1	USA	397	12,073	60	30.41	UK	173	2970	30	17.17
2	Netherlands	88	1616	24	18.36	USA	100	1370	21	13.70
3	Canada	43	2275	22	52.91	Spain	62	1298	20	20.94
4	UK	55	1057	19	19.22	Netherlands	51	1037	18	20.33
5	Italy	30	785	16	26.17	Taiwan	54	1036	18	19.19
6	Germany	45	405	12	9.00	Canada	47	737	14	15.68
7	Denmark	23	395	11	17.17	Italy	45	714	14	15.87
8	Belgium	22	556	10	25.27	Australia	27	460	14	17.04
9	Austria	13	548	9	42.15	Germany	33	515	13	15.61
10	Australia	14	293	9	20.93	Japan	41	536	12	13.07
11	PR China	15	595	8	39.67	PR China	20	479	12	23.95
12	Sweden	13	252	7	19.38	Sweden	29	364	12	12.55
13	Ireland	7	221	6	31.57	Denmark	17	355	11	20.88
14	Japan	13	220	6	16.92	Belgium	13	432	10	33.23
15	Switzerland	13	205	6	15.77	South Korea	30	321	10	10.70
16	South Korea	13	120	6	9.23	Finland	20	283	9	14.15
17	Turkey	9	144	5	16.00	Switzerland	13	304	8	23.38
18	Finland	6	77	5	12.83	France	21	166	8	7.90
19	France	10	75	5	7.50	Austria	11	346	7	31.45
20	Greece	4	155	4	38.75	India	16	234	7	14.63
21	Spain	6	113	4	18.83	Portugal	10	154	7	15.40
22	Norway	5	100	4	20.00	Norway	11	336	6	30.55
23	Singapore	2	67	2	33.50	Turkey	7	167	6	23.86
24	Portugal	2	19	2	9.50	Brazil	11	141	6	12.82
25	Taiwan	2	13	2	6.50	Ireland	8	119	6	14.88
26	Iceland	3	9	2	3.00	Greece	6	299	5	49.83
27	New Zealand	1	43	1	43.00	Singapore	8	144	5	18.00
28	India	1	5	1	5.00	Slovenia	5	116	5	23.20
29	Chile	1	2	1	2.00	Thailand	9	69	5	7.67
30	Israel	1	2	1	2.00	South Africa	5	38	4	7.60

of Tables 2, 3, 4, 5 and 6 where the bibliographic material is divided in periods of 5 years. Figures 1, 2, 3, 4 and 5 of the Online Supplement, present bibliographic coupling between countries divided in periods of 5 years between 1989 and 2013. As we can see in these figures, the USA is the main center of the network although the UK is growing significantly during the last years. Note that the connections show the countries that tend to cite the same bibliographic material.

Individual journal analysis of the leading countries

Another interesting issue to consider is the importance of the countries in the leading journals of innovation. In this field, as it is shown in Table 1 of the Online Supplement,

Table 9 Leading countries in innovation in Technological Forecasting and Social Change and Technology Analysis and Strategic Management

R	Technological Forecasting and Social Change					Technology Analysis and Strategic Management				
	Country	TPI	TCI	HI	CI/PI	Country	TPI	TCI	HI	CI/PI
1	USA	185	2578	28	13.94	UK	174	2191	24	12.59
2	Netherlands	103	1770	23	17.18	Netherlands	80	1552	20	19.40
3	UK	55	808	17	14.69	USA	59	490	13	8.31
4	Germany	33	621	14	18.82	Sweden	23	254	10	11.04
5	Taiwan	47	423	12	9.00	Denmark	14	254	8	18.14
6	Italy	30	354	12	11.80	Germany	24	177	8	7.38
7	South Korea	34	263	10	7.74	Italy	20	126	7	6.30
8	Japan	32	260	10	8.13	Switzerland	10	121	6	12.10
9	Portugal	24	259	10	10.79	Spain	29	117	6	4.03
10	Israel	13	276	9	21.23	Finland	17	103	6	6.06
11	France	26	233	9	8.96	Australia	11	74	6	6.73
12	Finland	18	153	9	8.50	South Korea	11	56	5	5.09
13	Australia	14	200	8	14.29	Belgium	9	84	4	9.33
14	PR China	15	175	7	11.67	Taiwan	20	70	4	3.50
15	Sweden	11	154	7	14.00	PR China	19	63	4	3.32
16	Switzerland	12	104	7	8.67	Canada	7	48	4	6.86
17	Canada	15	205	6	13.67	Austria	6	48	4	8.00
18	Brazil	10	171	6	17.10	France	14	47	4	3.36
19	Austria	10	143	6	14.30	Japan	8	39	4	4.88
20	Spain	22	128	6	5.82	Norway	5	62	3	12.40
21	South Africa	7	103	6	14.71	New Zealand	2	21	2	10.50
22	Denmark	11	89	5	8.09	India	4	15	2	3.75
23	Norway	5	45	4	9.00	Portugal	3	10	2	3.33
24	India	13	35	4	2.69	South Africa	2	5	2	2.50
25	Greece	5	31	4	6.20	Greece	3	28	1	9.33
26	Belgium	4	56	3	14.00	Ireland	2	10	1	5.00
27	Thailand	5	54	3	10.80	Israel	3	4	1	1.33
28	Singapore	7	34	3	4.86	Brazil	3	2	1	0.67
29	Mexico	4	29	3	7.25	Thailand	2	2	1	1.00
30	Turkey	3	12	2	4.00	Turkey	3	1	1	0.33

there are specialized and leading management journals where the articles are published. Table 7 presents the leading countries in the usually regarded as the two most significant journals: Research Policy and Strategic Management Journal (Cancino et al. 2015; Thongpapanl 2012).

In both journals the USA is the most productive and influential country. However, in Research Policy the UK obtains almost the same results than the USA which is very remarkable considering that it has five times less population. Note that in Strategic Management Journal there are fewer papers on innovation and only 29 countries have at least one publication in the journal.

Table 10 Leading countries in innovation in R&D Management and International Journal of Technology Management

R	R&D Management					International Journal of Technology Management				
	Country	TPI	TCI	HI	CI/PI	Country	TPI	TCI	HI	CI/PI
1	UK	142	2043	24	14.39	UK	116	739	15	6.37
2	USA	77	2032	24	26.39	USA	161	901	14	5.60
3	Germany	67	1482	21	22.12	Germany	68	391	11	5.75
4	Switzerland	25	752	13	30.08	Italy	57	286	10	5.02
5	Canada	42	525	13	12.50	Switzerland	30	257	10	8.57
6	Sweden	29	490	13	16.90	France	56	222	8	3.96
7	Netherlands	30	425	12	14.17	Finland	41	219	8	5.34
8	Italy	29	460	11	15.86	Canada	36	270	7	7.50
9	Taiwan	22	419	11	19.05	Australia	44	205	7	4.66
10	South Korea	13	255	8	19.62	Netherlands	47	185	7	3.94
11	Belgium	12	235	8	19.58	Taiwan	51	177	7	3.47
12	France	20	199	8	9.95	PR China	46	173	7	3.76
13	Spain	15	153	8	10.20	Spain	51	161	7	3.16
14	PR China	13	141	6	10.85	Denmark	36	191	6	5.31
15	Finland	8	132	6	16.50	Austria	18	168	6	9.33
16	Denmark	9	120	6	13.33	Sweden	33	106	6	3.21
17	Australia	14	277	5	19.79	South Korea	16	60	5	3.75
18	Japan	9	122	5	13.56	Brazil	8	40	5	5.00
19	New Zealand	8	122	5	15.25	Belgium	8	35	5	4.38
20	Austria	7	138	4	19.71	Japan	32	63	4	1.97
21	Israel	4	98	4	24.50	Singapore	8	47	4	5.88
22	South Africa	4	32	2	8.00	Ireland	3	42	3	14.00
23	India	4	23	2	5.75	Argentina	4	38	3	9.50
24	Ireland	2	16	2	8.00	India	16	34	3	2.13
25	Cyprus	1	31	1	31.00	Israel	4	16	3	4.00
26	Portugal	2	27	1	13.50	Thailand	5	19	2	3.80
27	Norway	1	23	1	23.00	New Zealand	3	13	2	4.33
28	Turkey	2	10	1	5.00	Greece	4	11	2	2.75
29	Brazil	2	5	1	2.50	Poland	3	7	2	2.33
30	Singapore	2	4	1	2.00	Russia	2	4	2	2.00

Next, let us look into some leading specialized journals in innovation. Table 8 presents the results in Journal of Product Innovation Management and Technovation.

In the Journal of Product Innovation Management, the USA is clearly leading the journal. The rest of the countries do not publish so much in this journal. In Technovation the UK is the leading country. The USA does not publish so much in this journal although it is in the second position. This journal is more diverse and many countries regularly publish in this journal. Table 9 shows the results for Technological Forecasting and Social Change and Technology Analysis and Strategic Management.

In Technological Forecasting, the USA is the leading country. However, it is worth noting that the Netherlands obtains the second position. In Technology Analysis, the UK

Table 11 Leading countries in innovation in Management Science and Organization Science

R	Management Science					Organization Science				
	Country	TPI	TCI	HI	CI/PI	Country	TPI	TCI	HI	CI/PI
1	USA	260	19,650	75	75.58	USA	227	30,740	81	135.42
2	France	20	1682	16	84.10	UK	27	1280	20	47.41
3	Canada	25	1072	15	42.88	Canada	22	1013	16	46.05
4	UK	12	737	9	61.42	France	15	2591	13	172.73
5	Singapore	10	590	8	59.00	Italy	14	496	12	35.43
6	South Korea	7	381	7	54.43	Netherlands	10	1122	10	112.20
7	Germany	8	306	7	38.25	Singapore	12	939	10	78.25
8	Netherlands	8	563	6	70.38	Sweden	6	5033	6	838.83
9	Italy	7	526	6	75.14	Japan	6	3868	6	644.67
10	Spain	7	502	5	71.71	South Korea	6	523	6	87.17
11	Australia	6	491	5	81.83	Denmark	9	494	6	54.89
12	PR China	7	181	5	25.86	Germany	6	466	5	77.67
13	Belgium	5	491	4	98.20	Switzerland	5	798	4	159.60
14	Switzerland	5	216	4	43.20	Israel	4	421	4	105.25
15	Austria	2	214	2	107.00	Australia	6	186	4	31.00
16	Israel	2	141	2	70.50	Spain	5	116	4	23.20
17	Chile	3	82	2	27.33	PR China	4	620	3	155.00
18	Japan	2	35	2	17.50	Norway	3	235	3	78.33
19	Taiwan	1	74	1	74.00	Finland	3	108	3	36.00
20	Sweden	1	26	1	26.00	Belgium	2	160	2	80.00
21	Luxembourg	1	24	1	24.00	New Zealand	1	498	1	498.00
22	Norway	1	12	1	12.00	Indonesia	1	83	1	83.00
23	India	1	7	1	7.00	Greece	1	82	1	82.00
24	Turkey	1	1	1	1.00	India	1	39	1	39.00
25	Denmark	1	1	1	1.00	Argentina	1	12	1	12.00
26	–					Austria	2	3	1	1.50

obtains the first position and Netherlands the second one. The USA appears in the third position. Sweden and Denmark are also well placed in this journal. Next, let us look into the results of R&D Management and the International Journal of Technology Management which are shown in Table 10.

The UK obtains the most remarkable results in both journals although the USA has published more articles in Technology Management. Switzerland gets very good results in these journals being in the fourth and fifth position, respectively.

In the following tables, let us focus on leading management journals. Since these journals do not publish so many articles on innovation, the study has grouped some of them in order to obtain bigger numbers. Table 11 presents the leading countries in innovation research in Management Science and Organization Science.

The USA gets the first position in both journals. France obtains very good results in both journals being in the second and fourth position, respectively. Note that in Management Science only 25 countries have published at least one article on innovation and only 26 countries in Organization Science. Finally, Table 12 presents the results for two groups of

Table 12 Leading countries in innovation in the Academy of Management Journal and Review and other selected journals

R	Academy of Management Journal and Review					Other Selected Journals				
	Country	TPI	TCI	HI	CI/PI	Country	TPI	TCI	HI	CI/PI
1	USA	231	41,832	109	181.09	USA	467	40,565	106	86.86
2	UK	27	3133	19	116.04	UK	96	5141	40	53.55
3	Canada	18	3205	16	178.06	Canada	76	4652	32	61.21
4	France	15	1083	14	72.20	PR China	40	2455	23	61.38
5	PR China	10	720	8	72.00	Netherlands	42	1424	23	33.90
6	Singapore	9	523	7	58.11	Germany	35	1329	21	37.97
7	Netherlands	5	436	5	87.20	Australia	19	977	14	51.42
8	South Korea	4	963	4	240.75	Sweden	18	921	13	51.17
9	Switzerland	4	128	4	32.00	Belgium	16	617	13	38.56
10	Israel	4	255	3	63.75	France	14	2362	12	168.71
11	Germany	3	71	3	23.67	Singapore	16	786	12	49.13
12	Japan	2	195	2	97.50	Denmark	15	568	12	37.87
13	Australia	2	161	2	80.50	Switzerland	16	785	11	49.06
14	Brazil	2	81	2	40.50	Italy	16	719	10	44.94
15	Denmark	2	19	2	9.50	Spain	15	358	9	23.87
16	Finland	1	573	1	573.00	Finland	9	265	8	29.44
17	Nigeria	1	193	1	193.00	South Korea	10	303	7	30.30
18	Italy	1	176	1	176.00	Israel	7	237	5	33.86
19	Norway	1	148	1	148.00	Norway	6	163	5	27.17
20	Taiwan	1	140	1	140.00	Austria	5	137	4	27.40
21	Portugal	1	61	1	61.00	India	4	91	4	22.75
22	Luxembourg	1	22	1	22.00	Japan	6	72	4	12.00
23	Belgium	1	22	1	22.00	Taiwan	4	66	4	16.50
24	Ireland	1	19	1	19.00	Portugal	3	116	3	38.67
25	Greece	1	19	1	19.00	Ireland	4	32	3	8.00
26	Argentina	1	18	1	18.00	Turkey	3	277	2	92.33
27	India	1	5	1	5.00	New Zealand	3	235	2	78.33
28	–					U. Arab Emirates	2	10	2	5.00
29	–					Slovenia	1	156	1	156.00
30	–					Egypt	1	94	1	94.00

Other selected journals include the Journal of Business Venturing, Journal of International Business Studies, Journal of Management, Journal of Marketing, Journal of Management Studies, and MIS Quarterly

journals. The first one includes the Academy of Management Journal and the Academy of Management Review. The second group includes the Journal of Business Venturing, Journal of International Business Studies, Journal of Management, Journal of Management Studies, Journal of Marketing, and MIS Quarterly.

In the Academy of Management Journals, the USA is clearly the leading country and the rest of the countries do no publish many papers. In the other selected journals the results are also similar although the differences between the USA and the rest are not so significant.

In order to see the connections between countries in these journals, let us develop a bibliographic coupling of countries for each journal or group of journals. Thus, the connections show those countries that cite similar bibliographic material. Figures 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17 of the Online Supplement present bibliographic coupling between countries for each of the journals or group of journals considered in Tables 7, 8, 9, 10, 11 and 12. It is worth noting that in the general management journals of Table 1 of the Online Supplement, the USA has a more dominant position than in the specialized journals where other countries are more relevant.

Conclusions

This study presents a general overview of the leading countries in innovation research between 1989 and 2013. First, the analysis focuses on a supranational perspective in order to see from a global perspective how is innovation research evolving throughout time. All the regions are increasing the number of publications being North America and Western Europe the leading ones. East Asia is growing a lot and currently is in the third position. The rest of the regions are also growing a lot but still far away from these three regions. The expectations for the future are that they will increase more and soon or later will reach results reasonably equivalent to the developed regions.

The USA is the most relevant country in this field with the highest number of publications and citations. However, when looking to the numbers per person, there are some other countries that obtain better results although they are much smaller and less representative from an absolute perspective. It is interesting to mention that the USA is clearly the leader in the leading management journals that regularly publish some articles on innovation. However, in the specialized journals his position is not so remarkable and obtains similar results than the UK although it has five times more population.

The UK is the second most significant country in this field and obtains very good results considering that it is much smaller than the USA. Moreover, in the seven specialized journals considered, it obtains results very close to the USA and sometimes even the first position. The rest of English-speaking countries also obtain very positive results although less remarkable mainly because they are much smaller. Through the VOS viewer analysis, we see that these countries are usually well connected with similar research profiles.

Western European countries also publish a lot in this field although far away from the English-speaking standards. It is particularly remarkable the results of the Scandinavian countries because in per capita terms their results are very close to the English-speaking ones. As usual, Germany, France, Italy and Spain are well placed in the rankings. It is also remarkable the results of Netherlands because usually it is the most productive and influential country in this region although it is much smaller than the previous four countries. In Eastern Europe the research productivity of the countries is much lower and none of the countries get a significant result. The first country from this region is Slovenia in the thirty-third position.

Asian countries are below in the rankings although East Asia is growing a lot during the last years. China is currently in the ninth position and it is expected that in the future will improve his ranking in this field (Huang et al. 2015; Zhu et al. 2014). From the positions seventeenth to twentieth, four Eastern Asian countries appear in the ranking: South Korea, Japan, Singapore and Taiwan. Other Asian countries that appear in the ranking are India,

Thailand and Malaysia. Note that the VOS viewer analysis shows how these countries are growing and in which journals they are becoming relevant.

In Latin America, Brazil is the most productive country and obtains the twenty-eighth position of the global ranking. However, Chile is more productive in per capita terms (Bonilla et al. 2015). Focussing on Middle East countries (Waast and Rossi 2010), Turkey obtains the most significant results being placed in the twenty-fourth position. It is expected that these two supranational regions will grow a lot in the future because the number of articles they publish is growing significantly.

African countries publish a very low number of articles although Kenya appears in the ranking in the 48th position. They clearly need to improve in order to become relevant in this field. This is in accordance with the general economic perspective of Africa that needs to develop a lot in order to reach the standards of developed nations (Confraria and Godinho 2015; Toivanen and Ponomariov 2011).

Note that the expectation for developing countries is that their economy will grow in the future. Therefore, they will have a broader infrastructure with more people doing research and development. This is expected for any field of science, including innovation. The first open question is when they will reach the economic standards of developed countries. And this question also affects research. The general perspective is that countries will continue growing but they will achieve different levels at different periods of time. For example, we can see that China has been improving a lot during the last years. And probably, other developing countries will reach similar levels in the next years.

Although this work shows the leading countries in innovation research, it is worth mentioning some limitations. First, an important limitation is that many authors may work abroad so it is not easy to evaluate the research of a country. This is very common for English-speaking countries that receive a lot of researchers from abroad obtaining higher results than they should obtain with only the citizens of the country. In this context it is also very common that many authors after some years working in one country obtains the nationality of the country where he has been working. This is very common in the USA. From the opposite perspective, non-English speaking and non-developed countries tend to loose most of their top researchers because they prefer to work in more competitive institutions. Therefore, the publication numbers of these countries is much lower than should be if nationals working abroad are considered in the analysis. In this study, the aim is to focus on the publications generated in the country so only publications from the institutions of this country are considered independently of the nationality of the authors that have written the articles.

Another important limitation to consider is that WoS gives one unit to each participating country of an article without taking into account the number of countries included in the article. This may bring some deviations. But in general, a country includes many researchers. Therefore, from a statistical point of view, the deviations should be equilibrated when considering many researchers. In any case, we have also developed a deep analysis with VOS viewer software and here we developed fractional counting. As it is seen in the figures of the paper and of the Online Supplement, the results are quite similar to the tables. Thus, in this case we can prove that there are not significant deviations between fractional and full counting. Note that inside this limitation there are many other issues that should be considered. For example, a big country like the USA often have several authors involved in the paper while a smaller country only have one author. Thus, usually smaller countries benefit from a full counting process.

Moreover, there are many other journals and old articles from some of the journals included in the analysis that do not appear in the WoS database. This issue could also

produce some deviations. However, the sample of the study is considerably huge in order to obtain general conclusions because it deals with more than 36,000 articles.

Finally, it is worth noting that quantifying research is not an easy task because the nature of each specific research topic inside innovation may have different characteristics bringing a higher publication and citation volume. Therefore, it is not easy to make general assumptions although the work tries to identify some general results that provide a comprehensive overview. In a country analysis an important problem is that many non-English speaking countries may publish also research in other languages and most of this research is not included in WoS (Collazo-Reyes 2014). Therefore, these publications are not considered and usually not cited. This issue could also produce deviations in the results. However, considering the current world standards for research, the material published in WoS is sufficiently representative to be considered as a general sample in order to identify important results and conclusions.

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