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Bibliometric analysis of journal Research Policy

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February 2019

Acknowledgments

At this point, I would like to express my deepest gratitude to my thesis supervisor Dr. Drivaliaris Dimosthenis for his encouragement and his patience along the way. In addition, I would sincerely like to thank professor Dr. Constantelou Anastasia for her faith in me. Further , many thanks to my friends and fellow students for their advice and support throughout my diploma thesis. Last but not least, I would like to thank my family for their continuous support and endless encouragement throughout my years of study.

Έχω διαβάσει και κατανοήσει τους κανόνες για τη λογοκλοπή και τον τρόπο σωστής αναφοράς των πηγών που περιέχονται στον Οδηγό συγγραφής διπλωματικών εργασιών του ΤΜΟΔ. Δηλώνω ότι, από όσα γνωρίζω, το περιεχόμενο της παρούσας διπλωματικής εργασίας είναι προϊόν δικής μου δουλειάς και υπάρχουν αναφορές σε όλες τις πηγές που χρησιμοποίησα.

Abstract

The present study aims to provide information about the characteristics of publications of journal Research Policy, in order to study the evolution of the journal. The bibliometric analysis of the contents of journal Research Policy shows a view of publications in the field of management technology and innovation during the period 1971-2017.Various aspects of the journal are examined, such as distribution of articles by year, length of articles, authorship pattern, scientific productivity, authors productivity ,countries productivity, geographical distributions of authors and collaborative measures.

Περίληψη

Η παρούσα διπλωματική έχει ως στόχο την παροχή πληροφοριών σχετικά με τα χαρακτηριστικά του περιοδικού Research Policy, με σκοπό τη μελέτη της εξέλιξης του περιοδικού. Η βιβλιομετρική ανάλυση του περιοδικού Research Policy δείχνει την εικόνα των δημοσιεύσεων στον τομέα της διοίκησης τεχνολογίας και καινοτομίας κατά την περίοδο 1971-2017. Εξετάζονται χαρακτηριστικά όπως η κατανομή των δημοσιευμένων άρθρων ανά χρονιά, το μήκος των δημοσιευμένων άρθρων, ερευνητική παραγωγικότητα, μετρικές συνεργασίας και γεωγραφική κατανομή των συγγραφέων.

Contents

List of Tables

List of Figures

1. Introduction

According to Anyi, Zainab and Anuar(2009) "*when a single journal is studied bibliometrically, it creates a portrait of the journal, providing a significant description that is beyond superficial. It can indicate the quality, maturity and productivity of the journal in any field, country or region. It also informs about the research orientation that it supports to disseminate and its influence on author's choice as a channel to communicate or retrieve information for their research needs*". So ,bibliometric study is a useful tool in order to understand the dynamic and growth of scientific literature.

Having collected the contents of the first forty-seven years of journal Research Policy, this thesis provides information about the evolution of published documents and research articles in Research Policy during period 1971-2017. The bibliometric analysis of this study gives a quantitative knowledge of scholarly literature in the field of management technology and innovation. The purpose of this study is to examine various aspects of the journal, such as distribution of articles by year, length of articles, authorship pattern, scientific productivity, collaborative measures and geographical distributions of authors.

Firstly, information about the journal such as number of volumes and issues during the period of study are provided. A discussion about the temporal evolution of published documents follows. After that, the published documents order by article type are analyzed. Then the analysis focuses on research articles and information about the length of research articles and the scientific productivity of journal is extracted.

Furthermore , authorship characteristics such as authorship pattern in order to see the authorship distribution in that field of science are analyzed. Afterwards authors productivity so as to see Lotka's law verification is studied. Moreover, are used two methods with a view to count both authors and author's affiliation country.

Finally, bibliometrics indicators in order to study collaboration among authors are measured.

1.1 Bibliometrics

Bibliometrics is a new field of research which focused on the quantitative analysis of science. It is a useful tool in the field of library and information science and provides information with a view to understand the growth of science.

The term" bibliometrics" was first introduced by Pritchard in 1969 and it was defined as "*the application of mathematical and statistical methods to books and other media of communication*". At the same period Nalimov and Mulchenko defined scientometrics as "*the application of quantitative methods which are dealing with the analysis of science viewed as an information process*". Therefore scientometrics is restricted to the measurement of science communication, whereas bibliometrics is designed to deal with more general information processes. At the present time both terms are used as synonyms.

Derek deSolla Price in his book "*Little Science-Big Science"* (1963) analyzed the recent system of science communication and in this way presented the first systematic approach to the structure of modern science applied to the science as a whole. He studied the exponential growth of literature and a half-life of scientific literature and formulated Price's law which said that half of research articles are contributed by the square root of the total number of authors.

In order to give a mathematical expression in scientific literature, in bibliometrics are used three laws: Lotka's law of scientific productivity (1926), Bradford's law of scattering (1934) and Zipf's law of word occurrence(1949). In this thesis we study only Lotka's law which describes the frequency of publications by authors. According to Lotka "*the number of authors making n contributions is about* $1/n^2$ *of those making one and the proportion of all contributors, that makes a single contribution, is about 60 per cent* "

Present-day bibliometric research is aimed at the following three main target-groups that clearly determine topics and sub-areas of "contemporary bibliometrics".

- *Bibliometrics for bibliometricians (Methodology)*

This is the domain of basic bibliometric research and is traditionally funded by the usual grants. Methodological research is conducted mainly in this domain.

- *Bibliometrics for scientific disciplines (Scientific information)*

The researchers in scientific disciplines form the bigger, but also the most diverse interest-group in bibliometrics. Due to their primary scientific orientation, their interests are strongly related to their speciality. This domain may be considered an extension of science information by metric means. Here we also find joint borderland with quantitative research in information retrieval.

- *Bibliometrics for science policy and management (science policy)*

This is the domain of research evaluation, at present the most important topic in the field. Here the national, regional, and institutional structures of science and their comparative presentation are in the foreground. (Glanzel W. 2003)

1.2 Journal Research Policy

Research Policy *(RP) articles examine empirically and theoretically the interaction between* ***innovation***, ***technology*** *or* ***research****, on the one hand, and economic, social, political and organizational processes, on the other. All* RP *papers are expected to yield findings that have implications for* ***policy*** *or* ***management****.*

Research Policy *(RP) is a multi-disciplinary journal devoted to analyzing, understanding and effectively responding to the economic, policy, management, organizational, environmental and other challenges posed by innovation, technology, R&D and science. This includes a number of related activities concerned with the creation of knowledge (through research), the diffusion and acquisition of knowledge (e.g. through organizational learning), and its exploitation in the form of new or improved products, processes or services.*

RP *is generally acknowledged to be the leading journal in the field of* ***innovation studies****, with its academic status and influence being reflected in a remarkably high 'Impact Factor' for a multi-disciplinary social science journal (*https://www.journals.elsevier.com/research-policy)

2.Data collection

The data for present thesis was gathered on March 21st 2018 from Scopus. Scopus is the largest abstract and citation database of peer-reviewed literature such as scientific journals, books and conference proceedings.

In a first place, we downloaded data from site of Scopus database into a csv file. Then we checked data from Research Policy webpage https://www.journals.elsevier.com/research-policy and we added data because missed from Scopus database. After adding the publications manually, 3630 published documents were collected. The database recorded the following information: authors, titles, sources titles, volumes, issues, page start, page end, cited by, affiliations and countries. Furthermore, we made a new column called page count in which calculated the total number of pages by published documents where is equal to page end minus page start plus one. In addition, we correct author's names having checked their profiles because many authors were registered with two ways. For instance, we saw that Aldridge T. and Aldridge T.T is the same author while Campbell E.G and Campbell G. are different.

Finally, we use R package in order to make statistic calculations and visualize our data in graphs.

3. Journal's productivity and publications characteristics

3.1 Journal's productivity

Journal Research Policy initiated its publications in 1971. During the period 1971-2017,journal has published 46 volumes and 333 issues. A volume of a journal is defined as the number of years the publications has been circulated whereas issue as how many times that journal has been published during a year. Issues are separated in nominal the total number of issues of journal and real which is the total number of published issues. Overall, the number of nominal issues is 333 whereas the number of real is 323.

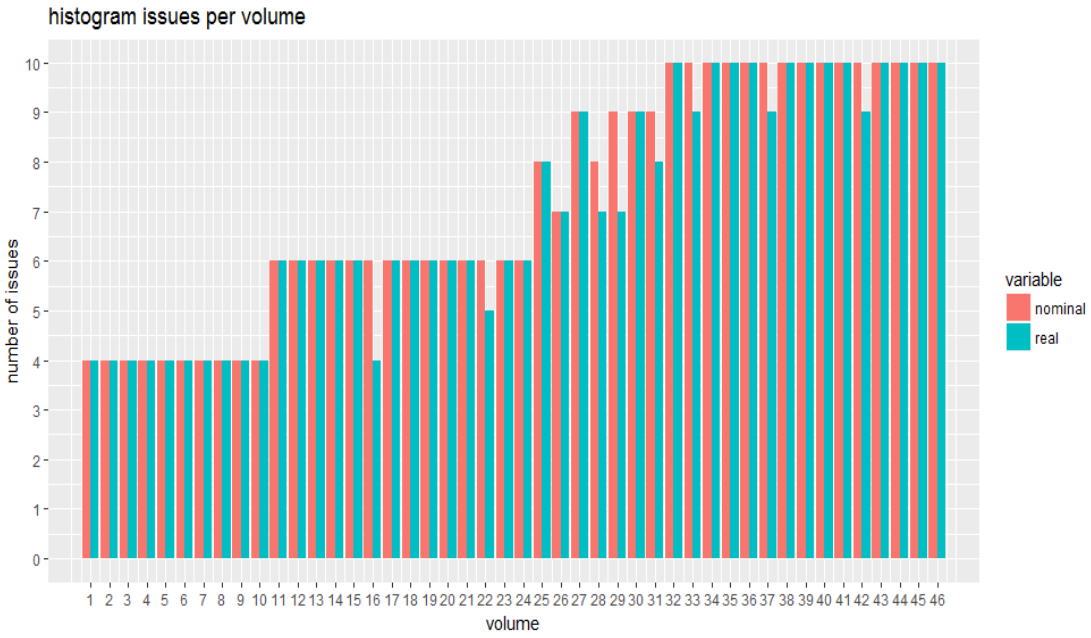

Figure 3.1 1 Issues by volumes

The bar chart illustrates information about the productivity of journal during the period of study. As it seems there is a rise from 4 to 10 issues by volume. More specifically, it is noticed that the number of issues was stable 4 by 10th volume, then rose up to 6 by 24th volume. After that, the number of issues ranged between 7 and 9 by 31st volume and then it was increased in 10 which is stable up to date.

3.2 Publications characteristics

In this chapter all calculations regarding the publications characteristics of journal Research Policy are included. More specifically, the publications of published documents by volume and 5-volume, the number of their pages are analyzed. After that, the publications according to their type of document in order to find out about research articles are separated. In the next step , the scientific productivity and the length of research articles is examined.

3.2.1 Temporal evolution of published documents

Volume	Year	Number of published documents	N%	Cumulative number of published documents	C%
1	1971-72	26	0.72	26	0.72
2	1973-74	28	0.77	54	1.49
3	1974-75	30	0.83	84	2.31
4	1975	25	0.69	109	3
5	1976	34	0.94	143	3.94
6	1977	33	0.91	176	4.85
7	1978	34	0.94	210	5.79
8	1979	33	0.91	243	6.69
9	1980	30	0.83	273	7.52
10	1981	34	0.94	307	8.46
11	1982	42	1.16	349	9.61
12	1983	25	0.69	374	10.3
13	1984	25	0.69	399	10.99
14	1985	31	0.85	430	11.85
15	1986	36	0.99	466	12.84
16	1987	31	0.85	497	13.69
17	1988	51	1.4	548	15.1
18	1989	46	1.27	594	16.36
19	1990	51	1.4	645	17.77
20	1991	51	1.4	696	19.17
21	1992	43	1.18	739	20.36
22	1993	70	1.93	809	22.29
23	1994	67	1.85	876	24.13
24	1995	67	1.85	943	25.98
25	1996-97	89	2.45	1032	28.43
26	1997-98	77	2.12	1109	30.55
27	1998	70	1.93	1179	32.48
28	1999	62	1.71	1241	34.19
29	2000	77	2.12	1318	36.31
30	2001	106	2.92	1424	39.23

31	2002	98	2.7	1522	41.93
32	2003	135	3.72	1657	45.65
33	2004	121	3.33	1778	48.98
34	2005	128	3.53	1906	52.51
35	2006	112	3.09	2018	55.59
36	2007	123	3.39	2141	58.98
37	2008	155	4.27	2296	63.25
38	2009	153	4.21	2449	67.47
39	2010	130	3.58	2579	71.05
40	2011	127	3.5	2706	74.55
41	2012	146	4.02	2852	78.57
42	2013	152	4.19	3004	82.75
43	2014	150	4.13	3154	86.89
44	2015	155	4.27	3309	91.16
45	2016	170	4.68	3479	95.84
46	2017	151	4.16	3630	100.00

Table 3.2.1 1 Temporal evolution of published documents by volume

As it can be seen in the above table, we calculated the frequency and cumulative frequency of published documents by volume. Totally, it is notice that the number of published documents during period 1971-2017 has increased from 26 to 3630. Looking at the number of published documents it seems that there are small fluctuations during volumes. The most published documents(170) in 45th volume were published.

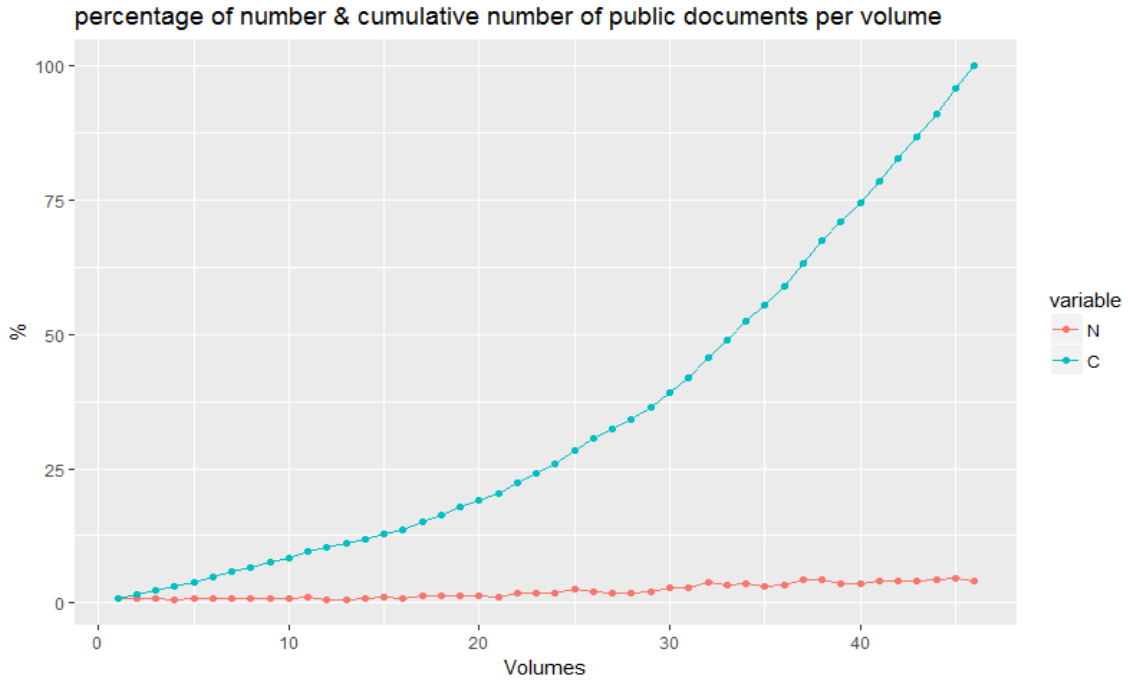

Figure 3.2.1 1 Number and cumulative number of published documents by volume

This graph illustrates the percentage of number and cumulative number of published documents in each volume. Hence, it is observed the temporal evolution of scientific literature. Looking at the percentage of number of published documents it is clear that there are small fluctuations during this period. As can be seen at cumulative percentage of published documents there is a growth in publications of journal. According to Price's Law, productivity follows an exponential growth. It can be stated that by the 20th volume are increased with little rate whereas from 21th rise rapidly.

Volumes	Year	Number of published documents	N%	Cumulative number of published documents	C%
1-5	1971-1976	143	3.94	143	3.94
6-10	1977-1981	164	4.52	307	8.46
11-15	1982-1986	159	4.38	466	12.84
16-20	1987-1991	230	6.34	696	19.17
21-25	1992-1997	336	9.26	1032	28.43
26-30	1997-2001	392	10.80	1424	39.23
31-35	2002-2006	594	16.36	2018	55.59
36-40	2007-2011	688	18.95	2706	74.55
41-45	2012-2016	773	21.29	3479	95.84
46	2017	151	4.16	3630	100.00

Table 3.2.1 2 Temporal evolution of published documents by 5-volumes

In this table we calculate the number and cumulative number & percentage of published documents by 5-volume. The public documents into 5-volumes periods are divided, except for last which include one. As it seems there is an increase in the number of published documents apart from 3rd period in which notice a small reduce from 164(4.52%) to 159(4.38%).

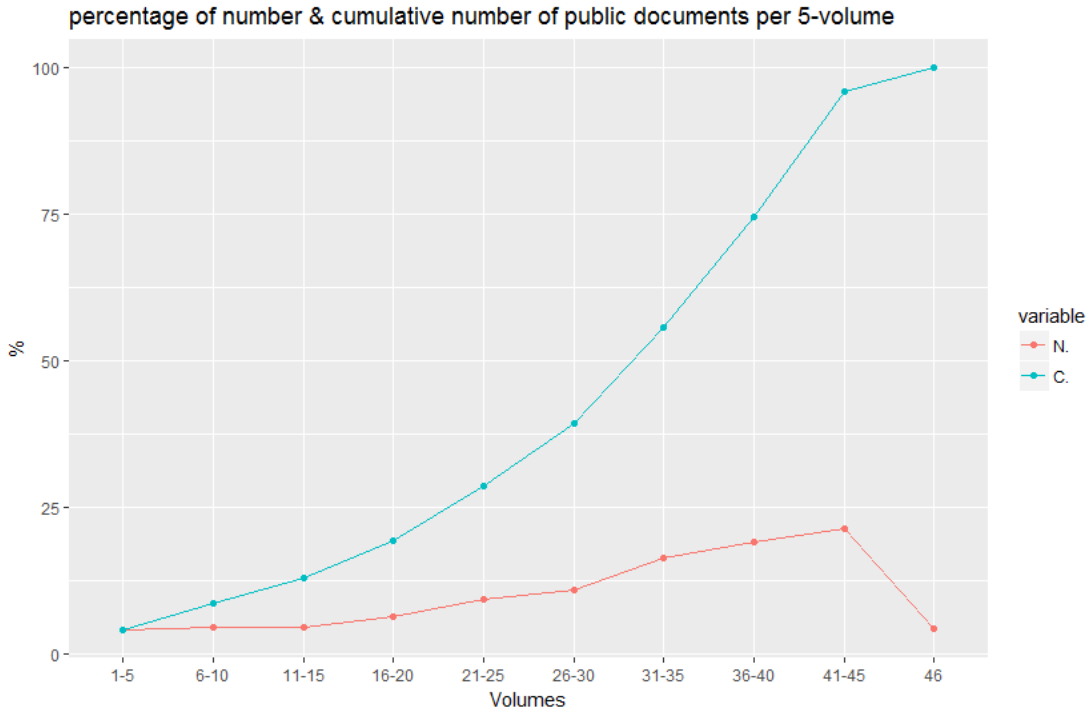

Figure 3.2.1 2 Number and cumulative number of published documents by 5-volumes

This figure illustrates the results from Table 3.2.1.2.

3.2.2 Temporal evolution of pages of published documents

Volume	Number of pages	N%	Cumulative number of pages	C%
1	407	0.89	407	0.89
2	411	0.89	818	1.78
3	369	0.80	1187	2.58
4	401	0.87	1588	3.45
5	453	0.99	2041	4.44
6	415	0.90	2456	5.34
7	394	0.86	2850	6.20
8	398	0.87	3248	7.07
9	359	0.78	3607	7.85
10	405	0.88	4012	8.73
11	370	0.80	4382	9.53
12	344	0.75	4726	10.28
13	372	0.81	5098	11.09
14	346	0.75	5444	11.84
15	336	0.73	5780	12.57

16	347	0.75	6127	13.33
17	385	0.84	6512	14.17
18	394	0.86	6906	15.02
19	566	1.23	7472	16.26
20	582	1.27	8054	17.52
21	558	1.21	8612	18.74
22	589	1.28	9201	20.02
23	732	1.59	9933	21.61
24	985	2.14	10918	23.75
25	1283	2.79	12201	26.54
26	963	2.10	13164	28.64
27	956	2.08	14120	30.72
28	1049	2.28	15169	33.00
29	1167	2.54	16336	35.54
30	1577	3.43	17913	38.97
31	1483	3.23	19396	42.20
32	1898	4.13	21294	46.33
33	1684	3.66	22978	49.99
34	1638	3.56	24616	53.55
35	1682	3.66	26298	57.21
36	1687	3.67	27985	60.88
37	1927	4.19	29912	65.07
38	1633	3.55	31545	68.63
39	1410	3.07	32955	71.69
40	1466	3.19	34421	74.88
41	1798	3.91	36219	78.80
42	1830	3.98	38049	82.78
43	1843	4.01	39892	86.79
44	1979	4.31	41871	91.09
45	2171	4.72	44042	95.81
46	1924	4.19	45966	100.00

Table 3.2.2 1 Temporal evolution of number of pages by volume

Table 3.2.2.1 shows the number and cumulative number of pages of published documents in each volume. As it seems the volume with the biggest length is 45th with totally 2171 (4.72%) pages whereas the smallest volume is 15th 336(0.73%) pages. It notice that there is a significant rise in volume's length from 407 pages to 45966 pages during the volumes.

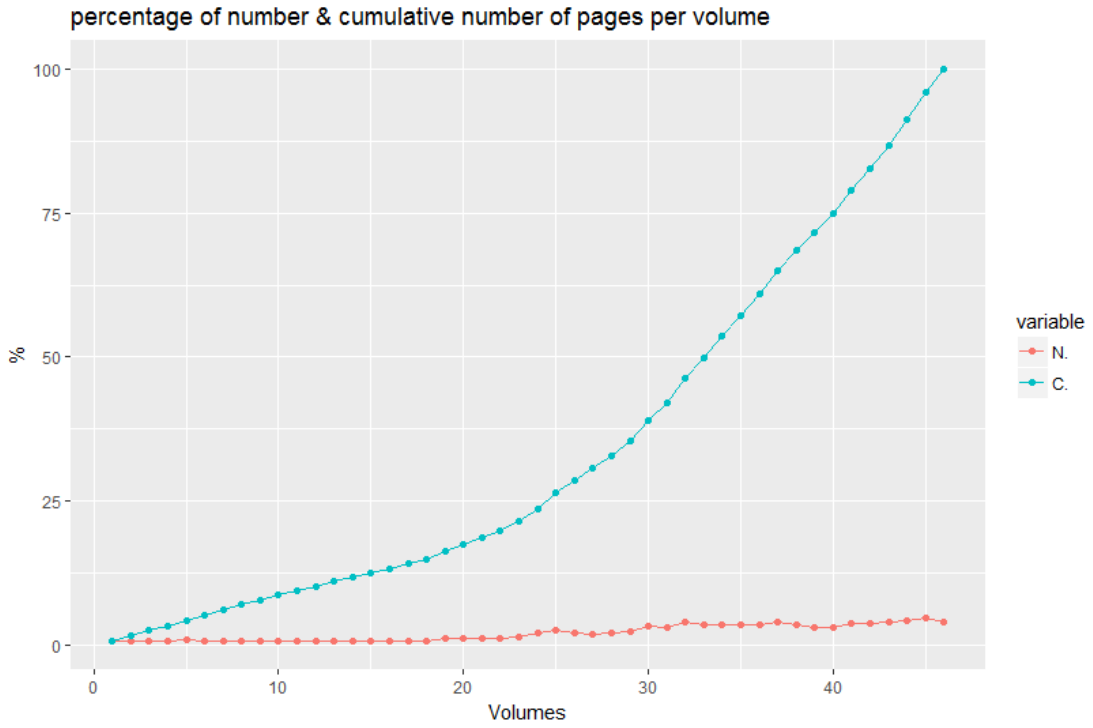

Figure 3.2.2 1 Number and cumulative number of pages by volume

This graph illustrates the percentage of number and cumulative number of research articles until to date. More specifically, shows the temporal evolution of scientific literature. Looking at the percentage of number of published documents it is clear that there are little fluctuations during this period. As can be seen at cumulative percentage of research articles there is a growth in journal's productivity. According to Price's Law productivity follows an exponential growth. It can be stated that by the 20th volume increased with little rate whereas from 21th with high.

Volumes	Number of pages	N%	Cumulative number of pages	C%
1-5	2041	4.44	2041	4.44
6-10	1971	4.29	4012	8.73
11-15	1768	3.85	5780	12.57
16-20	2274	4.95	8054	17.52
21-25	4147	9.02	12201	26.54
26-30	5712	12.43	17913	38.97
31-35	8385	18.24	26298	57.21
36-40	8123	17.67	34421	74.88
41-45	9621	20.93	44042	95.81
46	1924	4.19	45966	100.00

Table 3.2.2 2 Temporal evolution of number of pages by 5-volumes

In table 3.2.2.2 we calculate the number and cumulative number & percentage of pages of public documents by 5-volume. The published documents are divided into 5-volumes periods, except for last which include one. As it seems there is an downward trend in the number of pages from 2041 to 1768 in first three periods. Then, notice an upward trend except for eighth period which notice a small reduce to 8123 pages.

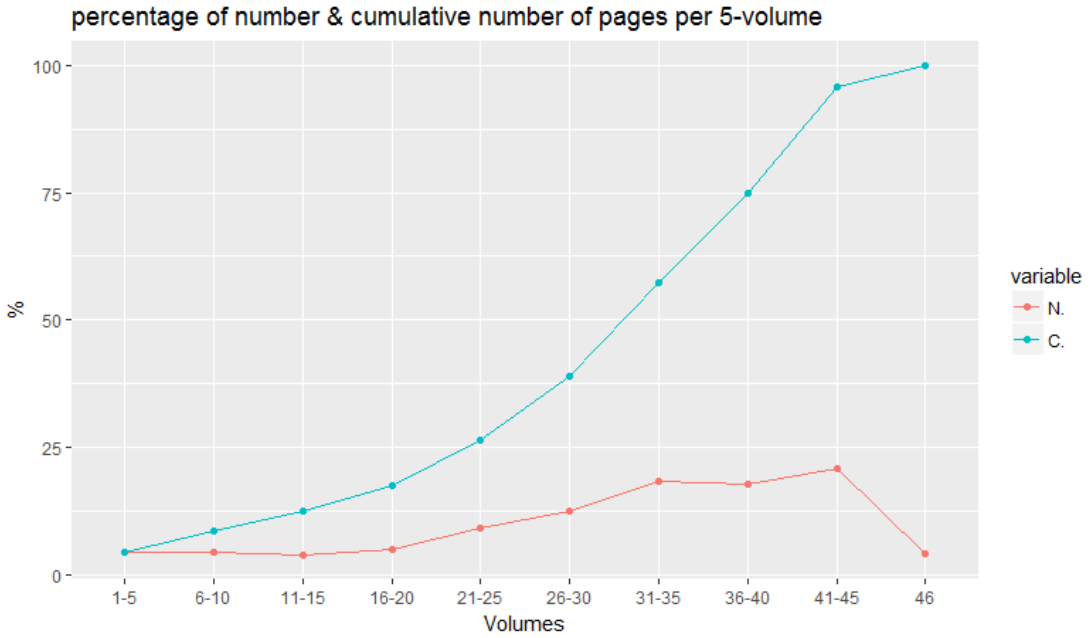

Figure 3.2.2 2 Number and cumulative number of pages by 5-volumes

The above graph illustrates the number and cumulative number of pages of published documents in five-volume periods and one. As it seems in three first periods there is a downward trend while after fourth period are increased.

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
1-5	1	2	14	14.27	21.5	87
6-10	1	2	10	12.02	21	55
11-15	1	3	11	11.13	16	38
16-20	1	2	10	9.89	15	38
21-25	1	2	13	12.34	19	43
26-30	1	11	16	14.83	19	75
31-35	1	11	16	14.12	19	35
36-40	1	10	12	11.81	15	34
41-45	1	11	13	12.45	15	34
46	1	11	14	12.75	16	23

Table 3.2.2 3 Five number summary of pages

In the table above is shown the five number summary for each quartile in order to see how distributed the number of pages of published documents by 5-volume.Five number summary provide information about the data. It is consists of minimum, 1st quartile, median 3rd quartile and maximum. Minimum indicates the smallest value in a dataset whereas maximum the biggest value in a dataset. Median is the middle of the dataset. First quartile shows that the 25% of the data are less than this values while third indicates that the 75% of the data are less than this value.

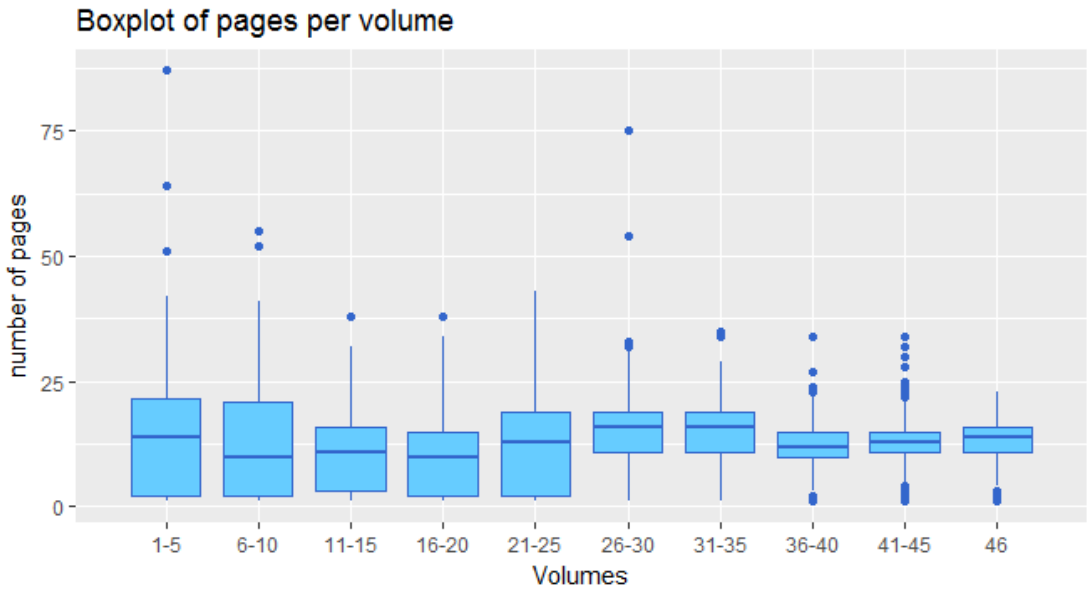

Figure 3.2.2 3 Boxplots of pages of published documents by 5-volumes

Figure 3.2.2.3 illustrates the five number summary of each quartile. As it seems 21-25 is the only quartile which have not outliers. 1-5 quartile has the biggest interquartile range(Q3-Q1) which means that varied the set of observed values. Also it seems that in quartiles 1-5,6-10,11-15 median<mean, so the data are right-skewed whereas the other quartiles are left-skewed.

3.3 Type of published documents

At this point we classified the type of published documents of journal during the period 1971-2017. After that, we continued the bibliometric analysis based on Research Articles only.

Type of published documents	Number of published documents	%
Research articles	2841	78.26
Book review	257	7.08
Others	171	4.71
Editorial Boards	164	4.52
Editorials	50	1.38
Conference abstracts	43	1.18
News	31	0.85
Erratum	21	0.58
Short communications	20	0.55
Correspondence	12	0.33
Discussions	11	0.30
Obituary	5	0.14
Articles in press	2	0.06
Review articles	2	0.06
Total	**3630**	**100**

Table 3.3 1 Type of published documents

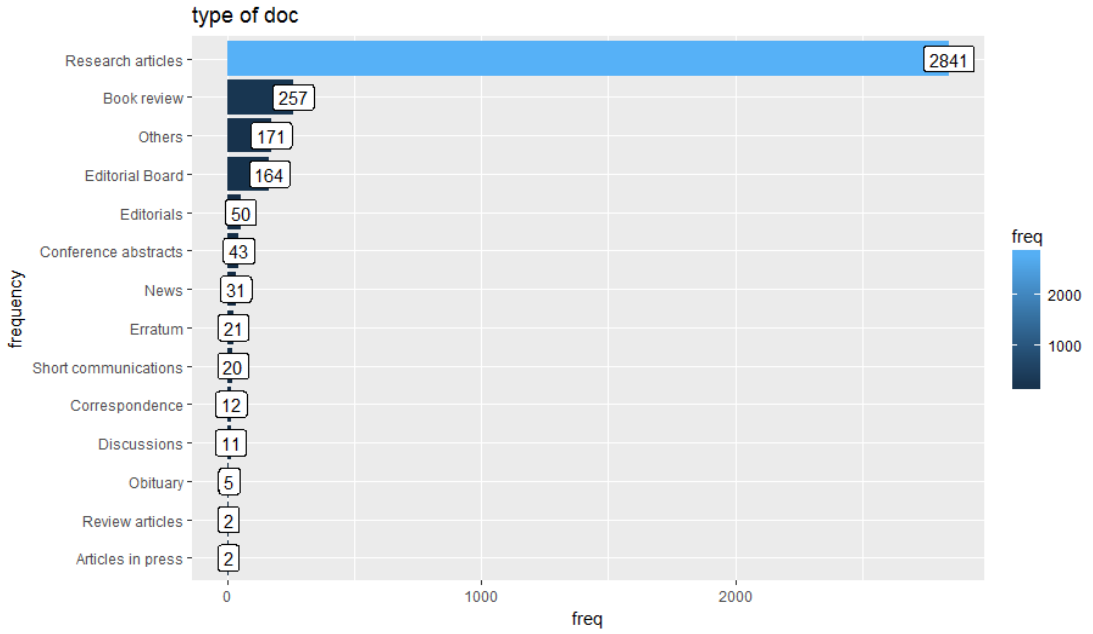

Figure 3.3 1 Barplot of types of published documents

Figure 3.3.1 indicates the total number of Research Policy publications during 1971-2017 sorted by publication type. A total of 3630 published documents in Journal have published. The vast majority are Research articles 2841(78.26%).The second most common type of document are Book reviews 257(7.08%). In 3rd position are Others 171(4.71%) which include: ‘call for papers’, ’author index’, ’subject index’, ’summaries’, followed by Editorial Boards 164(4.52%).

Vol	Research articles	Book review	Others	Editorial Boards	Editorials	Conf.abstracts	News	Erratum	Short com	Correspondence	Discussions	Obituary	Revie articl
1	18	0	3	0	1	0	3	1	0	0	0	0	0
2	20	0	3	1	0	0	3	0	1	0	0	0	0
3	22	0	2	1	0	0	5	0	0	0	0	0	0
4	20	0	2	1	0	0	2	0	0	0	0	0	0
5	12	0	8	1	0	5	3	2	0	2	1	0	0
6	19	0	8	1	0	2	2	0	0	1	0	0	0
7	17	0	10	1	0	2	2	0	1	0	1	0	0
8	19	0	11	1	0	0	2	0	0	0	0	0	0
9	14	0	9	1	0	2	3	0	0	0	1	0	0
10	17	0	10	1	0	0	4	2	0	0	0	0	0
11	23	0	16	1	1	0	1	0	0	0	0	0	0
12	21	0	2	1	0	0	1	0	0	0	0	0	0
13	21	0	2	1	1	0	0	0	0	0	0	0	0
14	26	0	2	1	2	0	0	0	0	0	0	0	0
15	24	7	3	1	0	0	0	0	1	0	0	0	0
16	20	3	5	1	1	0	0	0	1	0	0	0	0
17	29	18	3	1	0	0	0	0	0	0	0	0	0
18	26	15	4	1	0	0	0	0	0	0	0	0	0
19	37	11	2	1	0	0	0	0	0	0	0	0	0
20	36	10	2	1	0	0	0	1	0	0	0	0	1
21	31	9	2	1	0	0	0	0	0	0	0	0	0
22	24	5	7	1	1	32	0	0	0	0	0	0	0
23	43	17	5	1	0	0	0	0	1	0	0	0	0
24	51	12	3	1	0	0	0	0	0	0	0	0	0

25	69	15	4	1	0	0	0	0	0	0	0	0	0
26	58	17	0	1	0	0	0	0	0	1	0	0	0
27	58	7	2	0	3	0	0	0	0	0	0	0	0
28	46	9	5	0	2	0	0	0	0	0	0	0	0
29	65	6	2	0	2	0	0	0	0	2	0	0	0
30	84	17	3	0	2	0	0	0	0	0	0	0	0
31	81	9	2	0	2	0	0	2	1	1	0	0	0
32	101	15	5	4	5	0	0	0	1	0	0	4	0
33	93	14	4	7	2	0	0	1	0	0	0	0	0
34	94	12	11	9	2	0	0	0	0	0	0	0	0
35	98	0	2	10	2	0	0	0	0	0	0	0	0
36	100	4	1	11	4	0	0	1	0	1	1	0	0
37	126	15	1	9	2	0	0	2	0	0	0	0	0
38	133	5	1	10	3	0	0	0	0	0	0	1	0
39	110	2	1	10	1	0	0	0	0	4	1	0	1
40	114	0	0	10	2	0	0	0	1	0	0	0	0
41	132	0	0	10	0	0	0	4	0	0	0	0	0
42	133	1	0	9	2	0	0	1	1	0	5	0	0
43	134	0	0	10	1	0	0	3	2	0	0	0	0
44	140	1	1	10	1	0	0	0	2	0	0	0	0
45	150	0	1	10	4	0	0	0	4	0	1	0	0
46	132	1	1	10	1	0	0	1	3	0	0	0	0

Table 3.3 2 Type of published documents by volume

ume	Research articles	Book review	Others	Editorial Boards	Editorials	Conference abstracts	News	Erratum	Short communications	Correspondence	Discussions	Obituary	Review articles
	92	0	18	4	1	5	16	3	1	2	1	0	0
0	86	0	48	5	0	6	13	2	1	1	2	0	0
15	115	7	25	5	4	0	2	0	1	0	0	0	0
20	148	57	16	5	1	0	0	1	1	0	0	0	1
25	218	58	21	5	1	32	0	0	1	0	0	0	0
30	311	56	12	1	9	0	0	0	0	3	0	0	0
35	467	50	24	30	13	0	0	3	2	1	0	4	0
40	583	26	4	50	12	0	0	3	1	5	2	1	1
45	689	2	2	49	8	0	0	8	9	0	6	0	0
	132	1	1	10	1	0	0	1	3	0	0	0	0

Table 3.3 3 Type of published documents by 5-volumes

3.4 Temporal evolution of research articles

Volume	Number of research articles	N%	Cumulative number of research articles	C%
1	18	0.63	18	0.63
2	20	0.7	38	1.34
3	22	0.77	60	2.11
4	20	0.7	80	2.82
5	12	0.42	92	3.24
6	19	0.67	111	3.91
7	17	0.6	128	4.51
8	19	0.67	147	5.17
9	14	0.49	161	5.67
10	17	0.6	178	6.27
11	23	0.81	201	7.07
12	21	0.74	222	7.81
13	21	0.74	243	8.55
14	26	0.92	269	9.47
15	24	0.84	293	10.31
16	20	0.7	313	11.02
17	29	1.02	342	12.04
18	26	0.92	368	12.95
19	37	1.3	405	14.26
20	36	1.27	441	15.52
21	31	1.09	472	16.61
22	24	0.84	496	17.46
23	43	1.51	539	18.97
24	51	1.8	590	20.77
25	69	2.43	659	23.2
26	58	2.04	717	25.24
27	58	2.04	775	27.28
28	46	1.62	821	28.9
29	65	2.29	886	31.19
30	84	2.96	970	34.14
31	81	2.85	1051	36.99
32	101	3.56	1152	40.55
33	93	3.27	1245	43.82
34	94	3.31	1339	47.13
35	98	3.45	1437	50.58
36	100	3.52	1537	54.1
37	126	4.44	1663	58.54
38	133	4.68	1796	63.22
39	110	3.87	1906	67.09

40	114	4.01	2020	71.1
41	132	4.65	2152	75.75
42	133	4.68	2285	80.43
43	134	4.72	2419	85.15
44	140	4.93	2559	90.07
45	150	5.28	2709	95.35
46	132	4.65	2841	100

Table 3.4 1 Temporal evolution of research articles by volume

Table 3.4 1 shows the number and cumulative number of research articles published in Research Policy Journal during 1971-2017. As it seems the highest productivity is 150 (5.28%) research articles were published in 45th volume while the lowest productivity 12 (0.42%) research articles were published in 5th volume. It is also observed that the 50% of research articles were published during 1-35 volumes and 50 to 100% were published during 36-46 volumes.

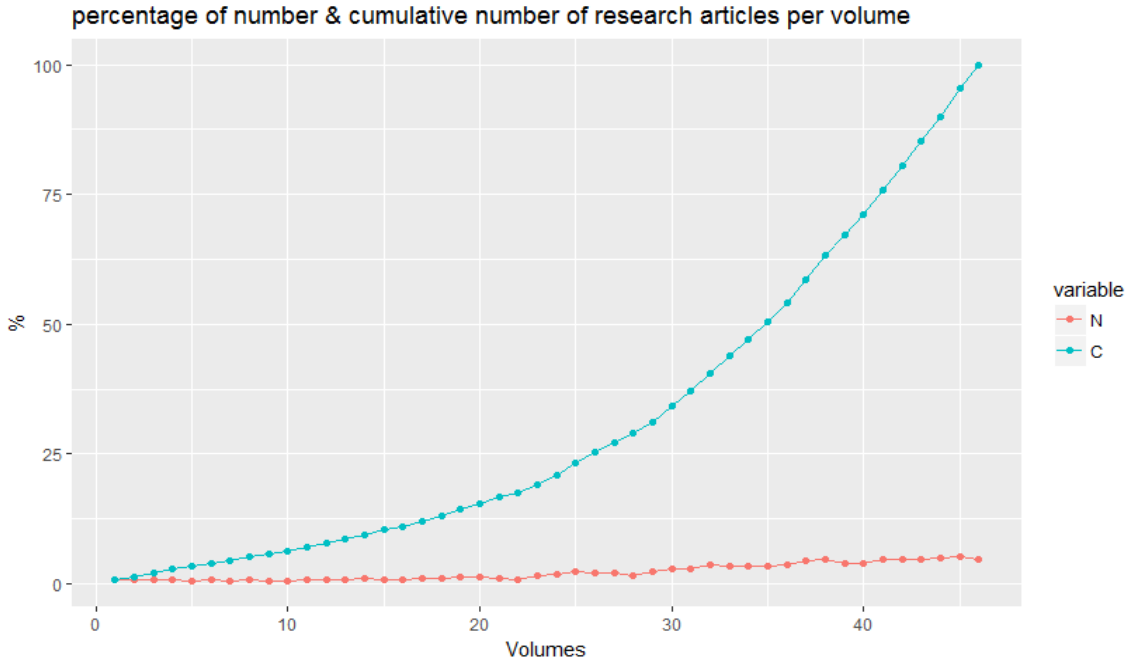

Figure 3.4 1 Number and cumulative number of research articles by volume

Looking at the blue line which represents the cumulative percentage of research articles in Figure 3.4.1, it is clear that the research in this discipline has increased to a great extend. According to Table 3.4.1 in 31-volume the Journal overcame a total of 1000 publications. In the next eight volumes by 40th the number of research articles reaches at 2020.It is obvious that research articles during the time period between 1st and 46 volumes follow an exponential growth.

Volumes	Number of research articles	N%	Cumulative number of research articles	C%
1-5	92	3.24	92	3.24
6-10	86	3.03	178	6.27
11-15	115	4.05	293	10.31
16-20	148	5.21	441	15.52
21-25	218	7.67	659	23.20
26-30	311	10.95	970	34.14
31-35	467	16.44	1437	50.58
36-40	583	20.52	2020	71.10
41-45	689	24.25	2709	95.35
46	132	4.65	2841	100.00

Table 3.4 2 Temporal evolution of research articles by 5-volumes

In table 3.4.2 we calculate the number and cumulative number & percentage of research articles by 5-volume. The research articles into 5-volumes periods are divided, except for last which include one. There is a small reduce in first period from 92 to 86. After that, it notice an increase in the number of research articles.

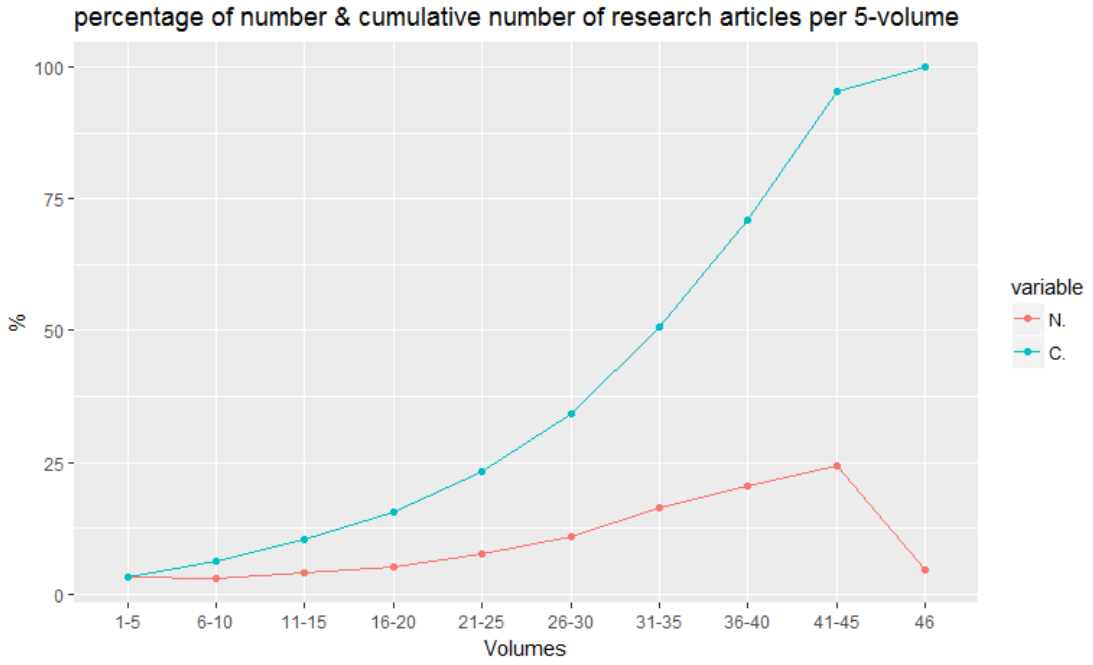

Figure 3.4 2 Number and cumulative number of research articles by 5-volumes

This figure illustrates the results from table 3.4.2

3.4.1Length of research articles

Volume	Total number of papers	Total number of pages	Mean of pages	Median of pages	Standard deviation of pages
1	18	385	21.39	18.5	13.03
2	20	360	18	16	5.00
3	22	356	16.18	14.5	8.98
4	20	393	19.65	17.5	11.04
5	12	323	26.92	23	21.11
6	19	384	20.21	18	9.44
7	17	351	20.65	21	4.64
8	19	369	19.42	16	11.83
9	14	331	23.64	22.5	10.66
10	17	374	22	21	5.66
11	23	321	13.96	14	4.60
12	21	337	16.05	13	7.25
13	21	365	17.38	16	8.89
14	26	338	13	13.5	4.19
15	24	312	13	12.5	3.98
16	20	327	16.35	13	8.39
17	29	343	11.83	12	3.54
18	26	356	13.69	14	5.17
19	37	533	14.41	14	6.4
20	36	533	14.81	15	4.53
21	31	529	17.06	17	6.35
22	24	445	18.54	16	6.59
23	43	660	15.35	14	6.11
24	51	947	18.57	19	4.98
25	69	1226	17.77	17	6.46
26	58	997	17.19	17	4.49
27	58	909	15.67	16	4.52
28	46	854	18.57	18	4.76
29	65	1116	17.17	17	5.85
30	84	1511	17.99	17.5	6.15
31	81	1413	17.44	18	4.79
32	101	1819	18.01	18	4.01
33	93	1619	17.41	17	4.90
34	94	1574	16.74	17	4.61
35	98	1647	16.81	17	4.80
36	100	1632	16.32	16	4.24
37	126	1866	14.81	15	3.84
38	133	1577	11.86	12	2.49
39	110	1345	12.23	12	2.35
40	114	1440	12.63	12.5	2.55
41	132	1784	13.52	13	3.63

42	133	1768	13.29	13	3.09
43	134	1808	13.49	13	3.65
44	140	1951	13.94	14	3.19
45	150	2119	14.13	14	3.25
46	132	1876	14.21	14	3.42

Table 3.4.1 1 Mean, Median and Standard deviation of pages by volume

In Table 3.4.1.1 mean, median and standard deviation of number of pages of research articles in each volume were calculated . As we seen mean values range between 11.83 and 26.92 while the median ranges between 12 and 23 and the standard deviation varied from 2.35 to 21.11.

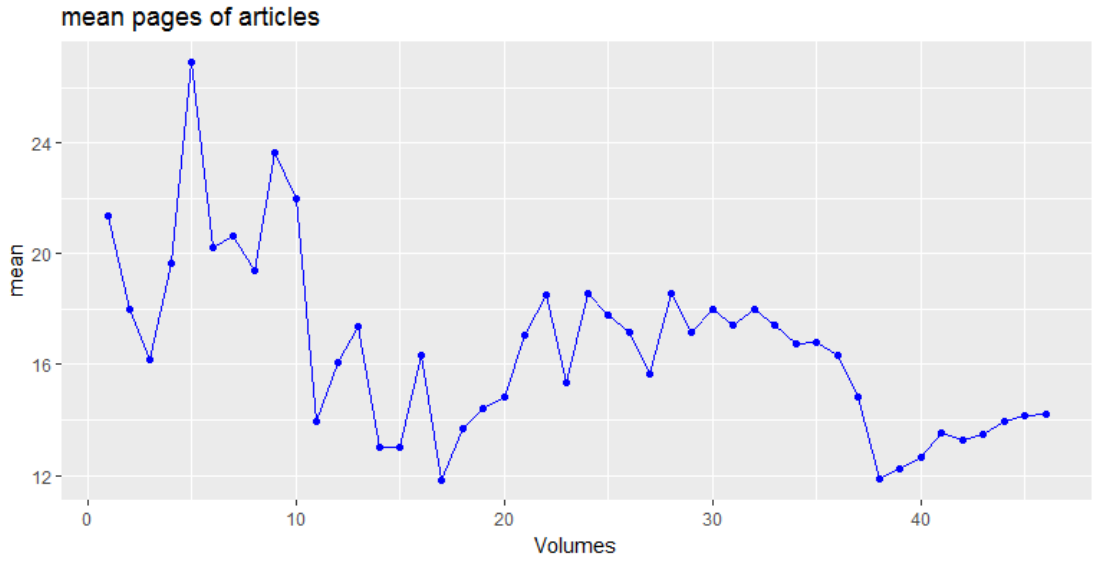

Figure 3.4.1 1 Mean of pages by volume

The line graph illustrated information about the mean of number of pages of research articles which have each volume. Overall, we observe that there are lots of fluctuations. Mean value ranges between 11.83 and 26.92. The maximum value notice in 5th volume while the minimum in 17th volume.

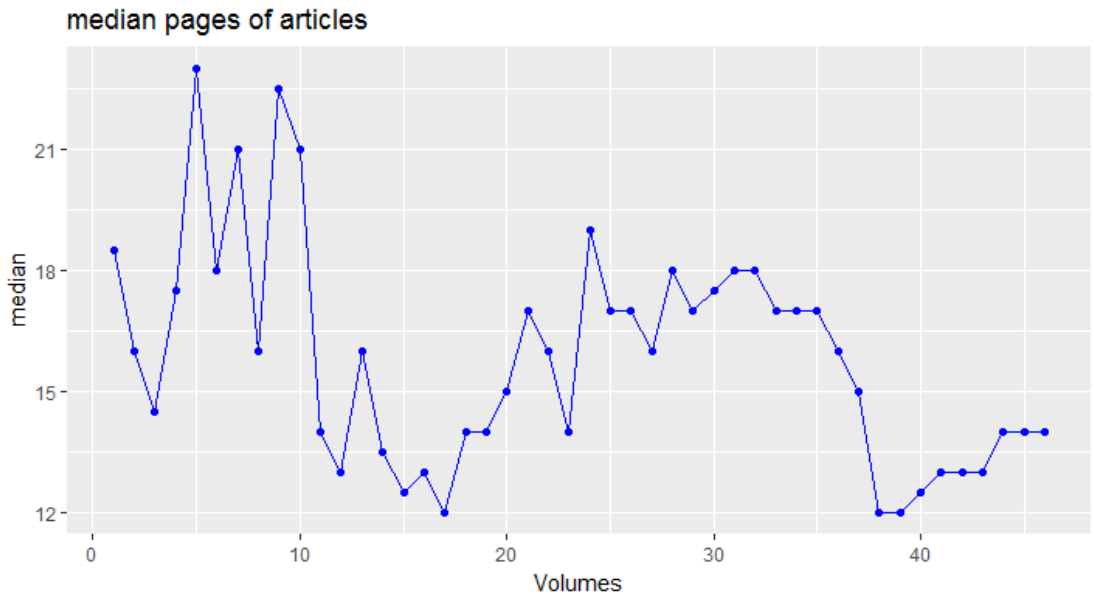

Figure 3.4.1 2 Median of pages by volume

The above graph provides information about the median of number of pages in each volume. As we seen the median values are between 12 and 23. The biggest value is in 5th volume while the smallest in volumes 17th 38th 39th

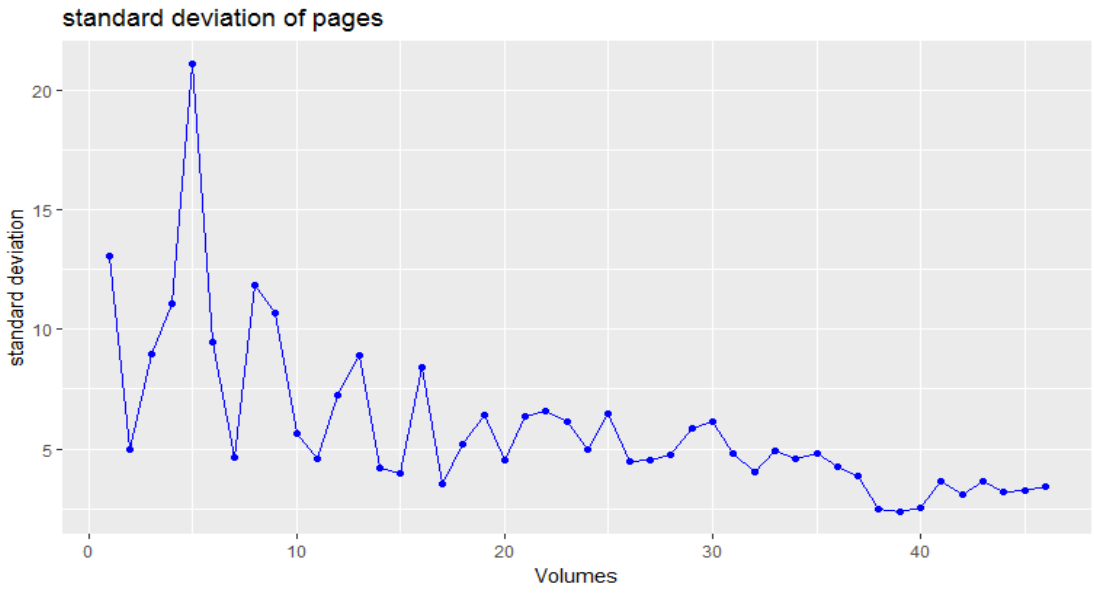

Figure 3.4.1 3 Standard deviation of pages by volume

The above graph provides information about the standard deviation of number of pages in each volume. As we seen the standard deviation varied from 2.35 to 21.11. The highest value is in 5th volume while the smallest in volumes 39th

Volumes	Total number of papers	Total number of pages	Mean of pages	Median of pages	Standard deviation of pages
1-5	92	1817	19.75	17	12.08
6-10	86	1809	21.03	21	8.83
11-15	115	1673	14.55	13	6.10
16-20	148	2092	14.14	14	5.73
21-25	218	3807	17.46	17	6.13
26-30	311	5387	17.32	17	5.37
31-35	467	8072	17.28	17	4.63
36-40	583	7860	13.48	13	3.57
41-45	689	9430	13.69	13	3.37
46	132	1876	14.21	14	3.42

Table 3.4.1 2 Mean, Median and Standard deviation of pages by 5-volumes

In the above table mean ,median and standard deviation of number of pages by 5-volume were calculated. As it seems, mean values range between 13.48 and 21.03 while the median ranges between 13 and 21 and the standard deviation varied from 3.37 to 12.08.

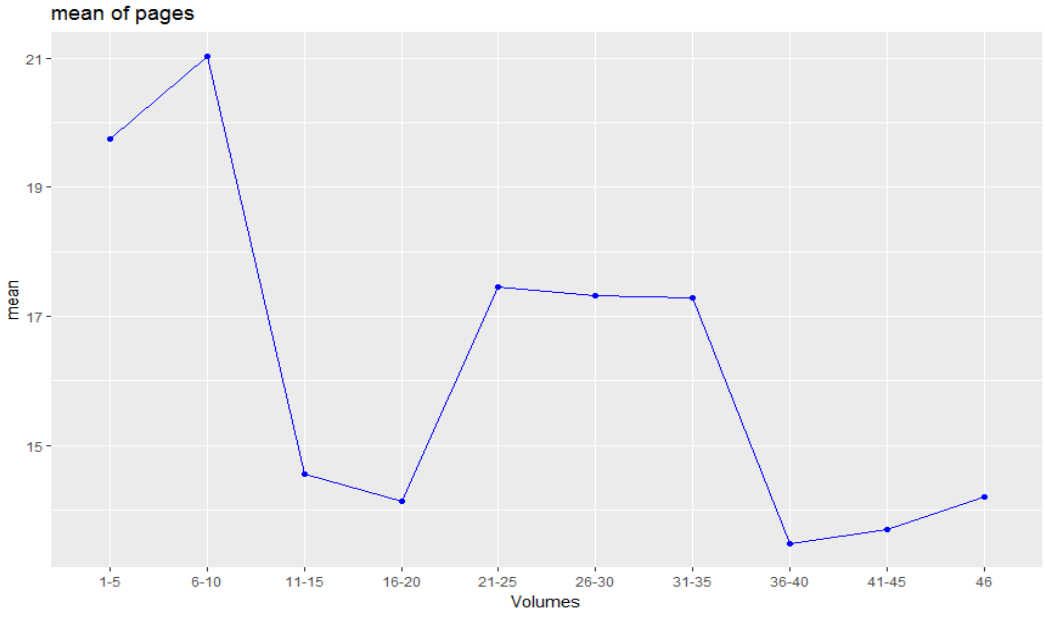

Figure 3.4.1 4 Mean of pages by 5-volumes

Figure 3.4.1.4 shows how the mean of pages of research articles fell from 19.75 to 14.21.

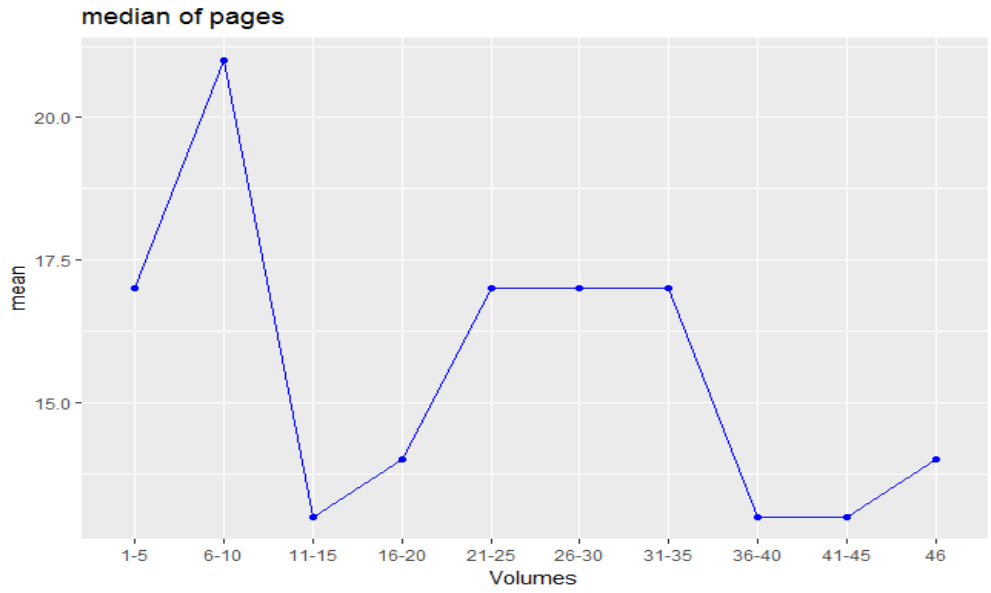

Figure 3.4.1 5 Median of pages by 5-volumes

Figure 3.4.1.5 shows how the median of pages of research articles fell from 17 to 14.

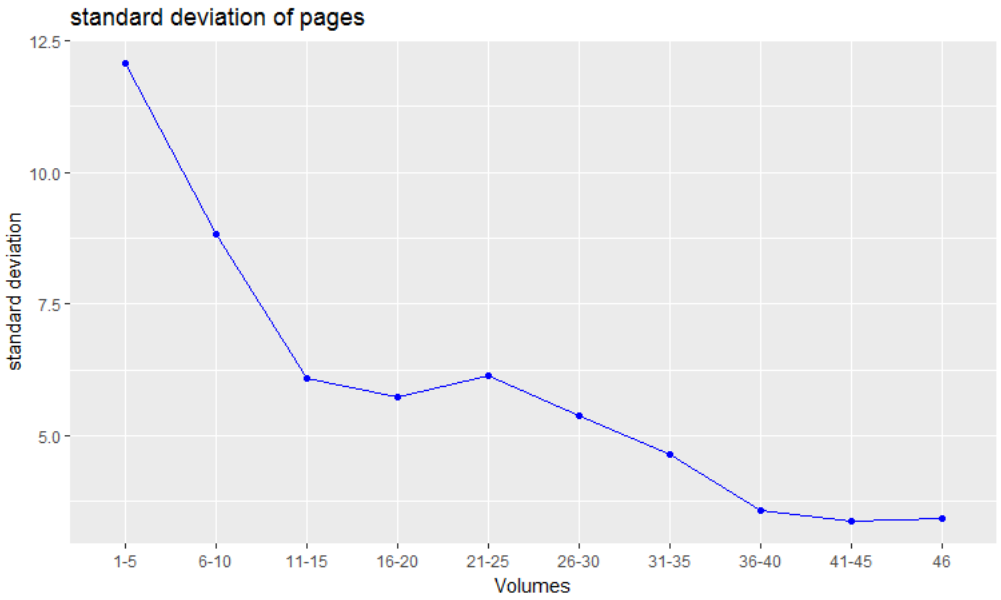

Figure 3.4.1 6 Standard deviation of pages by 5-volumes

Figure 3.4.1.6 illustrates the downward trend of standard deviation of pages of research articles from 12.08 to 3.42.

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
1-5	2	13	17	19.75	24.25	87
6-10	4	15.25	21	21.03	24	55
11-15	5	11	13	14.55	17	38
16-20	4	10	14	14.14	16.25	38
21-25	2	13	17	17.46	21	37
26-30	4	14	17	17.32	20	54
31-35	3	15	17	17.28	20	35
36-40	6	11	13	13.48	15	34
41-45	3	12	13	13.69	15	34
46	3	12	14	14.21	16	23

Table 3.4.1 3 Five number summary of pages of research articles

Table 3.4.1.3 indicates the five number summary for each quartile in order to see how distributed the number of pages of research articles by 5-volume.

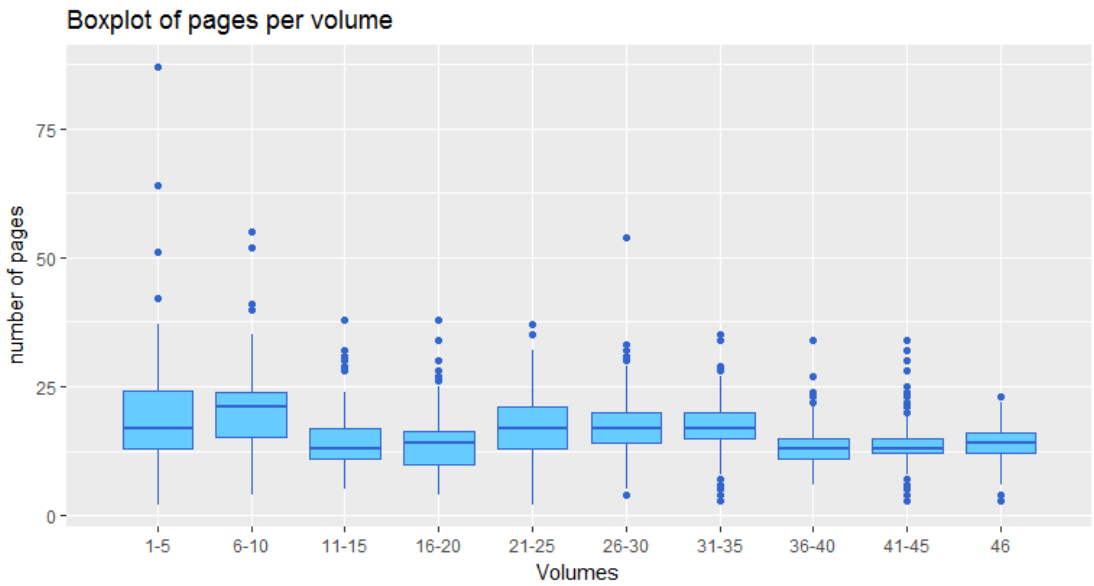

Figure 3.4.1 7 Boxplots of pages of research articles by 5-volumes

Figure 3.4.1.7 illustrates the five number summary of each quartile. As it seems 1-5 quartile has the biggest interquartile range(Q3-Q1) which means that varied the set of observed values. Furthermore 41-45 quartile has the most outliers. Also it is noticed that median<mean in all quartiles, so the data are right-skewed.

Volume	Total number of papers	1-10	%	11-20	%	21-30	%	31-40	%	41<	%
1	18	2	11.11	9	50	4	22.22	2	11.11	1	5.56
2	20	1	5	13	65	6	30	0	0	0	0
3	22	7	31.82	8	36.36	5	22.73	2	9.09	0	0
4	20	4	20	8	40	6	30	1	5	1	5
5	12	2	16.67	3	25	5	41.67	0	0	2	16.67
6	19	1	5.26	9	47.37	6	31.58	2	10.53	1	5.26
7	17	1	5.88	6	35.29	10	58.82	0	0	0	0
8	19	5	26.32	7	36.84	4	21.05	2	10.53	1	5.26
9	14	0	0	5	35.71	7	50	1	7.14	1	7.14
10	17	0	0	7	41.18	8	47.06	2	11.76	0	0
11	23	5	21.74	16	69.57	2	8.7	0	0	0	0
12	21	4	19.05	12	57.14	4	19.05	1	4.76	0	0
13	21	5	23.81	9	42.86	4	19.05	3	14.29	0	0
14	26	8	30.77	17	65.38	1	3.85	0	0	0	0
15	24	6	25	16	66.67	2	8.33	0	0	0	0
16	20	4	20	12	60	3	15	1	5	0	0
17	29	12	41.38	17	58.62	0	0	0	0	0	0
18	26	9	34.62	16	61.54	1	3.85	0	0	0	0
19	37	13	35.14	17	45.95	6	16.22	1	2.7	0	0
20	36	6	16.67	27	75	3	8.33	0	0	0	0
21	31	3	9.68	22	70.97	6	19.35	0	0	0	0
22	24	2	8.33	13	54.17	8	33.33	1	4.17	0	0
23	43	10	23.26	27	62.79	4	9.3	2	4.65	0	0
24	51	1	1.96	34	66.67	15	29.41	1	1.96	0	0
25	69	6	8.7	44	63.77	17	24.64	2	2.9	0	0
26	58	2	3.45	46	79.31	10	17.24	0	0	0	0
27	58	6	10.34	45	77.59	7	12.07	0	0	0	0
28	46	1	2.17	34	73.91	10	21.74	1	2.17	0	0
29	65	8	12.31	39	60	16	24.62	2	3.08	0	0
30	84	7	8.33	53	63.1	23	27.38	0	0	1	1.19
31	81	5	6.17	58	71.6	17	20.99	1	1.23	0	0
32	101	2	1.98	73	72.28	26	25.74	0	0	0	0
33	93	2	2.15	72	77.42	17	18.28	2	2.15	0	0
34	94	7	7.45	70	74.47	17	18.09	0	0	0	0
35	98	7	7.14	74	75.51	15	15.31	2	2.04	0	0
36	100	7	7	80	80	12	12	1	1	0	0
37	126	16	12.7	100	79.37	10	7.94	0	0	0	0
38	133	42	31.58	91	68.42	0	0	0	0	0	0
39	110	23	20.91	87	79.09	0	0	0	0	0	0
40	114	21	18.42	93	81.58	0	0	0	0	0	0
41	132	23	17.42	102	77.27	6	4.55	1	0.76	0	0
42	133	20	15.04	110	82.71	3	2.26	0	0	0	0
43	134	20	14.93	111	82.84	2	1.49	1	0.75	0	0

44	140	13	9.29	124	88.57	3	2.14	0	0	0	0
45	150	16	10.67	130	86.67	4	2.67	0	0	0	0
46	132	11	8.33	115	87.12	6	4.55	0	0	0	0
Total	**2841**	**376**	**13.23**	**2081**	**73.25**	**341**	**12.00**	**35**	**1.23**	**8**	**0.28**

Table 3.4.1 4 Length of pages by volume

Table3.4.1.4 shows the length of pages of research articles in Journal during 1-46volumes. We divided articles into categories according to their length pages. Out of 2841 research articles, 376 (13.23%) had between 1-10 pages,2081(73.25%) 11-20 pages, 341(12%) 21-30 pages, 35(1.23 %) 31-40 pages and 8(0.28%) 41< pages. The number of pages range between 2 and 87.The results shows that the vast majority of research articles in Journal has length between 11 and 20 pages.

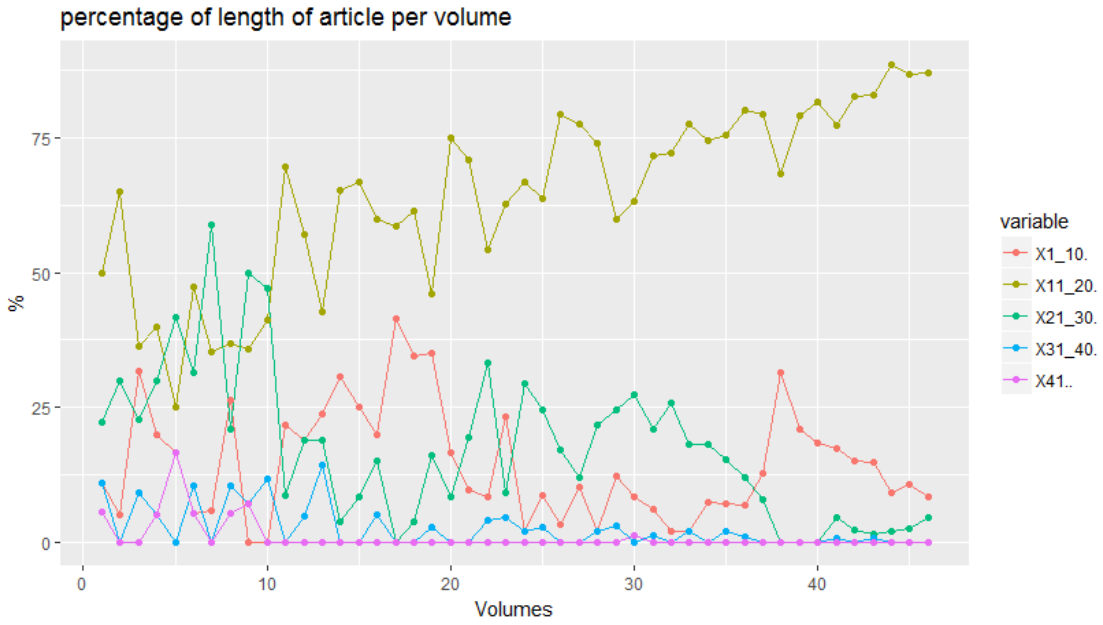

Figure 3.4.1 8 Percentage of length of research articles by volume

The line graph shows how the percentages of range length of articles are distributed in each volume. As can be seen from the graph, there are different trends for each variable. Overall, the vast majority of papers have pages between 11 and 20, followed by the category which the number of pages is between 1 and 10. Papers which the number of pages is more than 21 have low percentage.

Volumes	Total number of papers	1_10	%	11_20	%	21_30	%	31_40	%	41+	%
1-5	92	16	17.39	41	44.57	26	28.26	5	5.43	4	4.35
6-10	86	7	8.14	34	39.53	35	40.7	7	8.14	3	3.49
11-15	115	28	24.35	70	60.87	13	11.3	4	3.48	0	0
16-20	148	44	29.73	89	60.14	13	8.78	2	1.35	0	0
21-25	218	22	10.09	140	64.22	50	22.94	6	2.75	0	0
26-30	311	24	7.72	217	69.77	66	21.22	3	0.96	1	0.32
31-35	467	23	4.93	347	74.3	92	19.7	5	1.07	0	0
36-40	583	109	18.7	451	77.36	22	3.77	1	0.17	0	0
41-45	689	92	13.35	577	83.74	18	2.61	2	0.29	0	0
46	132	11	8.33	115	87.12	6	4.55	0	0	0	0

Table 3.4.1 5 Length of pages by 5-volumes

In the above Table we can see the length of research articles published in journal during nine five-volumes periods and one one-volume period.

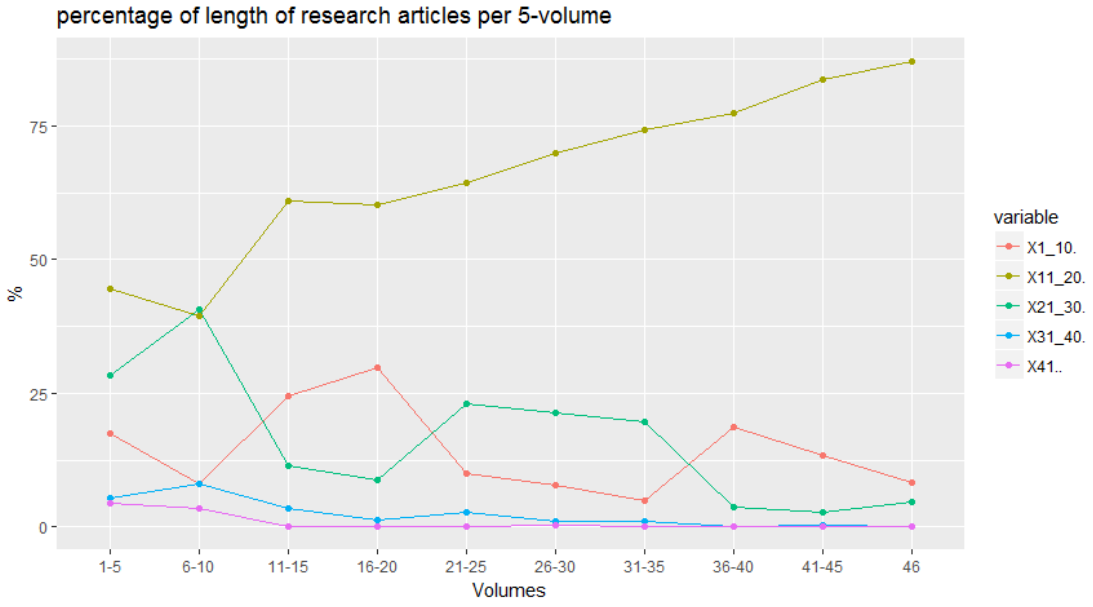

Figure 3.4.1 9 Percentage of length of research articles by 5-volumes

Figure shows the percentage of length of pages of research articles during 5-volumes. It is observed that the length of research articles ranges between 11-20 pages. Research articles which their length is more than 31 pages are introduced low percentages.

4. Authorship characteristics

This chapter aims to analyze authorship characteristics in Journal Research Policy. Studying authorship pattern of a journal give us information about how the authors are used to contribute. In addition ,author's productivity in order to find out who is the most productive author in journal is examined. For this purpose, we used to methods so as to count authors. Finally, the geographical distribution both of authors and research articles is analyzed.

4.1 Authorship pattern

Number of authors	Frequency	%
1	944	33.23
2	1082	38.09
3	582	20.49
4	160	5.63
5	54	1.90
6	8	0.28
7	4	0.14
8	2	0.07
9	2	0.07
16	1	0.04
20	1	0.04
26	1	0.04
Total	2841	100.00

Table 4.1 1 Authorship pattern

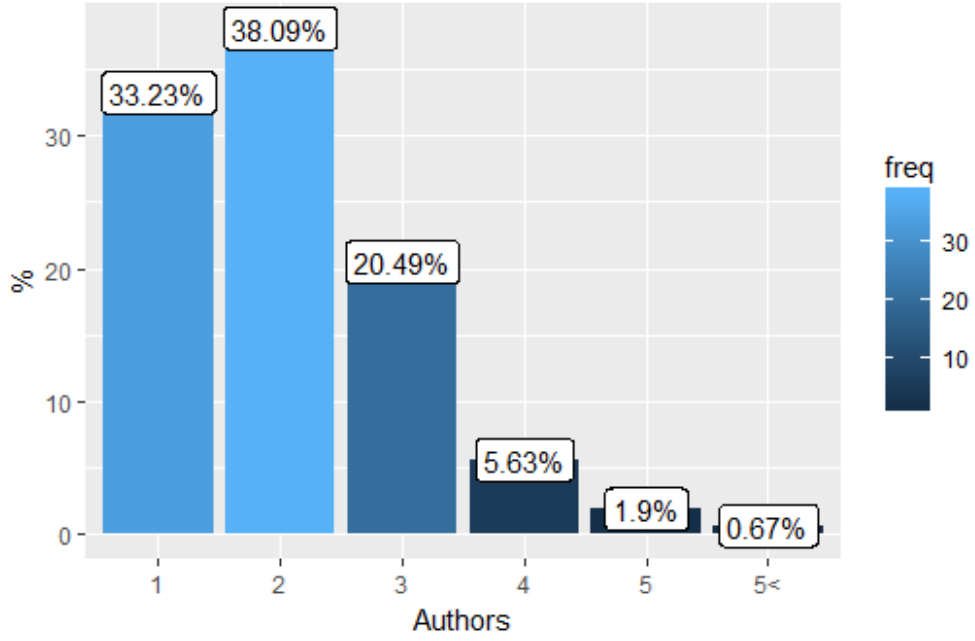

Figure 4.1 1 Barplot of Authorship pattern

The above graph shows the authorship patterns number of articles in Journal. It seems that two authored papers are first with 1082 articles (38.09%) followed by single authored 944 (33.23%). 582 articles (20.49%) have written by three authors. Four authored contributions are in 4th position with 160 papers (5.63%) followed by five authored 54(1.90%).The smallest percentage notice in articles which have written by more than five (0.63%). It is worth mentioning that the majority of publications are contributed by multiple authors which means that there is a trend in collaboration among them.

Vol.	Total number of papers	1	%	2	%	3	%	4	%	5	%	5<	%
1	18	15	83.33	3	16.67	0	0	0	0	0	0	0	0
2	20	15	75	4	20	1	5	0	0	0	0	0	0
3	22	18	81.82	2	9.09	1	4.55	0	0	0	0	1	4.55
4	20	15	75	3	15	2	10	0	0	0	0	0	0
5	12	7	58.33	5	41.67	0	0	0	0	0	0	0	0
6	19	10	52.63	7	36.84	1	5.26	0	0	0	0	1	5.26
7	17	8	47.06	7	41.18	1	5.88	0	0	1	5.88	0	0
8	19	10	52.63	8	42.11	1	5.26	0	0	0	0	0	0
9	14	12	85.71	2	14.29	0	0	0	0	0	0	0	0
10	17	12	70.59	4	23.53	0	0	0	0	1	5.88	0	0
11	23	14	60.87	5	21.74	3	13.04	1	4.35	0	0	0	0
12	21	14	66.67	3	14.29	4	19.05	0	0	0	0	0	0
13	21	13	61.9	8	38.1	0	0	0	0	0	0	0	0
14	26	15	57.69	9	34.62	1	3.85	1	3.85	0	0	0	0
15	24	18	75	5	20.83	1	4.17	0	0	0	0	0	0
16	20	8	40	6	30	4	20	1	5	1	5	0	0
17	29	14	48.28	9	31.03	4	13.79	2	6.9	0	0	0	0
18	26	18	69.23	6	23.08	2	7.69	0	0	0	0	0	0
19	37	22	59.46	8	21.62	6	16.22	0	0	1	2.7	0	0
20	36	23	63.89	5	13.89	5	13.89	2	5.56	1	2.78	0	0
21	31	15	48.39	11	35.48	4	12.9	0	0	1	3.23	0	0
22	24	10	41.67	12	50	1	4.17	1	4.17	0	0	0	0
23	43	18	41.86	19	44.19	3	6.98	2	4.65	1	2.33	0	0
24	51	20	39.22	21	41.18	8	15.69	2	3.92	0	0	0	0
25	69	26	37.68	25	36.23	16	23.19	2	2.9	0	0	0	0
26	58	25	43.1	22	37.93	10	17.24	1	1.72	0	0	0	0
27	58	31	53.45	20	34.48	5	8.62	2	3.45	0	0	0	0
28	46	16	34.78	26	56.52	2	4.35	2	4.35	0	0	0	0
29	65	33	50.77	24	36.92	5	7.69	3	4.62	0	0	0	0
30	84	36	42.86	30	35.71	10	11.9	4	4.76	4	4.76	0	0
31	81	30	37.04	34	41.98	12	14.81	4	4.94	1	1.23	0	0

32	101	41	40.59	43	42.57	15	14.85	0	0	1	0.99	1	0.99
33	93	31	33.33	35	37.63	20	21.51	3	3.23	3	3.23	1	1.08
34	94	25	26.6	48	51.06	15	15.96	6	6.38	0	0	0	0
35	98	32	32.65	36	36.73	22	22.45	5	5.1	2	2.04	1	1.02
36	100	23	23	43	43	24	24	3	3	5	5	2	2
37	126	31	24.6	64	50.79	21	16.67	6	4.76	3	2.38	1	0.79
38	133	41	30.83	45	33.83	39	29.32	7	5.26	0	0	1	0.75
39	110	22	20	58	52.73	23	20.91	6	5.45	1	0.91	0	0
40	114	17	14.91	45	39.47	33	28.95	14	12.28	3	2.63	2	1.75
41	132	31	23.48	47	35.61	43	32.58	9	6.82	2	1.52	0	0
42	133	30	22.56	51	38.35	37	27.82	11	8.27	3	2.26	1	0.75
43	134	16	11.94	59	44.03	43	32.09	9	6.72	5	3.73	2	1.49
44	140	14	10	57	40.71	46	32.86	13	9.29	8	5.71	2	1.43
45	150	26	17.33	55	36.67	43	28.67	23	15.33	1	0.67	2	1.33
46	132	23	17.42	43	32.58	45	34.09	15	11.36	5	3.79	1	0.76

Table 4.1 2 Distribution of authorship pattern by volume

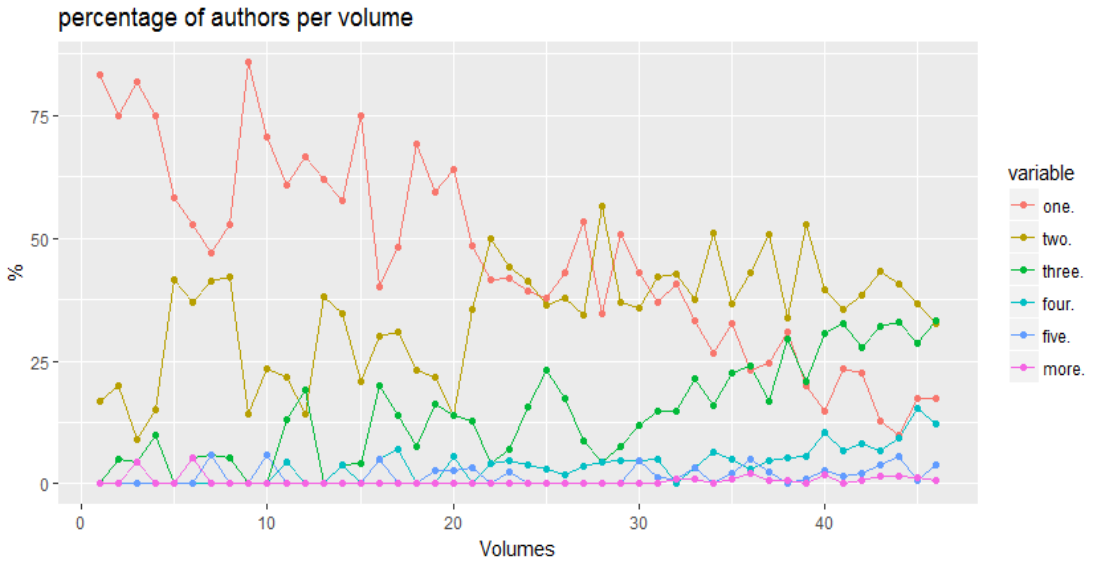

Figure 4.1 2 Percentage of authorship pattern by volume

Figure 4.1.2 shows the authorship pattern distribution of research articles authors during volumes. As it seems by the 21th volume the vast majority of research articles is single-authored. Following it notice that single-authored publications decline with some fluctuations overtime whereas two-authored publications increase and overcome single-authored publications. It notice that in last volumes two and three-authored publications are increased which means that there is collaborative trend in this subject. On the other hand, four, five and more than five-authored publications have low percentages overtime.

Vol	Total number of papers	1	%	2	%	3	%	4	%	5	%	5<	%
1-5	92	70	76.09	17	18.48	4	4.35	0	0	0	0	1	1.09
6-10	86	52	60.47	28	32.56	3	3.49	0	0	2	2.33	1	1.16
11-15	115	74	64.35	30	26.09	9	7.83	2	1.74	0	0	0	0
16-20	148	85	57.43	34	22.97	21	14.19	5	3.38	3	2.03	0	0
21-25	218	89	40.83	88	40.37	32	14.68	7	3.21	2	0.92	0	0
26-30	311	141	45.34	122	39.23	32	10.29	12	3.86	4	1.29	0	0
31-35	467	159	34.05	196	41.97	84	17.99	18	3.85	7	1.5	3	0.64
36-40	583	134	22.98	255	43.74	140	24.01	36	6.17	12	2.06	6	1.03
41-45	689	117	16.98	269	39.04	212	30.77	65	9.43	19	2.76	7	1.02
46	132	23	17.42	43	32.58	45	34.09	15	11.36	5	3.79	1	0.76

Table 4.1 3 Distribution of authorship pattern by 5-volumes

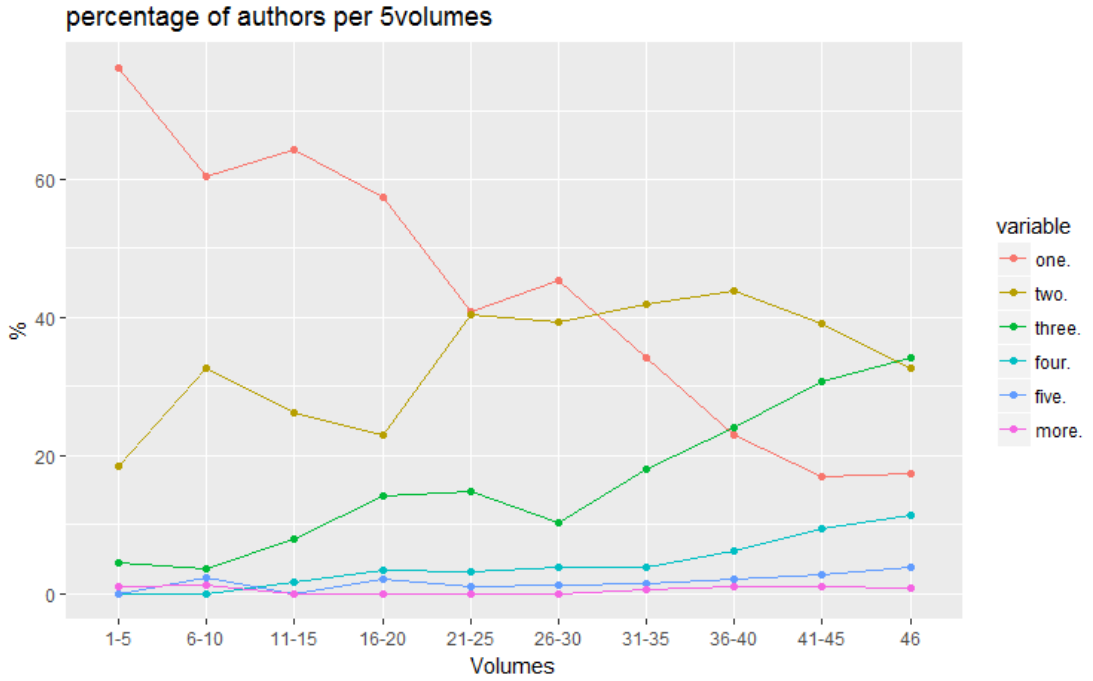

Figure 4.1 3 Percentage of authorship pattern by 5-volumes

The above figure indicates authorship pattern distribution during 5-volumes. It is clear that single-authored publications have been reducing gradually while two and three-authored publications have an upward trend having some fluctuations during periods. research articles with more than four authors have low percentage overtime. As a result, in recent years have been increased the collaboration among authors

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
one	2	12	15	15.71	18	64
two	3	12	15	15.49	18	87
three	4	12	14	14.98	17	38
four	3	11.25	14	14.60	16	34
five	7	12	15	15.56	18.75	26
more than five	9	12.5	18	17.68	19.50	34

Table 4.1 4 Five number summary of pages by authorship pattern

Table 4.1.4 indicates the five number summary for each quartile in order to see how distributed the number of pages of research articles by authorship pattern.

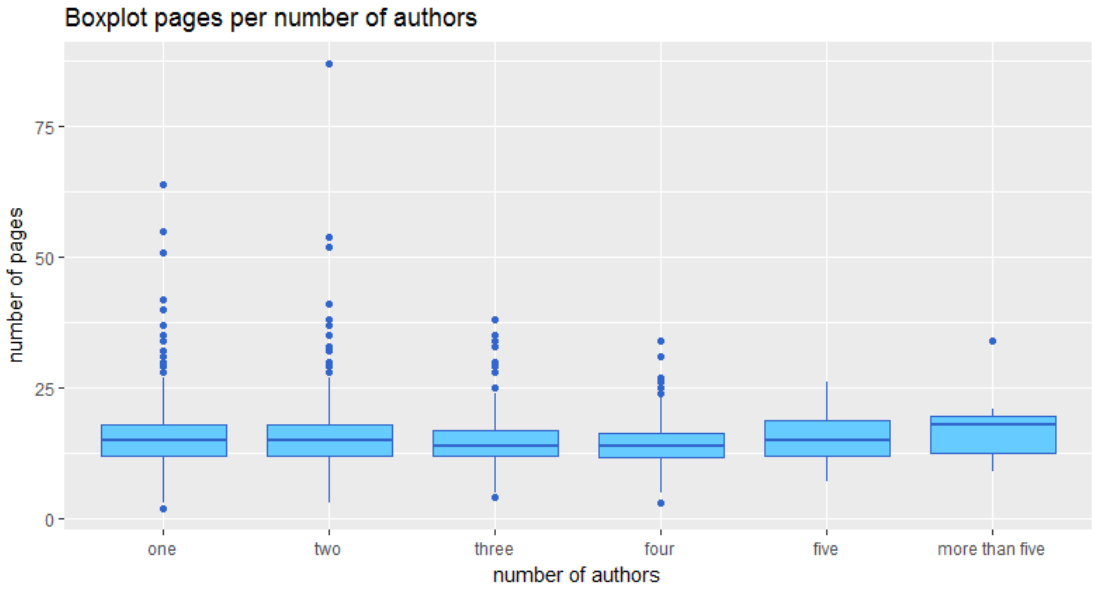

Figure 4.1 4 Boxplots of pages of authorship pattern

In the Figure above is indicated the five number summary of each quartile. As it seems more than five quartile has the biggest interquartile range(Q3-Q1) which means that varied the set of observed values. Looking at mean and median value it is noticed that only more than five quartile is left-skewed because median>mean while others have right-skewed.

Vol	Total number of papers	Total number of authors	Number of single-authored publications	%	Number of multiple-authored publications	%	Number of authors in multi-authored publications	Mean of authors	Median of authors	Standard deviation of authors
1	18	21	15	83.33	3	16.67	6	1.17	1	0.38
2	20	26	15	75.00	5	25.00	11	1.3	1	0.57
3	22	31	18	81.82	4	18.18	13	1.41	1	1.14
4	20	27	15	75.00	5	25.00	12	1.35	1	0.67
5	12	17	7	58.33	5	41.67	10	1.42	1	0.51
6	19	34	10	52.63	9	47.37	24	1.79	1	1.4
7	17	30	8	47.06	9	52.94	22	1.76	2	1.03
8	19	29	10	52.63	9	47.37	19	1.53	1	0.61
9	14	16	12	85.71	2	14.29	4	1.14	1	0.36
10	17	25	12	70.59	5	29.41	13	1.47	1	1.00
11	23	37	14	60.87	9	39.13	23	1.61	1	0.89
12	21	32	14	66.67	7	33.33	18	1.52	1	0.81
13	21	29	13	61.90	8	38.10	16	1.38	1	0.5
14	26	40	15	57.69	11	42.31	25	1.54	1	0.76
15	24	31	18	75.00	6	25.00	13	1.29	1	0.55
16	20	41	8	40.00	12	60.00	33	2.05	2	1.15
17	29	52	14	48.28	15	51.72	38	1.79	2	0.94
18	26	36	18	69.23	8	30.77	18	1.38	1	0.64
19	37	61	22	59.46	15	40.54	39	1.65	1	0.95
20	36	61	23	63.89	13	36.11	38	1.69	1	1.09
21	31	54	15	48.39	16	51.61	39	1.74	2	0.93
22	24	41	10	41.67	14	58.33	31	1.71	2	0.75
23	43	78	18	41.86	25	58.14	60	1.81	2	0.93
24	51	94	20	39.22	31	60.78	74	1.84	2	0.83
25	69	132	26	37.68	43	62.32	106	1.91	2	0.85
26	58	103	25	43.10	33	56.90	78	1.78	2	0.8
27	58	94	31	53.45	27	46.55	63	1.62	1	0.79
28	46	82	16	34.78	30	65.22	66	1.78	2	0.73
29	65	108	33	50.77	32	49.23	75	1.66	1	0.82
30	84	162	36	42.86	48	57.14	126	1.93	2	1.08
31	81	155	30	37.04	51	62.96	125	1.91	2	0.91
32	101	184	41	40.59	60	59.41	143	1.82	2	0.93
33	93	194	31	33.33	62	66.67	163	2.09	2	1.07
34	94	190	25	26.60	69	73.40	165	2.02	2	0.83
35	98	209	32	32.65	66	67.35	177	2.13	2	1.20
36	100	243	23	23.00	77	77.00	220	2.45	2	2.07

37	126	267	31	24.60	95	75.40	236	2.12	2	0.98
38	133	282	41	30.83	92	69.17	241	2.13	2	0.97
39	110	236	22	20.00	88	80.00	214	2.15	2	0.83
40	114	309	17	14.91	97	85.09	292	2.72	2	2.43
41	132	300	31	23.48	101	76.52	269	2.27	2	0.95
42	133	318	30	22.56	103	77.44	288	2.40	2	1.54
43	134	341	16	11.94	118	88.06	325	2.54	2	1.18
44	140	372	14	10.00	126	90.00	358	2.66	2	1.12
45	150	376	26	17.33	124	82.67	350	2.51	2	1.11
46	132	335	23	17.42	109	82.58	312	2.54	2.5	1.07

Table 4.1 5 Mean, Median and Standard deviation of number of authors by volume

In Table 4.1.5 the number of single and multiple authored publications by volumes were calculated. In addition we calculated the mean, median and standard deviation of number of authors of research articles in each volume. As we seen mean values range between 1.14 and 2.72 while the median ranges between 1 and 2.5 and the standard deviation varied from 0.36 to 2.43.

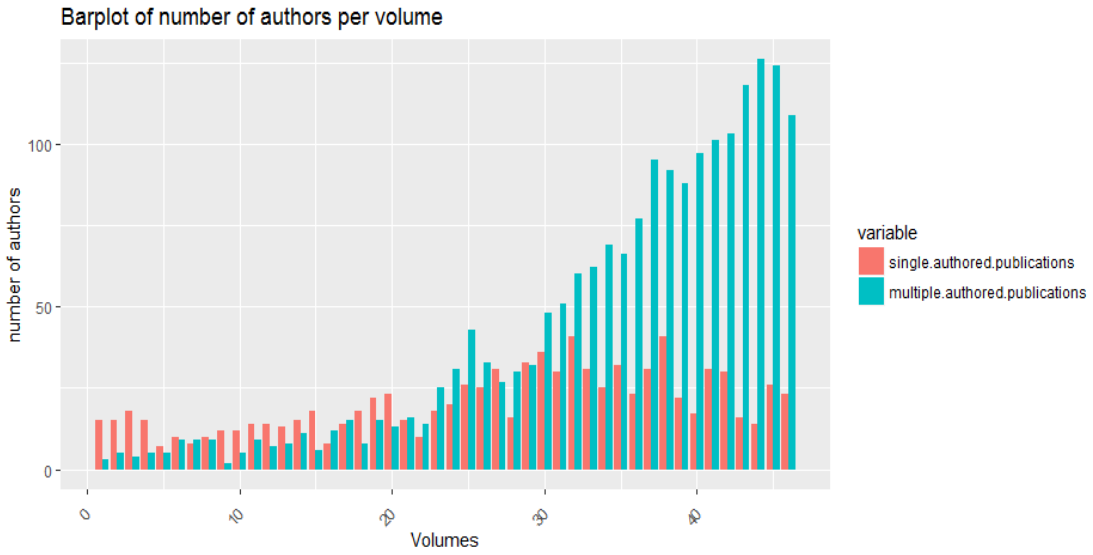

Figure 4.1 5 Barplot of single and multiple authored publications by volume

Figure 4.1.5 indicates the number of research articles according to the number of authors of research articles during volumes. Single-authored publications have low number of research articles while it notice rapidly increase in multiple-authored publications over volumes.

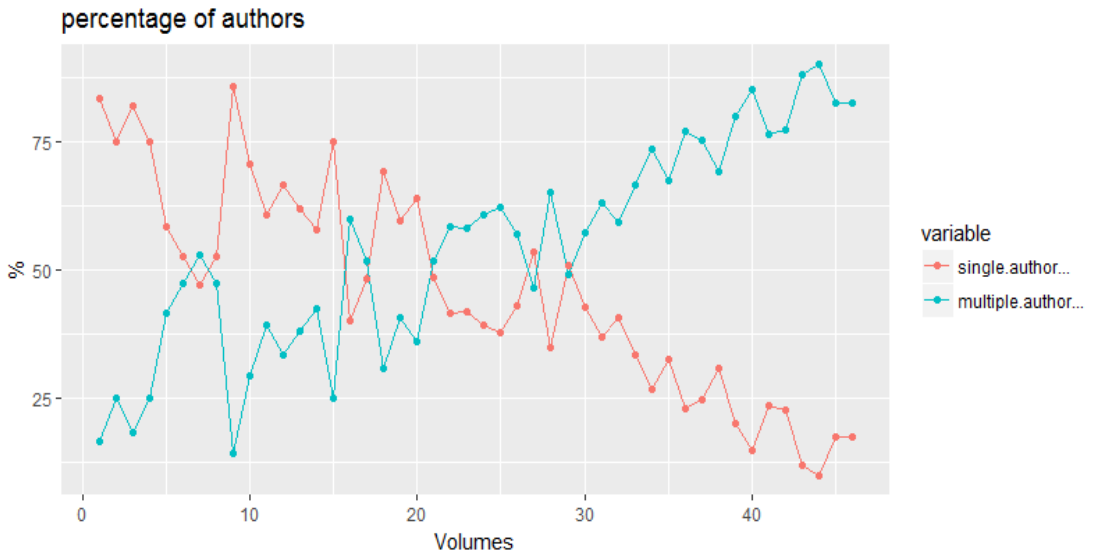

Figure 4.1 6 Percentage of single and multiple authored publications by volume

Figure indicates the percentage of research articles according to the number of authors of research articles during volumes It seems from the above figure that single-authored publications have an downward trend from 83.33 to 17.42 overtime whereas multiple-authored publications are increased from 16.67 to 82.58.

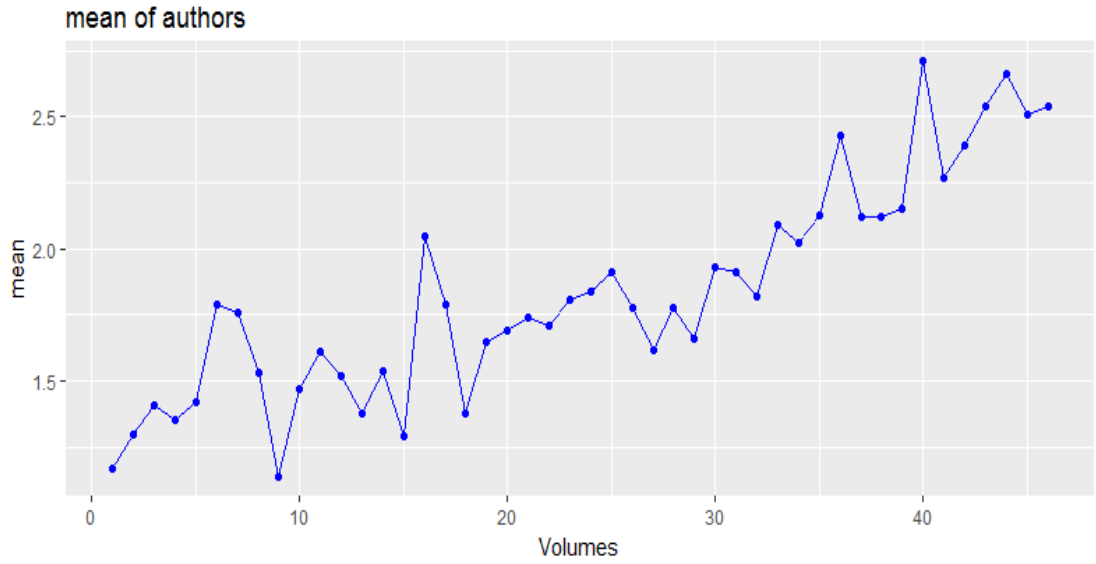

Figure 4.1 7 Mean of authors by volume

The above graph provides information about the mean of number of authors in each volume. As we seen the mean values range between 1.14 and 2.71. It was expected the rise because the number of authors have been increased gradually.

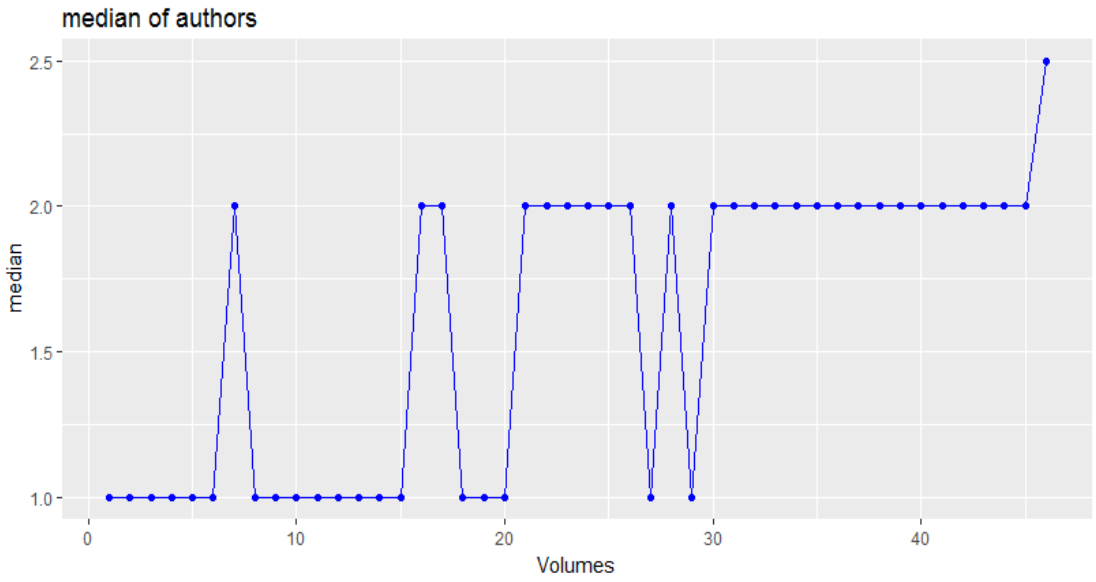

Figure 4.1 8 Median of authors by volume

The above Figure shows how the median of number of authors is increased from 1 to 2.5.

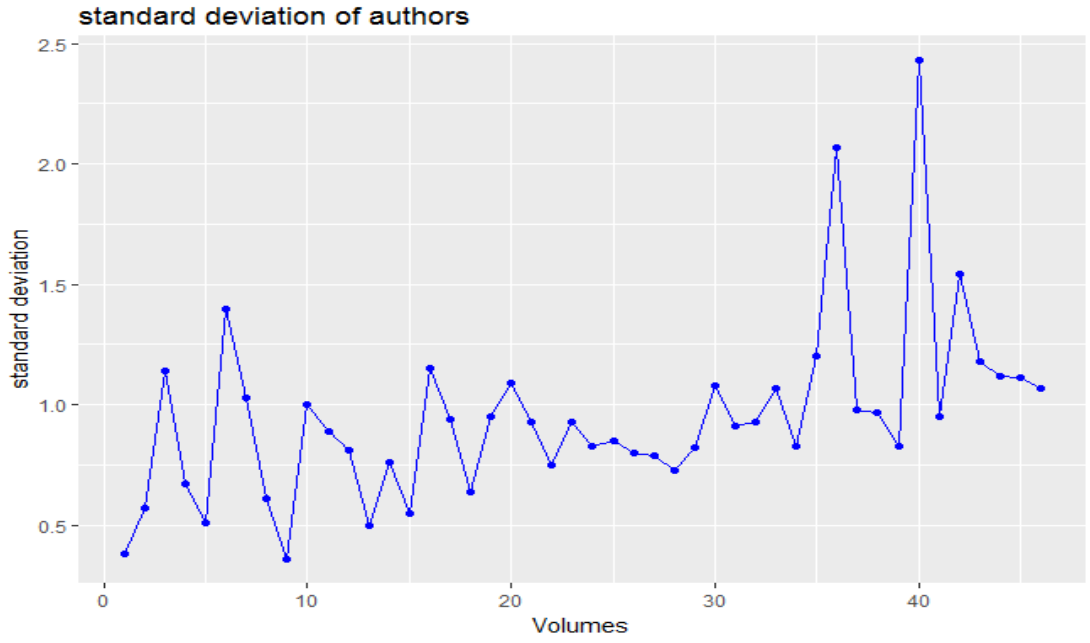

Figure 4.1 9 Standard deviation of authors by volume

In this Figure is shown how the standard deviation of number of authors is increased from 0.38 to 1.07.

Vol	Total number of papers	Total number of authors	Number of single-authored publications	%	Number of multiple-authored publications	%	Number of authors in multi-authored publications	Mean of authors	Median of authors	Standard deviation of authors
1-5	92	122	70	76.09	22	23.91	52	1.33	1	0.73
6-10	86	134	52	60.47	34	39.53	82	1.56	1	0.98
11-15	115	169	74	64.35	41	35.65	95	1.47	1	0.72
16-20	148	251	85	57.43	63	42.57	166	1.70	1	0.97
21-25	218	399	89	40.83	129	59.17	310	1.83	2	0.86
26-30	311	549	141	45.34	170	54.66	408	1.77	2	0.88
31-35	467	932	159	34.05	308	65.95	773	2.00	2	1.00
36-40	583	1337	134	22.98	449	77.02	1203	2.30	2	1.57
41-45	689	1707	117	16.98	572	83.02	1590	2.48	2	1.20
46	132	335	23	17.42	109	82.58	312	2.54	2.5	1.07

Table 4.1 6 Mean, Median and Standard deviation of number of authors by 5-volumes

In the above table were calculated number of single and multiple authored publications, mean ,median and standard deviation of number of authors by 5-volume. As it seems, mean values range between 1.33 and 2.54 while the median ranges between 1 and 2.5 and the standard deviation varied from 0.73 to 1.57

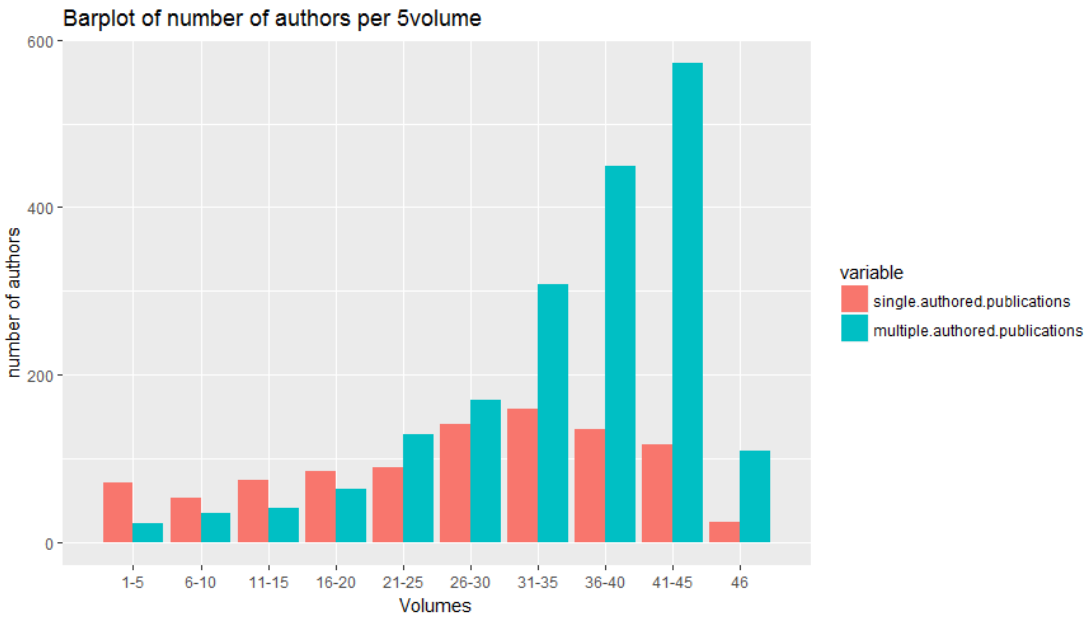

Figure 4.1 10 Barplot of single and multiple authored publications by 5-volumes

Figure 4.1.10 shows the number of research articles according to the number of authors of research articles in the ten periods(nine 5-volumes and one volume). It is clear that the number of single-authored publications is bigger than multiple by the fourth period(16-20volumes).Following the number of multiple-authored publications is increased to a great extent.

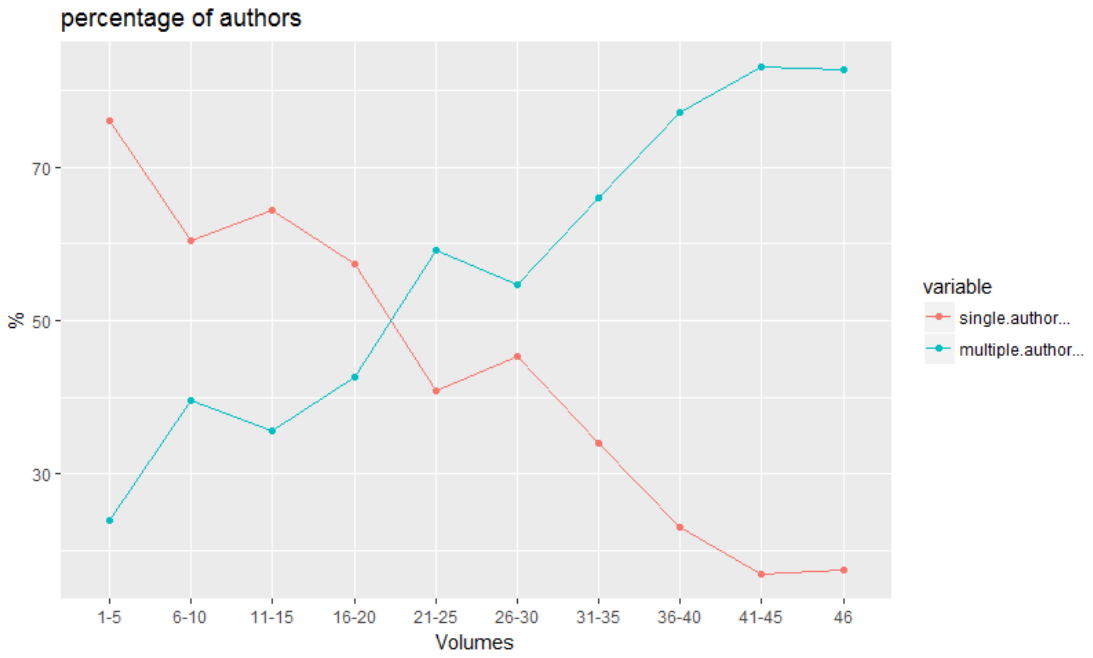

Figure 4.1 11 Percentage of single and multiple authored publications by 5-volumes

Figure indicates the percentage of research articles according to the number of authors of research articles during 10 periods. As it seems from the above Figure single-authored publications have an downward trend from 76.09 to 17.42 overtime whereas multiple-authored publications are increased from 23.91 to 82.58.

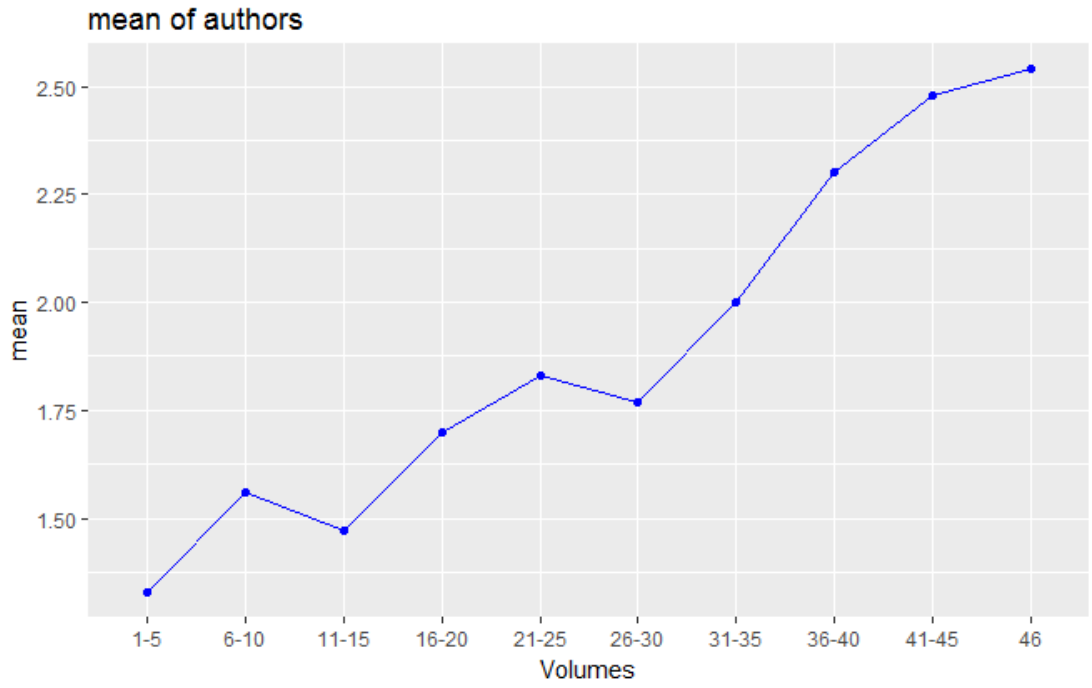

Figure 4.1 12 Mean of authors by 5-volumes

The above graph indicates the mean of number of authors by 5-volume. As it notices the mean value have an upward trend from 1.33 to 2.54.

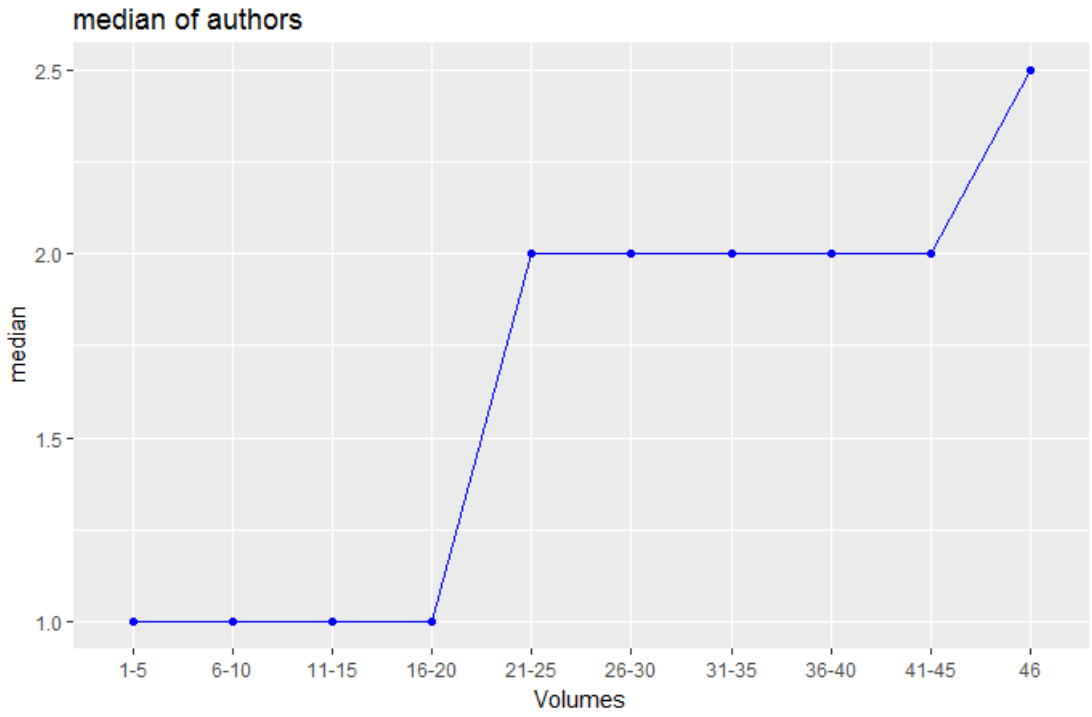

Figure 4.1 13 Median of authors by 5-volumes

Figure 4.1.13 shows how the median of number of authors rise from 1 to 2.5.

Figure 4.1 14 Standard deviation of authors by 5-volumes

In Figure 4.1.14 is shown the standard deviation of authors

4.2 Publish or perish phenomenon?

"Publish or perish" is a phrase coined to describe the pressure in academia to rapidly and continually publish academic work to sustain or further one's career. As we seen below when the number of authors rise then the number of pages is decreased. One hypothesis have been proposed to explain this pattern is that researchers prefer to publish cutting-edge research in order to be sustainable.

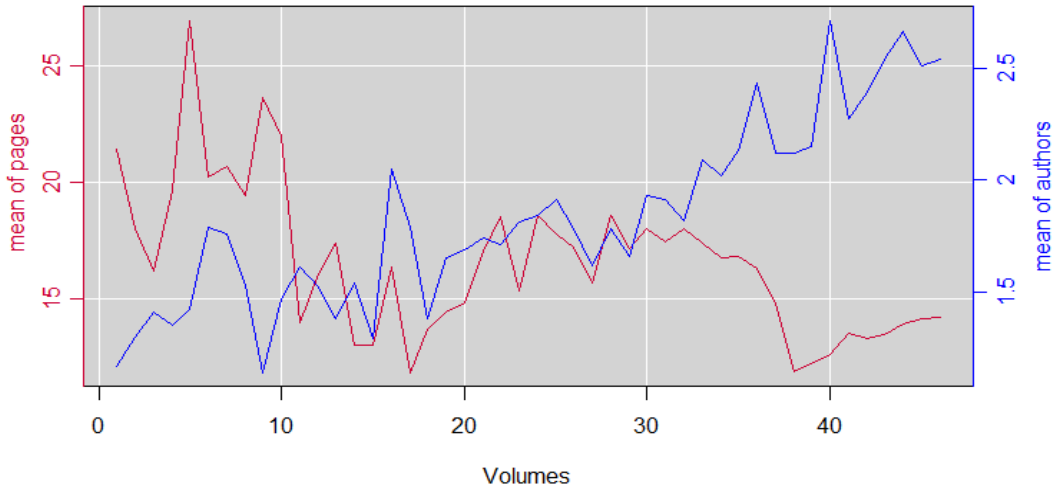

Figure 4.2 1 Mean of pages and mean of authors by volume

The above graph shows how mean both of authors and number of pages is distributed by volume. The red line shows trends in the mean page length of each article while the blue one the mean of number of authors. We observe that mean of authors have an upward trend and mean of pages a downward trend. The mean of pages have reduced from 21.39 to 14.21 whereas the mean of authors have increased from 1.17 to 2.55.

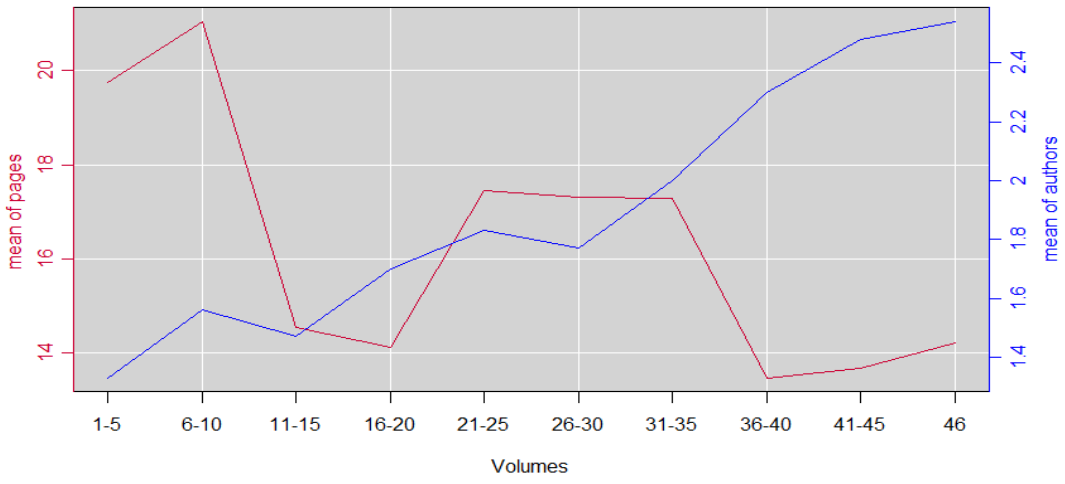

Figure 4.2 2 Mean of pages and mean of authors by 5-volumes

4.3 Authors productivity and Lotka's law

This section aims to analyze the most productive authors in Journal during the period of study. For this purpose was developed one of the significant laws in bibliometrics studies known as Lotka's law. According to Lotka A.J(1926), in a given area of science, there are lot of authors who publish only one study while a small group of prolific contribute with a large number of publications.

4.3.1 Lotka's law

Lotka's law is defined as the total number of authors y in a given subject, each producing x publications, is inversely proportional to some exponential function n of x. Hence, describes the frequency of publications by authors in a given subject field. It is expressed as:

$$x^n * y = C$$

where

$$x = number\ of\ publications$$
$$y = number\ of\ authors\ credited\ with\ x\ publications$$
$$n = constant, equals\ 2\ for\ scientific\ subjects$$
$$C = constant$$

Number of papers which have written by authors	Number of authors	%
1	2764	73.94
2	539	14.42
3	186	4.98
4	102	2.73
5	46	1.23
6	23	0.62
7	20	0.54
8	15	0.40
9	12	0.32
10	6	0.16
11	10	0.27
12	1	0.03
13	4	0.11
14	1	0.03
15	3	0.08
16	3	0.08
17	1	0.03
18	1	0.03
20	1	0.03

Table 4.3.1 1 Authors productivity

The above table shows the number of papers which have been contributed by authors. Out of 3738 unique authors ,2764(73.94%) authors have written only one research article. It is evident that is verified Lotka's law.

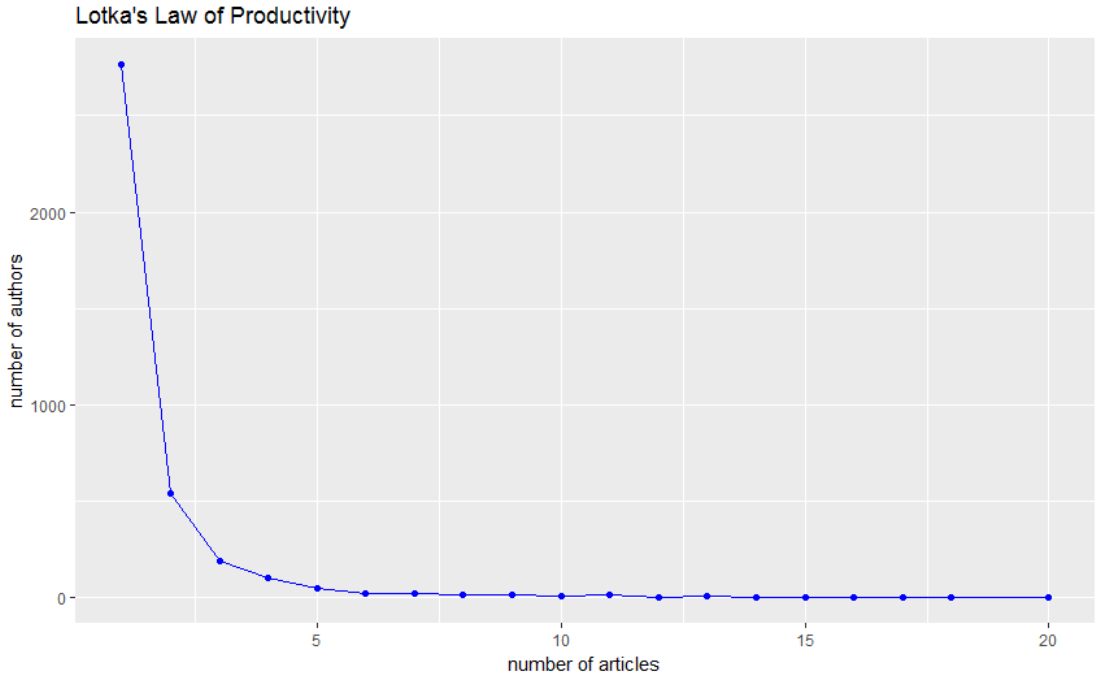

Figure 4.3.1 1 Lotka's law distribution

From the above graph it seems clearly that our data follows Lotka's law distribution.

4.3.2 Authors productivity

According to Egghe L. ,Rousseau R and Van Hooydonk G.(2000) there are seven methods in order to count authors productivity. For this study we based on two count methods ,normal and fractional so as to evaluate authors productivity. Normal counting means that the authors in multiple-authored publications have weight of one for each co-author., all of which increase the number of publications. On the other hand ,the fractional counting method taking into account the total number of co-authors in each article which means that 1/N fractional count account for N authors. In this case each publication has equal weight to one.

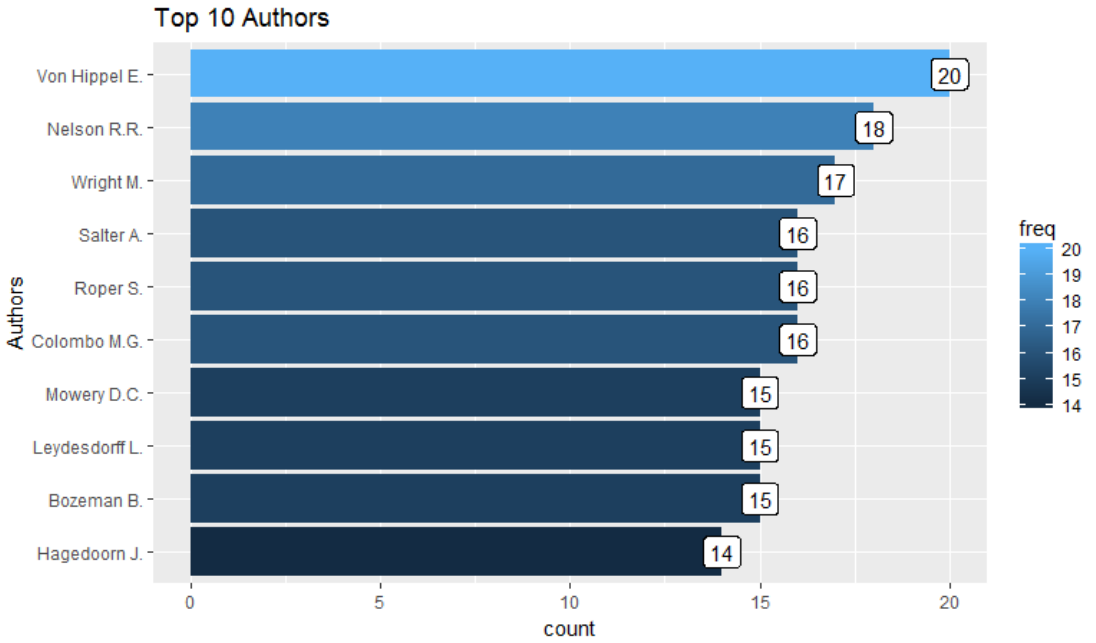

Figure 4.3.2 1 Top 10 authors with normal count

Figure 4.3.2.1 illustrates the top ten productive authors of journal. Von Hippel E. holds the first position with 20 research articles followed by Nelson R.R with 18.

In Table 4.3.2.1 below we see the fractional counts of authors. According to the fractional counts the highest productivity is 11.28(0.03%) whereas the lowest productivity is 0.04(0.43%).

Fractional count	Number of authors	%	Fractional count	Number of authors	%
11.28	1	0.03	**3.75**	1	0.03
10.87	1	0.03	**3.75**	3	0.08
9.42	1	0.03	**3.72**	1	0.03
8.33	1	0.03	**3.67**	3	0.08
7.70	1	0.03	**3.67**	1	0.03
7.50	1	0.03	**3.65**	1	0.03
7.38	1	0.03	**3.58**	2	0.05
7.33	1	0.03	**3.58**	1	0.03
7.17	1	0.03	**3.56**	1	0.03
6.92	1	0.03	**3.50**	2	0.05
6.50	1	0.03	**3.42**	4	0.11
6.39	1	0.03	**3.40**	1	0.03
6.03	1	0.03	**3.40**	1	0.03
6.00	2	0.05	**3.37**	1	0.03
5.98	1	0.03	**3.33**	5	0.13
5.95	1	0.03	**3.33**	1	0.03

5.92	1	0.03	**3.28**	1	0.03
5.83	1	0.03	**3.20**	1	0.03
5.83	1	0.03	**3.20**	1	0.03
5.33	1	0.03	**3.17**	1	0.03
5.17	1	0.03	**3.13**	1	0.03
5.03	1	0.03	**3.12**	1	0.03
5.00	1	0.03	**3.08**	2	0.05
4.83	2	0.05	**3.05**	1	0.03
4.81	1	0.03	**3.00**	14	0.37
4.75	2	0.05	**2.95**	1	0.03
4.75	2	0.05	**2.92**	2	0.05
4.73	1	0.03	**2.92**	1	0.03
4.71	1	0.03	**2.87**	1	0.03
4.70	1	0.03	**2.86**	1	0.03
4.67	1	0.03	**2.83**	4	0.11
4.58	1	0.03	**2.78**	1	0.03
4.50	1	0.03	**2.75**	2	0.05
4.42	1	0.03	**2.75**	2	0.05
4.33	2	0.05	**2.70**	1	0.03
4.25	1	0.03	**2.67**	1	0.03
4.20	1	0.03	**2.67**	1	0.03
4.17	1	0.03	**2.62**	1	0.03
4.00	3	0.08	**2.61**	1	0.03
3.93	1	0.03	**2.58**	3	0.08
3.83	3	0.08	**2.55**	1	0.03
3.78	1	0.03	**2.50**	23	0.62
3.76	1	0.03	**2.50**	3	0.08
2.48	1	0.03	**1.25**	1	0.03
2.37	1	0.03	**1.23**	1	0.03
2.33	15	0.40	**1.22**	1	0.03
2.33	1	0.03	**1.20**	5	0.13
2.28	1	0.03	**1.17**	2	0.05
2.25	4	0.11	**1.17**	22	0.59
2.25	1	0.03	**1.15**	1	0.03
2.20	2	0.05	**1.14**	1	0.03
2.17	5	0.13	**1.12**	1	0.03
2.08	3	0.08	**1.11**	1	0.03
2.00	62	1.66	**1.08**	11	0.29
2.00	6	0.16	**1.06**	1	0.03
1.95	1	0.03	**1.05**	1	0.03
1.92	2	0.05	**1.04**	1	0.03
1.90	1	0.03	**1.03**	2	0.05
1.87	2	0.05	**1.00**	483	12.92
1.83	19	0.51	**1.00**	9	0.24
1.83	1	0.03	**0.95**	5	0.13
1.82	1	0.03	**0.92**	6	0.16

1.78	1	0.03	**0.88**	1	0.03
1.75	9	0.24	**0.87**	3	0.08
1.75	2	0.05	**0.83**	111	2.97
1.73	1	0.03	**0.83**	1	0.03
1.72	1	0.03	**0.78**	2	0.05
1.71	1	0.03	**0.75**	28	0.75
1.70	4	0.11	**0.73**	1	0.03
1.67	14	0.37	**0.70**	7	0.19
1.65	1	0.03	**0.67**	56	1.50
1.62	1	0.03	**0.65**	1	0.03
1.58	8	0.21	**0.63**	1	0.03
1.58	1	0.03	**0.62**	1	0.03
1.53	1	0.03	**0.61**	2	0.05
1.52	1	0.03	**0.58**	45	1.20
1.50	95	2.54	**0.56**	1	0.03
1.50	3	0.08	**0.55**	2	0.05
1.45	1	0.03	**0.54**	1	0.03
1.42	4	0.11	**0.53**	10	0.27
1.40	1	0.03	**0.50**	964	25.79
1.37	2	0.05	**0.48**	2	0.05
1.34	1	0.03	**0.45**	11	0.29
1.34	1	0.03	**0.42**	1	0.03
1.33	57	1.52	**0.40**	4	0.11
1.33	2	0.05	**0.40**	1	0.03
1.28	2	0.05	**0.38**	1	0.03
1.28	1	0.03	**0.38**	1	0.03
1.25	8	0.21	**0.37**	1	0.03
0.34	1	0.03	**0.14**	21	0.56
0.33	845	22.61	**0.13**	13	0.35
0.30	1	0.03	**0.11**	9	0.24
0.25	320	8.56	**0.06**	1	0.03
0.20	154	4.12	**0.05**	4	0.11
0.17	31	0.83	**0.04**	16	0.43

Table 4.3.2 1 Fractional count of authors

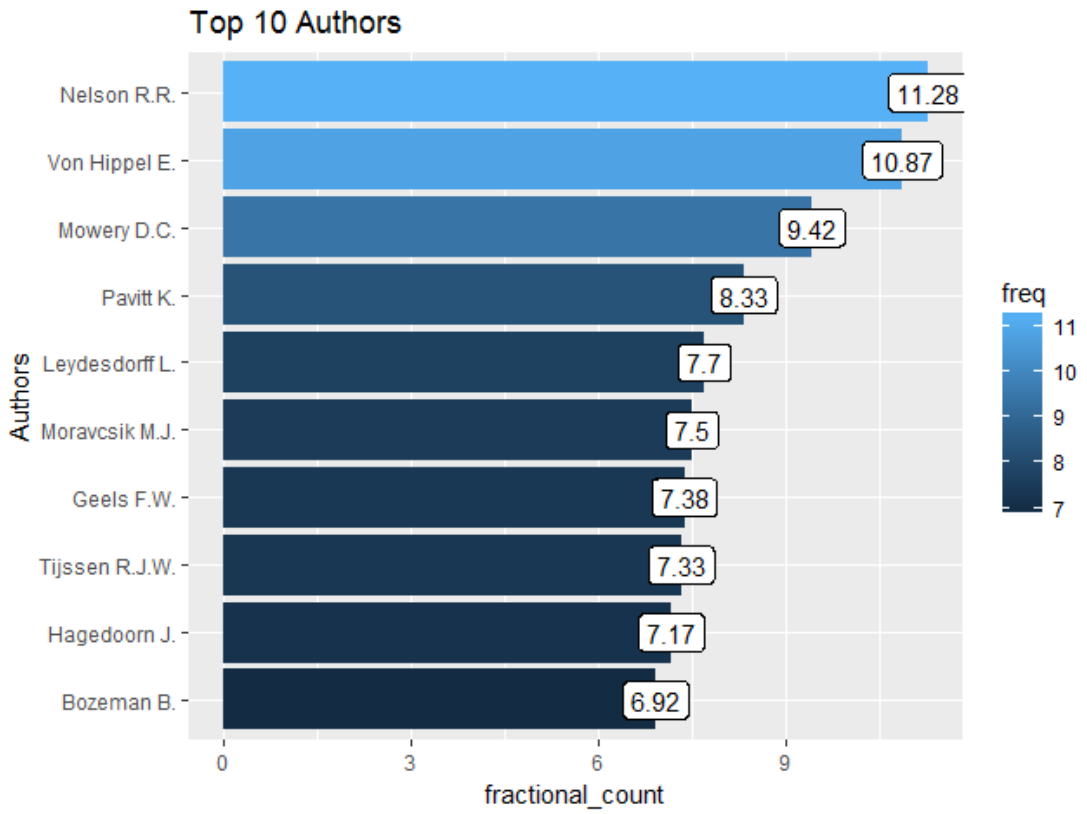

Figure 4.3.2 2 Top 10 authors with fractional count

The graph illustrated the top 10 authors according to their fractional counts. Author Nelson R.R. has the first position with 11.28 in journal while Von Hippel E. has the second position with 10.87.

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Table 4.3.2.2 below show the authors who have published more than one research articles during 1-46 volumes, the first and last volume in which they have published and the time period in volumes between their publications.

Authors	**Time period between papers**	**First volume**	**Last volume**	**Number of research articles**
Abernathy W.J.	3	11	14	3
Achilladelis B.	14	16	30	5
Acosta M.	9	32	41	4
Acs Z.J.	12	31	43	3
Afuah A.	9	24	33	3

Aggarwal A.	5	29	34	3
Agrawal A.	8	38	46	3
Aharonson B.S.	8	37	45	4
Albert M.B.	13	20	33	3
Aldrich H.E.	17	24	41	3
Aldridge T.T.	4	39	43	4
Alexy O.	1	42	43	4
Allen T.J.	27	7	34	4
Almeida P.	14	32	46	4
Amable B.	18	27	45	3
Amara N.	19	27	46	7
Amendola M.	4	19	23	3
Amesse F.	10	20	30	3
Andersson M.	4	41	45	3
Anon Higon D.	9	36	45	4
Ansari S.	3	38	41	3
Antonelli C.	3	15	18	3
Aram J.D.	4	21	25	3
Arcangeli F.	7	20	27	3
Archibugi D.	26	20	46	12
Arora A.	22	23	45	7
Arque-Castells P.	4	41	45	3
Artes J.	8	38	46	3
Arundel A.	19	27	46	5
Arvanitis S.	4	37	41	3
Asakawa K.	10	30	40	4

Aschhoff B.	5	38	43	3
Astebro T.	7	34	41	4
Athreye S.	9	36	45	3
Audretsch D.B.	15	31	46	12
Autant-Bernard C.	12	30	42	3
Autio E.	19	26	45	10
Averch H.A.	2	18	20	3
Azagra-Caro J.M.	11	35	46	3
Azoulay P.	11	35	46	4
Baba Y.	20	24	44	7
Baden-Fuller C.	9	36	45	5
Balconi M.	8	31	39	5
Baldini N.	3	35	38	3
Baldwin C.	8	35	43	4
Baldwin J.R.	6	25	31	3
Balland P.-A.	3	43	46	3
Balsmeier B.	3	43	46	3
Baptista R.	13	27	40	3
Barbera-Tomas D.	6	40	46	3
Barge-Gil A.	7	38	45	5
Barlow J.	8	29	37	3
Barnard H.	4	37	41	3
Barras R.	4	15	19	3
Baruffaldi S.H.	5	41	46	4
Basberg B.L.	5	11	16	4
Battisti G.	11	27	38	5

Battke B.	0	45	45	3
Bayona-Saez C.	12	30	42	4
Bean A.S.	20	4	24	4
Beaudry C.	7	38	45	4
Becker M.C.	1	34	35	3
Beise M.	5	28	33	3
Bekkers R.	13	31	44	5
Belderbos R.	13	30	43	4
Bell M.	6	34	40	5
Belussi F.	12	27	39	3
Beneito P.	3	32	35	3
Benner M.	8	29	37	3
Bercovitz J.	4	36	40	3
Bergek A.	9	33	42	5
Berger F.	0	41	41	3
Berggren C.	11	33	44	4
Berry M.J.	5	21	26	3
Bertoni F.	4	40	44	3
Bessant J.	22	11	33	6
Bessen J.	1	37	38	3
Bidault F.	17	26	43	3
Bindon G.	1	7	8	3
Binz C.	3	43	46	3
Biscotti D.	3	37	40	3
Bizer K.	3	42	45	3
Black G.C.	2	34	36	3

Blind K.	18	28	46	12
Block J.H.	5	40	45	4
Blume S.S.	31	3	34	4
Blumenthal D.	13	16	29	3
Boardman P.C.	4	35	39	5
Bodas Freitas I.M.	9	37	46	8
Boeing P.	1	45	46	4
Bonaccorsi A.	15	29	44	8
Bonte W.	8	33	41	3
Boon W.P.C.	3	40	43	4
Boschma R.	16	28	44	5
Bosworth D.L.	5	8	13	3
Bourke P.	2	26	28	3
Boyack K.W.	6	37	43	3
Bozeman B.	33	13	46	16
Braun D.	5	27	32	3
Breitzman A.	20	24	44	3
Breschi S.	7	32	39	4
Breznitz D.	10	36	46	5
Brostrom A.	3	39	42	3
Brouwer E.	3	25	28	3
Brown M.A.	5	19	24	4
Bruneel J.	4	39	43	3
Brusoni S.	7	32	39	5
Bruun H.	6	33	39	3
Buckley P.J.	6	37	43	4

Buenstorf G.	7	38	45	5
Buesa M.	17	22	39	4
Busom I.	4	33	37	3
Butler L.	6	26	32	4
Cainarca G.C.	3	18	21	3
Cainelli G.	2	42	44	3
Callaert J.	11	33	44	5
Callon M.	15	9	24	4
Cantner U.	15	30	45	6
Cantwell J.	8	28	36	4
Carayol N.	1	32	33	3
Carlsson B.	27	10	37	6
Carrere M.	4	33	37	3
Casali G.L.	3	41	44	3
Casper S.	10	32	42	5
Cassiman B.	15	28	43	5
Cassimon D.	7	33	40	3
Castaldi C.	8	38	46	3
Castellacci F.	9	37	46	6
Castro-Martinez E.	3	40	43	4
Caviggioli F.	4	42	46	3
Cecere G.	3	43	46	3
Cefis E.	14	30	44	5
Chakrabarti A.K.	21	10	31	4
Chaminade C.	4	37	41	3
Chang Y.-C.	7	38	45	3

Chapman I.D.	1	11	12	3
Chataway J.	6	33	39	3
Chaves C.V.	5	36	41	3
Chen J.-R.	7	38	45	3
Chen K.	4	41	45	3
Chen S.-H.	15	26	41	4
Chesbrough H.	0	32	32	3
Christensen J.F.	10	24	34	4
Cillo P.	4	35	39	3
Cines M.	3	16	19	3
Clark K.B.	0	14	14	3
Clark N.	8	1	9	3
Clarysse B.	18	25	43	10
Cloodt M.	3	32	35	3
Coad A.	8	37	45	3
Cockburn I.	3	39	42	3
Coenen L.	9	34	43	4
Cohen W.M.	14	31	45	5
Cohendet P.	0	30	30	3
Colombo M.G.	27	18	45	17
Colyvas J.A.	4	36	40	3
Consoli D.	11	34	45	6
Conti A.	5	40	45	5
Cooke P.	8	26	34	3
Coombs R.	19	11	30	5
Coriat B.	0	31	31	3

Corley E.A.	4	33	37	4
Coronado D.	9	32	41	4
Corrocher N.	8	35	43	5
Costantini V.	5	41	46	4
Courtial J.-P.	2	17	19	3
Cowan R.	18	24	42	5
Crescenzi R.	1	44	45	3
Crespi F.	2	44	46	3
Crespi G.	9	36	45	7
Criscuolo P.	12	34	46	6
Cruz-Castro L.	10	32	42	4
Cuervo-Cazurra A.	1	36	37	3
Currall S.C.	5	40	45	3
Cusumano M.A.	0	21	21	3
Czarnitzki D.	4	38	42	5
D'Adderio L.	7	30	37	3
Dahlander L.	9	34	43	5
Dahlin K.B.	1	33	34	4
Dalpe R.	3	21	24	3
Daniels P.L.	3	22	25	3
Daraio C.	0	40	40	3
Darby M.R.	10	26	36	3
Davenport S.	1	33	34	3
David P.A.	15	23	38	6
Davies A.	0	29	29	3
Dayan T.	1	43	44	3

De Faria P.	0	39	39	3
De Jong J.P.J.	9	35	44	5
De Rassenfosse G.	8	38	46	6
Debackere K.	25	19	44	10
DeBresson C.	3	21	24	3
Delmastro M.	1	30	31	3
Desai A.V.	5	9	14	4
D'Este P.	11	34	45	10
Desyllas P.	6	39	45	4
Dickson K.	18	12	30	4
Ding W.	4	36	40	3
Divito L.	4	41	45	3
Dodgson M.	3	37	40	3
Dolfsma W.	8	34	42	5
Dosi G.	35	11	46	8
Dowling M.	21	21	42	5
Drejer I.	3	33	36	3
Du J.	6	37	43	3
Dushnitsky G.	12	34	46	3
Dutrenit G.	1	40	41	3
Duysters G.	20	25	45	11
Dvir D.	8	25	33	4
Ebersberger B.	1	43	44	3
Edler J.	11	34	45	7
Eesley C.E.	10	36	46	3
Ejermo O.	5	35	40	3

Ekboir J.M.	8	32	40	3
Engel C.	1	44	45	3
Engelen P.J.	7	33	40	3
Ensley M.D.	0	34	34	3
Epicoco M.	3	42	45	3
Ernst H.	9	27	36	4
Escribano A□ .	8	38	46	3
Estrada I.	6	39	45	3
Ettlie J.E.	1	11	12	3
Etzkowitz H.	7	27	34	7
Evangelista R.	14	25	39	5
Faber J.	13	33	46	4
Fabrizio K.R.	9	37	46	5
Faems D.	3	42	45	4
Fagerberg J.	25	16	41	9
Farina C.	4	8	12	5
Feldman M.	10	34	44	8
Feller I.	15	16	31	6
Fernandez-de-Lucio I.	2	35	37	3
Ferriani S.	1	37	38	3
Filippetti A.	2	40	42	3
Finch J.H.	15	31	46	3
Fini R.	3	39	42	4
Fischer T.	2	41	43	4
Flanagan K.	3	37	40	3
Fleming L.	14	30	44	5

Florida R.	9	17	26	4
Fontana R.	11	35	46	7
Fontes M.	9	26	35	4
Foray D.	23	20	43	7
Fosaas M.	1	40	41	3
Fosfuri A.	5	33	38	3
Frame J.D.	6	17	23	4
Franke N.	6	32	38	4
Fransman M.	17	13	30	4
Franzoni C.	8	36	44	6
Freel M.S.	7	32	39	3
Freeman C.	35	3	38	5
Frenken K.	13	28	41	8
Frenz M.	4	38	42	3
Frietsch R.	3	35	38	3
Fritsch M.	5	30	35	5
Fu X.	3	38	41	3
Fuchs E.R.H.	7	39	46	5
Fuentelsaz L.	13	32	45	5
Funk J.L.	14	30	44	5
Furman J.L.	15	31	46	5
Galia F.	11	33	44	3
Gallouj F.	8	26	34	3
Gambardella A.	24	21	45	12
Ganco M.	0	46	46	3
Gann D.M.	10	29	39	4

Gans J.S.	14	32	46	3
Garcia-Marco T.	12	30	42	4
Garcia-Quevedo J.	2	43	45	3
Garnsey E.	15	22	37	4
Garrone P.	9	25	34	3
Garud R.	20	23	43	8
Gassmann O.	14	28	42	4
Gaughan M.	13	33	46	5
Gaule P.	0	40	40	3
Gaunand A.	2	44	46	3
Geels F.W.	14	31	45	12
Gehman J.	2	41	43	4
Gemunden H.G.	13	24	37	3
Genus A.	11	26	37	3
George G.	9	32	41	4
Georghiou L.	9	27	36	5
Geroski P.A.	3	26	29	3
Geuna A.	19	26	45	14
Giarratana M.S.	9	33	42	3
Gibbons M.	8	3	11	9
Gibson H.	0	26	26	3
Giebe T.	8	35	43	3
Gil N.	5	36	41	4
Gilbert B.A.	3	41	44	3
Gilsing V.	10	35	45	6
Gittelman M.	10	35	45	5

Giuliani E.	8	34	42	5
Giummo J.	4	39	43	3
Giuri P.	16	29	45	5
Glasmeier A.	5	20	25	3
Glenna L.	3	37	40	3
Godin B.	11	25	36	8
Godinho M.M.	12	33	45	4
Gold B.	16	2	18	3
Goldfarb B.	5	32	37	3
Gomez I.	5	19	24	3
Gomez J.	13	32	45	7
Gonzalez-Brambila C.	6	36	42	3
Goto A.	26	10	36	5
Graf H.	10	35	45	3
Grande E.	2	28	30	3
Granstrand O.	14	19	33	6
Gray D.O.	7	30	37	3
Grazzi M.	2	44	46	4
Greenstein S.	12	31	43	3
Gresser K.	0	2	2	3
Grilli L.	9	34	43	5
Grimaldi R.	12	30	42	6
Grimpe C.	7	38	45	8
Groenewegen P.	10	27	37	3
Gruber H.	4	25	29	3
Grupp H.	16	23	39	11

Guan J.C.	12	33	45	10
Guellec D.	12	30	42	5
Guerzoni M.	1	43	44	3
Gulbrandsen M.	7	34	41	3
Gummett P.J.	2	5	7	3
Gustafsson R.	3	37	40	3
Gutierrez-Gracia A.	2	35	37	3
Haefliger S.	3	39	42	4
Haeussler C.	3	40	43	6
Hagedoorn J.	22	21	43	15
Hall B.H.	10	29	39	6
Hamilton K.S.	4	26	30	3
Harhoff D.	20	26	46	12
Harris R.	5	38	43	3
Hart D.M.	8	30	38	3
Hashai N.	6	37	43	3
He Z.-L.	3	35	38	3
Hegde D.	3	34	37	3
Heidenreich M.	4	34	38	3
Heijs J.	7	32	39	3
Heimeriks G.	8	37	45	5
Heinze T.	5	37	42	4
Hekkert M.P.	1	44	45	3
Hellsmark H.	13	32	45	3
Hemmert M.	7	33	40	3
Henkel J.	13	32	45	12

Herrmann A.M.	6	40	46	4
Herstad S.J.	1	43	44	3
Herstatt C.	8	34	42	3
Hessels L.K.	3	37	40	4
Hewitt-Dundas N.	11	33	44	6
Hicks D.	21	23	44	8
Hienerth C.	8	35	43	3
Hipp C.	4	30	34	3
Hobday M.	26	18	44	8
Hoegl M.	5	33	38	5
Hoffmann V.H.	5	41	46	7
Hohberger J.	1	44	45	3
Hoisl K.	10	36	46	8
Hollenstein H.	12	25	37	4
Hong W.	5	37	42	3
Hopkins M.M.	1	35	36	3
Hoppmann J.	1	42	43	3
Hottenrott H.	3	43	46	3
Howell A.	1	44	45	3
Howells J.	1	24	25	3
Howells J.R.	16	19	35	5
Hoyssa M.	5	33	38	3
Hsu D.H.	8	36	44	4
Hu A.G.	3	36	39	3
Hu M.-C.	7	34	41	5
Huang C.	7	38	45	5

Huenteler J.	2	43	45	3
Huergo E.	11	35	46	3
Hughes A.	4	39	43	5
Hukkinen J.	6	33	39	3
Hull R.	1	27	28	3
Hung S.-C.	3	40	43	3
Hunter E.M.	5	40	45	3
Hussinger K.	6	38	44	5
Hussler C.	2	34	36	3
Hyysalo S.	6	38	44	4
Hyytinen A.	8	34	42	3
Iammarino S.	16	28	44	5
Iansiti M.	8	24	32	4
Ibert O.	11	33	44	3
Inhaber H.	4	3	7	4
Intarakumnerd P.	13	31	44	4
Inzelt A.	7	33	40	3
Irvine J.	4	12	16	6
Ison R.	0	43	43	3
Izushi H.	0	32	32	3
Jacobsson S.	22	20	42	9
Jaffe A.B.	24	18	42	4
Jain S.	3	38	41	3
Jamasb T.	3	37	40	3
James A.D.	10	34	44	3
Janger J.	3	43	46	4

Jappelli T.	2	44	46	3
Jimenez-Saez F.	0	40	40	3
Johnson B.	5	31	36	3
Johnston R.	3	3	6	3
Joly P.-B.	21	25	46	4
Jones P.M.S.	5	1	6	3
Jong S.	6	37	43	3
Jonkers K.	2	40	42	3
Jorgensen U.	2	39	41	3
Jullien N.	12	32	44	3
Justman M.	9	15	24	3
Justo-Hanani R.	1	43	44	3
Kafouros M.I.	7	37	44	4
Kaiser U.	10	31	41	3
Kalaitzandonakes N.	3	40	43	4
Kang B.	0	44	44	3
Kappen P.	3	40	43	3
Karlsson C.	9	35	44	3
Kash D.E.	6	23	29	3
Katila R.	10	32	42	3
Kato M.	1	40	41	3
Katrak H.	4	27	31	3
Katz J.S.	9	26	35	4
Kealey T.	17	26	43	3
Keck O.	12	5	17	4
Kelley M.R.	10	25	35	3

Kemp R.	10	28	38	3
Kenney M.	29	15	44	14
Kern F.	15	30	45	4
Keupp M.M.	1	41	42	3
Kim B.	2	43	45	3
Kim J.	0	45	45	3
Kim L.	22	9	31	4
Kim W.	3	41	44	3
Kim Y.	10	31	41	3
Kim Y.K.	5	41	46	3
Kinder T.	1	31	32	3
Kingston W.	7	23	30	4
Kivimaa P.	10	35	45	4
Kleinknecht A.	9	19	28	6
Kloyer M.	8	33	41	4
Klueter T.	0	46	46	3
Knoben J.	1	45	46	3
Kobayashi S.	1	29	30	3
Kodama F.	5	29	34	5
Koenig M.E.D.	8	4	12	3
Kogut B.	16	24	40	3
Kolympiris C.	3	40	43	4
Koski H.	11	28	39	3
Krabel S.	4	38	42	3
Krafft J.	10	33	43	5
Krammer S.M.S.	7	38	45	3

Krishnamurthy S.	5	38	43	3
Kuemmerle W.	1	27	28	3
Kuhlmann S.	10	30	40	4
Kumar N.	9	25	34	4
Laamanen T.	4	34	38	3
Lacy W.B.	3	37	40	3
Lakhani K.R.	12	32	44	4
Lal K.	3	28	31	3
Lall S.	23	9	32	3
Lampel J.	1	42	43	3
Landini F.	3	43	46	3
Landoni P.	6	40	46	6
Landry R.	12	27	39	6
Landstrom H.	0	41	41	3
Langford C.H.	15	29	44	4
Langlois R.N.	4	21	25	4
Langrish J.	12	1	13	3
Laranja M.	14	26	40	4
Laredo P.	23	21	44	9
Lars Hakanson	0	22	22	4
Lau A.K.W.	2	38	40	3
Laurens P.	0	44	44	3
Laursen K.	18	25	43	6
Lavoie M.	5	27	32	3
Lawson C.	0	44	44	3
Lawton Smith H.	15	20	35	3

Lazaric N.	6	32	38	3
Lazonick W.	10	30	40	3
Le Bas C.	18	26	44	5
Lechevalier S.	0	43	43	3
Lee C.-Y.	11	34	45	7
Lee H.	2	44	46	4
Lee H.-F.	6	39	45	3
Lee J.	37	9	46	9
Lee J.J.	1	43	44	3
Lee K.	16	30	46	9
Lee S.H.	2	38	40	3
Lee Y.-N.	1	44	45	6
Leeuwis C.	3	37	40	3
Legros D.	8	33	41	3
Lehmann E.E.	0	34	34	4
Lehrer M.	5	33	38	3
Leiponen A.	2	36	38	3
Lemarie S.	12	32	44	3
Leonard-Barton D.	4	13	17	3
Leoncini R.	20	25	45	7
Lepori B.	4	40	44	5
Leten B.	0	43	43	4
Lettl C.	1	37	38	3
Lewin A.Y.	3	31	34	3
Leydesdorff L.	32	13	45	16
Lhuillery S.	7	38	45	5

Li J.	1	45	46	3
Li X.	3	38	41	3
Li Y.	8	38	46	3
Lichtenberg F.R.	4	15	19	3
Lim K.	9	33	42	4
Lima F.	7	39	46	4
Lin Z.	9	31	40	3
Link A.N.	30	13	43	14
Lissoni F.	14	30	44	8
Liu C.C.	1	43	44	3
Liu X.	19	27	46	8
Llerena P.	12	30	42	5
Lobo J.	8	36	44	3
Lockett A.	7	31	38	10
Lofsten H.	10	31	41	3
Lokshin B.	9	33	42	4
Lopes-Bento C.	4	42	46	5
Lopez A.	8	35	43	3
Los B.	8	38	46	3
Love J.H.	16	30	46	11
Lundvall B.-A.	15	31	46	4
Luthje C.	11	34	45	3
Luukkonen T.	20	19	39	8
Luzzi A.	0	36	36	3
Lynam J.K.	16	16	32	3
Lynn L.H.	4	21	25	3

MacCormack A.	2	41	43	4
Macdonald S.	8	15	23	4
MacGarvie M.	6	39	45	4
Macioti M.	5	4	9	3
Madeuf B.	13	13	26	3
Maffioli A.	1	40	41	3
Magnusson T.	2	42	44	3
Mahmood I.P.	6	32	38	3
Majumdar S.K.	23	22	45	4
Malecki E.J.	1	9	10	3
Malerba F.	32	14	46	11
Mangematin V.	20	24	44	11
Manning S.	4	42	46	4
Mansfield E.	14	12	26	7
Mariani M.	12	33	45	5
Marin A.	5	39	44	4
Marin G.	2	43	45	3
Mariotti S.	6	18	24	4
Markard J.	10	35	45	6
Marsili O.	9	35	44	5
Marstrand P.K.	9	1	10	3
Martin B.R.	32	12	44	14
Martin Cruz N.	8	37	45	4
Martin F.	10	17	27	3
Martinelli A.	5	41	46	3
Marx M.	0	44	44	3

Marzucchi A.	1	44	45	3
Massini S.	10	31	41	4
Mathews J.A.	10	31	41	6
Matt M.	16	30	46	7
Mattsson J.	3	39	42	3
Mazzanti M.	3	41	44	5
Mazzoleni R.	10	26	36	4
McKelvey M.	10	32	42	3
McQueen D.H.	3	20	23	3
Meeus M.T.H.	12	29	41	4
Mendonca J.	6	40	46	3
Mendonca S.	9	33	42	4
Metcalfe J.S.	27	13	40	5
Methe D.T.	9	21	30	3
Meyer M.	23	17	40	7
Meyer-Krahmer F.	20	10	30	9
Midgley D.F.	12	21	33	3
Miles I.	15	30	45	3
Miller D.	3	40	43	3
Mina A.	11	34	45	7
Miozzo M.	14	31	45	8
Mitchell W.	6	20	26	3
Modrego Rico A.	6	39	45	3
Moed H.F.	26	14	40	6
Moen J.	7	29	36	3
Mogee M.E.	29	4	33	3

Molas-Gallart J.	9	26	35	3
Molero J.	22	12	34	6
Molina A.H.	3	19	22	3
Montresor S.	20	25	45	7
Moors E.H.M.	9	36	45	5
Moravcsik M.J.	15	2	17	9
Moray N.	1	34	35	3
Morris N.	2	29	31	3
Morrison A.	7	39	46	5
Morrison P.D.	12	21	33	3
Motohashi K.	10	34	44	9
Mowery D.C.	36	8	44	16
Mudambi R.	2	38	40	3
Mueller E.	7	38	45	5
Mueller P.	3	35	38	3
Mugwagwa J.	5	39	44	3
Mukerji S.	1	7	8	3
Muller K.	38	1	39	3
Munari F.	15	31	46	5
Munier F.	0	30	30	3
Murmann J.P.	9	35	44	3
Murray F.	15	31	46	7
Murray G.C.	12	24	36	5
Muscio A.	3	42	45	3
Mustar P.	12	31	43	5
Nagaoka S.	10	35	45	4

Napolitano G.	5	20	25	3
Nappi C.A.	2	44	46	3
Narayanan V.K.	3	38	41	3
Narin F.	13	16	29	10
Narula R.	7	31	38	3
Nathan M.	1	44	45	3
Nederhof A.J.	7	15	22	4
Nedeva M.	3	39	42	3
Nelson A.J.	5	38	43	5
Nelson R.R.	39	6	45	19
Nemet G.F.	3	38	41	3
Nesta L.	8	35	43	4
Nightingale P.	14	27	41	9
Niosi J.	4	28	32	4
Nishimura J.	3	40	43	4
Nobeoka K.	5	21	26	3
Noorderhaven N.G.	8	37	45	3
Nooteboom B.	9	28	37	5
Noyons E.C.M.	4	23	27	3
Nugent R.	1	44	45	3
Numagami T.	6	25	31	3
Nuvolari A.	4	40	44	4
Odagiri H.	27	14	41	8
Okamuro H.	4	36	40	4
Olivastro D.	9	21	30	4
Oliveira P.	3	40	43	3

Olmos-Penuela J.	3	43	46	3
Oriani R.	7	39	46	3
Orsenigo L.	14	25	39	6
Oskarsson C.	1	24	25	3
Owen-Smith J.	12	32	44	5
Ozcelik E.	4	33	37	3
Ozdemir S.Z.	8	36	44	3
Ozer M.	2	36	38	3
Padilla-Perez R.	6	37	43	3
Padmore T.	0	26	26	3
Palangkaraya A.	1	44	45	3
Palda K.S.	4	11	15	3
Palomas S.	7	38	45	4
Palomeras N.	8	36	44	3
Pammolli F.	14	30	44	4
Panico C.	3	40	43	3
Papanastassiou M.	10	28	38	3
Papon P.	25	2	27	5
Park W.G.	15	26	41	4
Patel P.	20	16	36	7
Patton D.	6	38	44	5
Pavitt K.	26	1	27	12
Pearce R.	10	28	38	4
Peck M.J.	5	10	15	3
Peine A.	3	37	40	3
Pellegrino G.	3	43	46	3

Penin J.	3	34	37	3
Penna C.C.R.	0	44	44	3
Penner O.	0	44	44	3
Pennings E.	1	38	39	3
Pereira T.S.	0	33	33	3
Perkmann M.	7	37	44	6
Perry S.J.	5	40	45	3
Persson O.	17	16	33	3
Peters H.P.F.	0	22	22	3
Peters M.	1	41	42	3
Petersen A.M.	1	44	45	3
Pianta M.	18	21	39	4
Picci L.	3	39	42	3
Pisano G.P.	15	20	35	4
Piva E.	8	35	43	5
Pohl C.	6	40	46	3
Pollitt M.G.	3	37	40	3
Ponomariov B.L.	4	39	43	3
Popp D.	6	40	46	3
Porter M.E.	12	31	43	3
Powell W.W.	6	32	38	3
Pray C.E.	18	20	38	3
Prencipe A.	5	25	30	4
Proserpio L.	5	33	38	3
Quaglione D.	3	42	45	3
Quatraro F.	4	39	43	4

Raasch C.	2	42	44	4
Rabellotti R.	7	39	46	3
Radosevic S.	14	28	42	4
Raffo J.	5	38	43	4
Rafols I.	5	41	46	3
Rajan J.V.	14	3	17	4
Ramani S.V.	10	31	41	4
Rammer C.	15	31	46	3
Rappa M.A.	2	23	25	4
Rasmussen E.	4	39	43	3
Raven R.	10	35	45	5
Ray G.F.	15	3	18	4
Reddy N.M.	6	19	25	4
Reekie W.D.	9	2	11	3
Reger G.	0	28	28	3
Reijnen J.O.N.	1	20	21	3
Reitzig M.	10	32	42	6
Rentocchini F.	2	44	46	4
Riboldazzi F.	1	43	44	3
Riccaboni M.	14	30	44	6
Rickne A.	6	31	37	4
Rinia E.J.	3	27	30	3
Rip A.	28	10	38	6
Roach M.	4	39	43	4
Robert Nobel	0	22	22	3
Roberts E.B.	26	10	36	10

Roberts J.H.	12	21	33	3
Robertson A.B.	5	2	7	4
Robertson P.L.	20	21	41	5
Robin S.	12	33	45	4
Rodriguez-Pose A.	3	42	45	3
Roessner D.	13	29	42	3
Roessner J.D.	23	8	31	7
Rogers J.D.	15	31	46	5
Rogers M.	5	35	40	3
Rohracher H.	2	39	41	3
Roijakkers N.	1	34	35	3
Romanelli M.	0	36	36	3
Romijn H.A.	9	31	40	3
Ronde P.	6	30	36	5
Roper S.	16	30	46	17
Rosenberg N.	30	8	38	6
Rosenbloom R.S.	13	11	24	3
Rossi F.	2	40	42	3
Rost K.	6	34	40	5
Rothaermel F.T.	6	30	36	5
Rothwell R.	12	2	14	8
Rotolo D.	1	44	45	3
Roy R.	12	32	44	3
Rubenstein A.H.	7	3	10	5
Rush H.	12	24	36	4
Rusnak J.	2	41	43	3

Ruttan V.W.	11	4	15	3
Rycroft R.W.	6	23	29	3
Sabatier M.	10	36	46	3
Sabharwal M.	2	40	42	3
Sadowski B.M.	5	30	35	3
Sahal D.	4	10	14	4
Sakakibara M.	5	26	31	4
Salandra R.	0	46	46	3
Salter A.	17	29	46	17
Sampat B.N.	16	30	46	6
Sanderson S.	19	24	43	3
Sandner P.G.	5	40	45	4
Santamaria L.	1	38	39	3
Santangelo G.D.	9	29	38	3
Santarelli E.	9	25	34	3
Sanz-Menendez L.	7	32	39	3
Sapprasert K.	0	41	41	3
Sapsalis E.	5	35	40	3
Sapsed J.	6	36	42	3
Sauermann H.	4	39	43	6
Saviotti P.P.	17	11	28	6
Savona M.	5	41	46	4
Scellato G.	7	39	46	5
Scherer F.M.	21	11	32	5
Schiffel D.D.	3	4	7	4
Schiller D.	5	37	42	3

Schilling M.A.	5	40	45	3
Schmidt S.	0	43	43	3
Schmidt T.S.	9	37	46	7
Schmoch U.	13	23	36	6
Schnee J.E.	1	7	8	3
Schneider M.	1	41	42	3
Schoen A.	0	44	44	3
Schoenmakers W.	4	39	43	3
Schrader S.	4	20	24	3
Schubert T.	8	38	46	5
Schwarzkopf A.	3	16	19	3
Schweisfurth T.G.	2	44	46	4
Scott A.J.	1	20	21	3
Scott J.T.	10	29	39	6
Sedaitis J.B.	2	27	29	3
Sedita S.R.	1	38	39	3
Segarra-Blasco A.	8	37	45	3
Senker J.M.	18	20	38	4
Shah S.K.	11	32	43	3
Shane S.	7	32	39	4
Shapira P.	21	25	46	8
Sharif N.	6	35	41	4
Sharp M.	5	22	27	3
Shenhar A.J.	2	25	27	3
Shibayama S.	0	44	44	3
Shimizu H.	2	42	44	3

Shrum W.M.	9	31	40	3
Siegel D.S.	12	31	43	11
Silverman B.S.	8	27	35	3
Simeth M.	3	42	45	4
Simms C.D.	1	45	46	3
Simon D.F.	24	16	40	3
Singh J.	12	32	44	4
Sirbu M.A.	0	7	7	3
Sirilli G.	14	13	27	6
Slaughter S.	20	22	42	3
Sleuwaegen L.	26	17	43	3
Smith A.	7	34	41	3
Smith K.	24	18	42	5
Sobrero M.	18	24	42	9
Soete L.	22	16	38	3
Sofka W.	7	38	45	7
Soh P.-H.	10	32	42	3
Solomon E.	0	45	45	3
Song J.	6	40	46	3
Sorensen F.	6	36	42	4
Sorenson O.	9	30	39	6
Souder W.E.	10	4	14	3
Souitaris V.	0	31	31	3
Spaeth S.	10	32	42	3
Steinmueller W.E.	35	11	46	4
Stephan P.	12	34	46	6

Sterlacchini A.	9	28	37	3
Stern S.	15	31	46	6
Sternitzke C.	3	39	42	3
Sterzi V.	1	41	42	3
Stirling A.	9	34	43	4
Stoneman P.	22	20	42	7
Storey D.J.	0	26	26	4
Storper M.	4	20	24	3
Storz C.	7	37	44	5
Strumsky D.	8	36	44	3
Stuart T.	11	32	43	4
Suarez F.F.	11	22	33	3
Subramanian A.M.	0	42	42	3
Subramanian S.K.	7	3	10	3
Sun Y.	3	40	43	3
Sundbo J.	6	36	42	4
Sutz J.	1	29	30	3
Suzuki J.	7	33	40	3
Svensson R.	5	31	36	3
Swann P.	2	25	27	3
Swift T.	2	38	40	3
Switzer L.	2	12	14	3
Sydow J.	0	42	42	3
Tait J.	0	33	33	3
Tajar A.	0	37	37	3
Tang E.P.Y.	7	33	40	4

Tang J.	4	35	39	3
Tang P.	12	34	46	4
Tartari V.	4	40	44	5
Tassey G.	23	11	34	6
Taymaz E.	4	33	37	3
Teece D.J.	20	15	35	4
Teixeira A.A.C.	6	39	45	4
Tell F.	15	30	45	3
Tether B.S.	19	26	45	13
Teubal M.	29	6	35	9
Thoma J.	4	42	46	3
Thomke S.H.	1	26	27	4
Thumm N.	8	33	41	3
Thursby J.G.	12	31	43	8
Thursby M.C.	9	34	43	9
Tijssen R.J.W.	18	21	39	10
Tishler A.	4	27	31	3
Todo Y.	8	37	45	3
Todtling F.	4	30	34	3
Toole A.A.	12	29	41	3
Torrisi S.	18	27	45	4
Townsend J.	14	3	17	3
Traore N.	5	32	37	3
Tribo J.A.	8	38	46	3
Tripathi A.K.	5	38	43	3
Tripsas M.	13	24	37	3

Trommetter M.	4	28	32	3
Trott P.	1	45	46	3
Truffer B.	11	35	46	10
Trushin E.	0	45	45	3
Tsai K.-H.	4	34	38	4
Tucci C.L.	7	32	39	4
Tylecote A.	7	35	42	4
Tyre M.J.	4	20	24	3
Ughetto E.	7	39	46	4
Ugur M.	0	45	45	3
Un C.A.	1	36	37	3
Utterback J.M.	19	7	26	6
Uyarra E.	3	37	40	3
Uzumeri M.	0	24	24	3
Vahter P.	3	42	45	4
Van Den Bergh J.C.J.M.	5	36	41	3
Van den Besselaar P.	14	23	37	3
Van Den Ende J.	7	28	35	4
van den Oord A.	1	36	37	3
Van Der Meulen B.	0	27	27	3
Van Der Panne G.	2	35	37	3
Van Kranenburg H.	1	34	35	3
Van Leeuwen Th.N.	15	27	42	5
Van Lente H.	4	37	41	3
Van Looy B.	11	33	44	8
Van Pottelsberghe De La	14	30	44	10

Potterie B.				
Van Raan A.F.J.	28	14	42	12
Van Reenen J.	20	26	46	5
Van Rijnsoever F.J.	7	37	44	5
Van Vuren H.G.	3	27	30	3
Van Wouwe M.	7	33	40	3
Vanderwerf P.A.	2	19	21	3
Vanhaverbeke W.	8	37	45	4
Vargas P.	3	38	41	3
Varsakelis N.C.	5	30	35	3
Veloso F.M.	7	36	43	6
Venkataraman S.	10	22	32	3
Venturini F.	2	44	46	3
Verspagen B.	22	19	41	9
Veugelers R.	20	26	46	10
Vezzani A.	5	39	44	3
Vezzulli A.	10	36	46	5
Villard L.	0	44	44	3
Visentin F.	1	44	45	3
Vivarelli M.	18	25	43	4
Von Hippel E.	40	5	45	21
Von Krogh G.	7	32	39	4
Von Tunzelmann N.	12	29	41	5
Von Wartburg I.	4	34	38	3
Von Zedtwitz M.	13	28	41	4
Vonortas N.S.	20	26	46	5

Wagner M.	8	36	44	4
Wagner S.	6	39	45	4
Wakasugi R.	15	21	36	3
Wakelin K.	4	26	30	3
Walker G.	15	24	39	3
Walker J.	3	43	46	4
Walker W.B.	27	2	29	6
Wallin M.W.	7	35	42	3
Walsh J.P.	14	31	45	12
Walsh V.	20	13	33	5
Wang C.	12	32	44	3
Wang E.C.	3	36	39	3
Wang J.	2	44	46	4
Wang J.-C.	15	23	38	4
Wang N.	2	41	43	3
Wang P.	0	46	46	3
Wang Y.	0	46	46	3
Watanabe C.	7	21	28	3
Webster A.	1	28	29	3
Webster E.	1	44	45	3
Weinstein O.	5	26	31	3
Welsh R.	3	37	40	3
Wennberg K.	6	40	46	3
West J.	3	29	32	4
Weterings A.	2	36	38	3
White S.	18	27	45	5

Whitley R.	13	32	45	4
Wield D.	9	24	33	4
Wiklund J.	6	40	46	4
Williams C.	18	23	41	5
Wilson A.H.	3	3	6	4
Windeler A.	0	42	42	3
Windrum P.	4	33	37	3
Winter S.G.	29	6	35	4
Woerter M.	5	37	42	5
Wonder E.F.	3	5	8	3
Wright M.	15	31	46	18
Wu G.	3	32	35	3
Wu Y.	1	39	40	3
Wyatt S.	11	17	28	3
Yam R.C.M.	12	33	45	6
Yamada K.	10	1	11	3
Yan Y.	1	44	45	3
Yang C.-H.	8	37	45	5
Yang H.	3	40	43	3
Yang Y.	7	38	45	3
Yinnon T.	5	20	25	3
Youtie J.	21	25	46	9
Zabala-Iturriagagoitia J.M.	1	40	41	3
Zander I.	17	26	43	5
Zanfei A.	16	22	38	3

Zehavi A.	7	39	46	3
Zhang J.	8	36	44	3
Zhang M.	2	42	44	3
Zhang W.	11	34	45	3
Ziedonis A.A.	14	30	44	4
Ziegler A.	3	38	41	3
Zirpoli F.	8	34	42	3
Zucker L.G.	10	26	36	3
Zuscovitch E.	5	15	20	3

Table 4.3.2 2 Authors publications and time period between them

4.4 Geographical distribution of authors

Rank	Country of author's affiliation	Number of authors	%	Rank	Country of author's affiliation	Number of authors	%
1	United States	784	20.97	**33**	Hungary	7	0.19
2	United Kingdom	537	14.37	**34**	Chile	5	0.13
3	Germany	303	8.11	**35**	Iran	5	0.13
4	Italy	244	6.53	**36**	Poland	5	0.13
5	The Netherlands	243	6.50	**37**	Thailand	5	0.13
6	France	224	5.99	**38**	Turkey	5	0.13
7	Spain	209	5.59	**39**	Colombia	4	0.11
8	Canada	124	3.32	**40**	Kenya	4	0.11
9	Sweden	101	2.70	**41**	Nigeria	4	0.11
10	Japan	90	2.41	**42**	Caracas	3	0.08
11	Switzerland	84	2.25	**43**	Luxembourg	3	0.08
12	Belgium	73	1.95	**44**	Malaysia	3	0.08
13	Denmark	66	1.77	**45**	Slovenia	3	0.08
14	China	59	1.58	**46**	Uruguay	3	0.08
15	Australia	55	1.47	**47**	Croatia	2	0.05
16	South Korea	58	1.55	**48**	Cyprus	2	0.05
17	Finland	45	1.20	**49**	Czech Republic	2	0.05
18	Norway	41	1.10	**50**	Romania	2	0.05
19	Israel	40	1.07	**51**	Tunisia	2	0.05
20	Taiwan	38	1.02	**52**	Ukraine	2	0.05
21	Austria	37	0.99	**53**	United Arab Emirates	2	0.05
22	Portugal	35	0.94	**54**	Bolivia	1	0.03
23	Brazil	31	0.83	**55**	Bulgaria	1	0.03
24	India	27	0.72	**56**	Egypt	1	0.03
25	Ireland	17	0.45	**57**	Estonia	1	0.03
26	Singapore	16	0.43	**58**	Iceland	1	0.03
27	Mexico	14	0.37	**59**	Indonesia	1	0.03
28	Hong Kong	13	0.35	**60**	Iraq	1	0.03
29	Argentina	12	0.32	**61**	Ivory Coast	1	0.03
30	New Zealand	12	0.32	**62**	Kazakhstan	1	0.03
31	Greece	11	0.29	**63**	Macau	1	0.03
32	South Africa	11	0.29	**64**	Russia	1	0.03

Table 4.4 1 Geographical distribution of authors

Table 4.4.1 indicates the geographical distribution of authors.Overall,3738 authors from 64 different countries contributed to the publications of journal Research Policy. United States was the origin of most authors with 784(20.97%) followed by United Kingdom with 537(14.37%). Greece is in 31st position with 11 authors(0.29%).

4.5 Countries productivity

In order to count countries productivity we used two methods normal and fractional count such as in authors productivity.

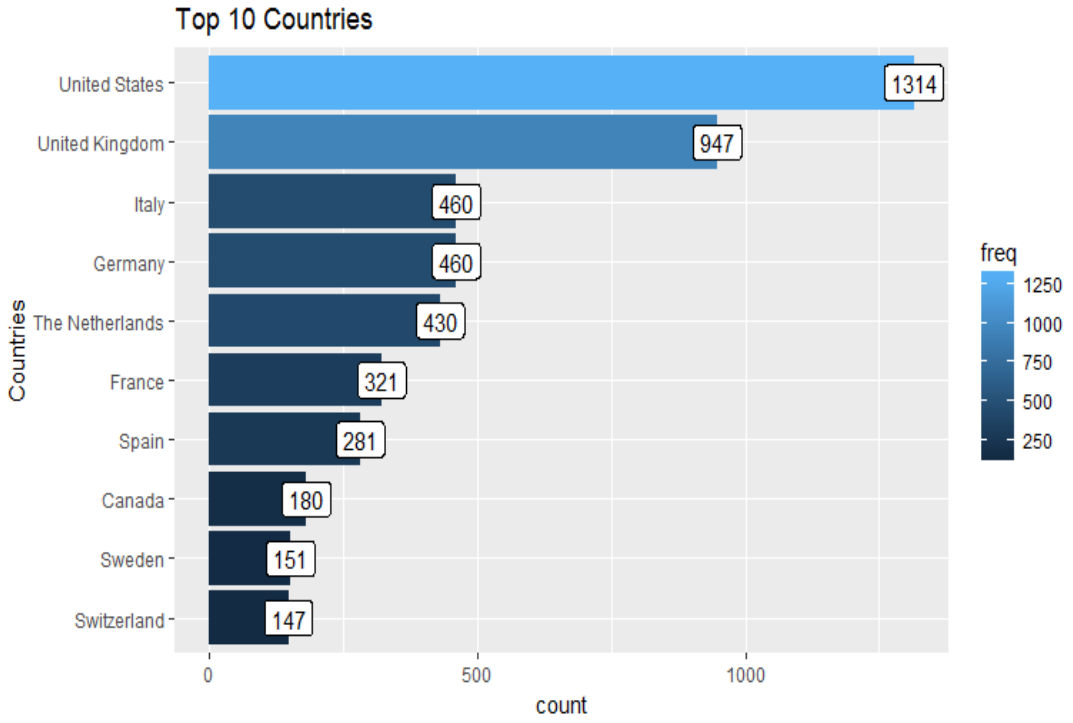

Figure 4.5 1 Top 10 countries with normal count

Figure 4.5.1 illustrates the top ten countries. United States holds the first position with 1314 research articles followed by United Kingdom with 947. Germany and Italy are in 3rd position with 460 research articles.

In Table 4.5.1 below we see the fractional counts of countries. According to the fractional counts the highest productivity is 675.32 whereas the lowest productivity is 0.25

Fractional count	Number of countries	%	Fractional count	Number of countries	%
675.32	1	1.56	**7.75**	1	1.56
477.52	1	1.56	**7.33**	1	1.56
217.01	1	1.56	**5.83**	1	1.56
203.43	1	1.56	**5.17**	1	1.56
199.91	1	1.56	**4.50**	1	1.56
136.99	1	1.56	**4.37**	1	1.56
121.67	1	1.56	**3.50**	1	1.56
87.00	1	1.56	**3.00**	2	3.13
74.15	1	1.56	**2.67**	1	1.56

70.99	1	1.56	**2.25**	1	1.56
64.30	1	1.56	**2.17**	2	3.13
47.73	1	1.56	**2.00**	1	1.56
46.85	1	1.56	**1.67**	1	1.56
39.50	1	1.56	**1.50**	1	1.56
36.66	1	1.56	**1.43**	1	1.56
34.33	1	1.56	**1.33**	1	1.56
31.02	1	1.56	**1.00**	5	7.81
30.45	1	1.56	**0.99**	1	1.56
30.15	1	1.56	**0.92**	1	1.56
27.58	1	1.56	**0.83**	2	3.13
23.45	1	1.56	**0.75**	2	3.13
20.21	1	1.56	**0.58**	1	1.56
19.85	1	1.56	**0.50**	1	1.56
15.83	1	1.56	**0.45**	1	1.56
13.50	1	1.56	**0.33**	2	3.13
11.67	1	1.56	**0.25**	3	4.69
9.25	1	1.56			

Table 4.5 1 Fractional count of countries

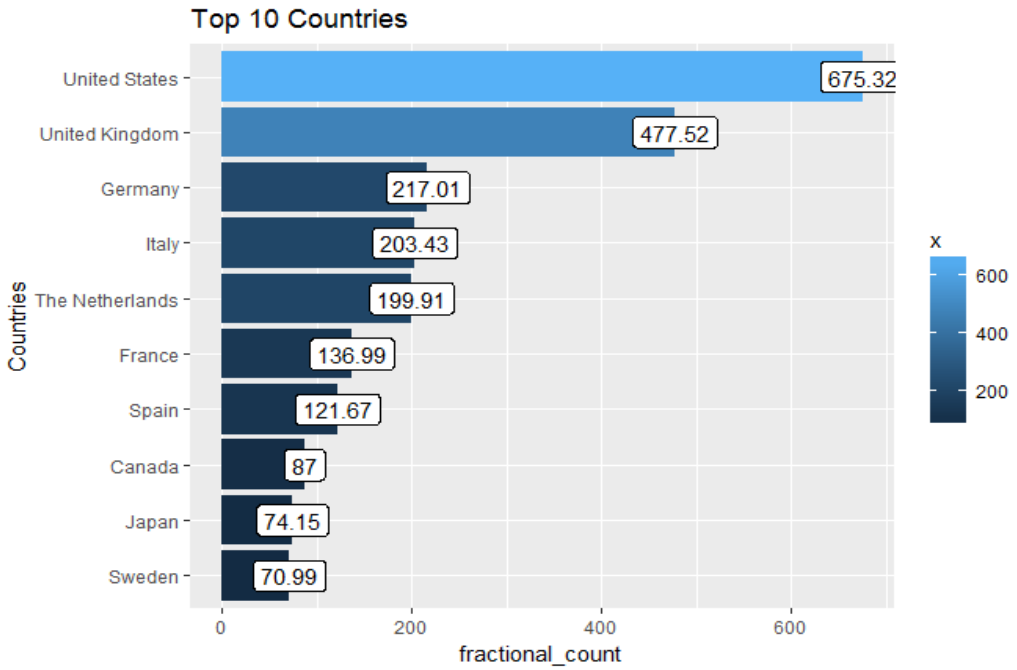

Figure 4.5 2 Top 10 countries with fractional count

This chart illustrates the top 10 countries according to their fractional counts. Author Nelson R.R. has the first position with 11.28 in journal while Von Hippel E. has the second position with 10.87.

5. Collaborative measures

The purpose of this section is to study the collaborative trends among the authors. For this purpose we count and analyze the following collaborative measures according to Liao C.H, Yen H.R (2012):

- *Collaborative Index* measures the mean number of authors per research article. Although it is easily computable. it is not easily interpretable as a degree. for it has no upper limit moreover. it gives a non-zero weight to single-authored papers. which involve no collaboration. The formula is given by *Lawani* as follows:

$$CI = \frac{\sum_{j=1}^{k} j * f_j}{N}$$

where

$$CI = \text{Collaborative Index}$$
$$f_j = \text{number of research articles having j authors}$$
$$k = \text{total number of authors per research article}$$
$$N = \text{total number of research articles}$$

- *Degree of Collaboration* is defined as the ratio of the number of multiple-authored research articles to the total number of research articles during a certain period of time. Hence. it shows the proportion of multiple-authored publications The formula introduced by *Subramanyam* in order to measure the collaborative pattern and it is expressed as:

$$DC = \frac{Nm}{Nm + Ns}$$

where

$$DC = \text{degree of collaboration}$$
$$N_m = \text{number of multiple\_authored research articles during a year}$$
$$N_s = \text{number of single\_authored research articles during a year}$$

- *Collaborative Coefficient* is a measure of collaboration in research. that reflects both the mean number of authors per research articles as well as the proportion of multiple-authored. Hence. measures the strength of collaboration. The formula suggested by *Ajiferuke* as follows:

$$CC = 1 - \frac{\sum_{j=1}^{k} (1/j) * f_j}{N}$$

where

$$CC = \text{Collaborative Coefficient}$$
$$f_j = \text{number of research articles having j authors}$$
$$k = \text{total number of authors per research article}$$
$$N = \text{total number of research articles}$$

- *Revised Collaborative Coefficient*

$$RCC = \frac{n}{n-1}\left\{1 - \frac{\sum_{j=1}^{k} (1/j) * f_j}{N}\right\}$$

where

$$RCC = \text{Revised Collaborative Coefficient}$$
$$f_j = \text{number of research articles having j authors}$$
$$k = \text{total number of authors per research article}$$
$$N = \text{total number of research articles}$$
$$n = \text{total number of authors}$$

Volume	DC	CI	CC	RCC
1	0.17	1.17	0.08	0.09
2	0.25	1.30	0.13	0.14
3	0.18	1.41	0.11	0.12
4	0.25	1.35	0.14	0.15
5	0.42	1.42	0.21	0.22
6	0.47	1.79	0.26	0.27
7	0.53	1.76	0.29	0.30
8	0.47	1.53	0.25	0.25
9	0.14	1.14	0.07	0.08
10	0.29	1.47	0.16	0.17
11	0.39	1.61	0.23	0.24
12	0.33	1.52	0.20	0.21
13	0.38	1.38	0.19	0.20
14	0.42	1.54	0.23	0.23
15	0.25	1.29	0.13	0.14
16	0.60	2.05	0.36	0.37
17	0.52	1.79	0.30	0.31
18	0.31	1.38	0.17	0.17
19	0.41	1.65	0.24	0.24
20	0.36	1.69	0.23	0.23
21	0.52	1.74	0.29	0.30
22	0.58	1.71	0.31	0.32
23	0.58	1.81	0.32	0.33
24	0.61	1.84	0.34	0.34
25	0.62	1.91	0.36	0.36
26	0.57	1.78	0.32	0.32
27	0.47	1.62	0.26	0.26
28	0.65	1.78	0.34	0.35
29	0.49	1.66	0.27	0.27
30	0.57	1.93	0.33	0.33
31	0.63	1.91	0.36	0.36
32	0.59	1.82	0.33	0.33
33	0.67	2.09	0.39	0.39
34	0.73	2.02	0.41	0.41
35	0.67	2.13	0.40	0.40
36	0.77	2.43	0.46	0.46
37	0.75	2.12	0.43	0.43
38	0.69	2.12	0.41	0.41
39	0.80	2.15	0.45	0.45
40	0.85	2.71	0.52	0.52
41	0.77	2.27	0.46	0.46
42	0.77	2.39	0.47	0.47
43	0.88	2.54	0.53	0.53
44	0.90	2.66	0.55	0.55

45	0.83	2.51	0.51	0.51
46	0.83	2.54	0.51	0.51

Table 5 1 Measures of collaboration by volume

Table 5.1 shows the values of collaborative measures by volume. As it seems. despite the fact that has lots of fluctuations. Collaborative Index has an upward trend during the period of study with the highest value reaches 2.71 in volume 44. The results of Degree of Collaboration shows a trend toward for collaboration among authors. Looking at Collaborative Coefficient . it is notice a significant growth which means that there is trend for collaboration.

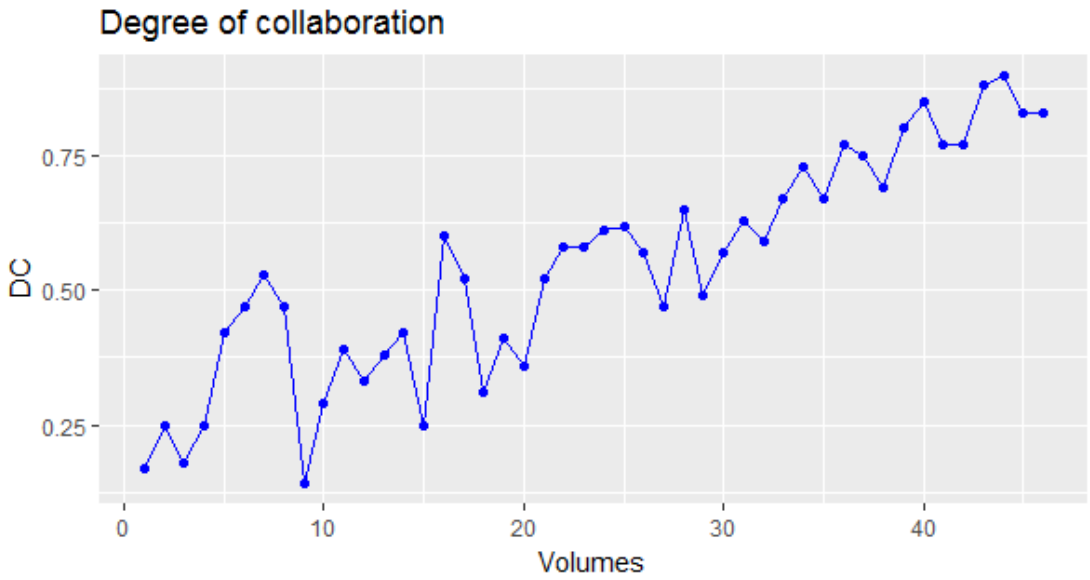

Figure 5 1 Degree of collaboration by volume

Figure 5.1 indicates the Degree of Collaboration by volume. Even though there are lots of fluctuations .it is observed an upward trend over volumes. The highest value is 2.71 in volume 40 whereas the smallest is 0.14 in volume 9.

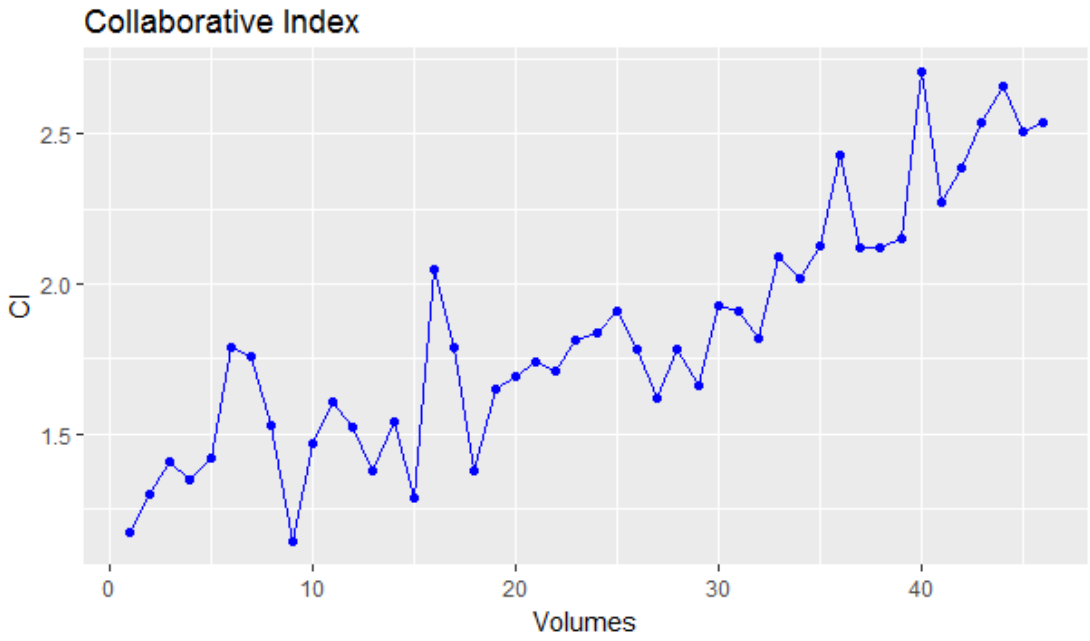

Figure 5 2 Collaborative index by volume

Figure 5.2 shows the Collaborative Index by volume. It is clear that there is an increase over volumes from 1.17 to 2.54. which means that the average number of authors is increased .

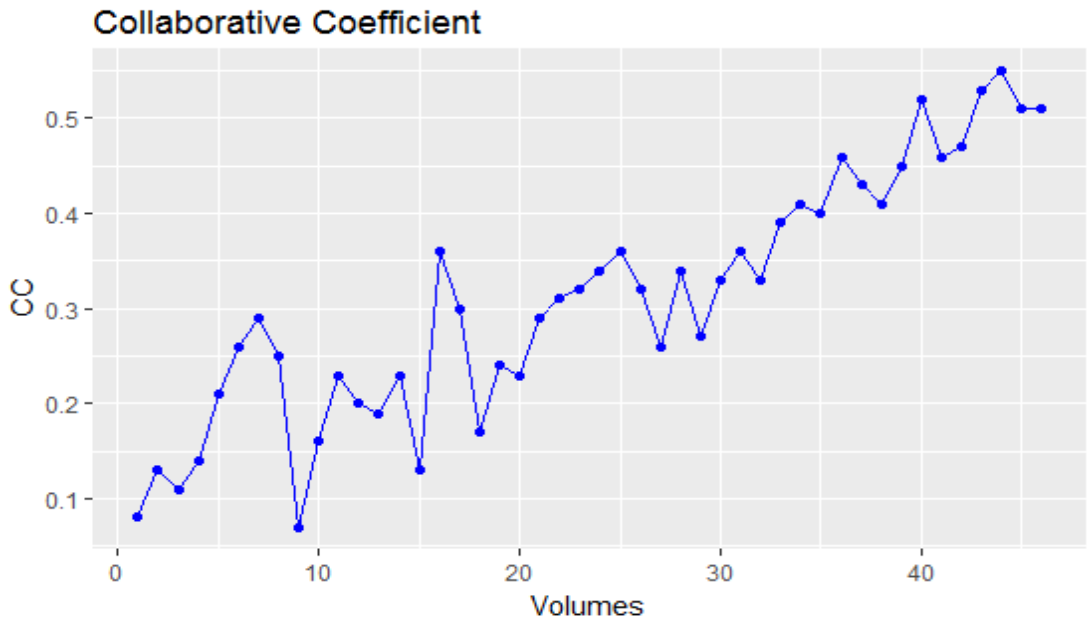

Figure 5 3 Collaborative coefficient by volume

Figure 5.3 shows how Collaborative Coefficient range from 0.08 to 0.51 during volumes. It is evident that there is a trend toward co-authorship in comparison with the past.

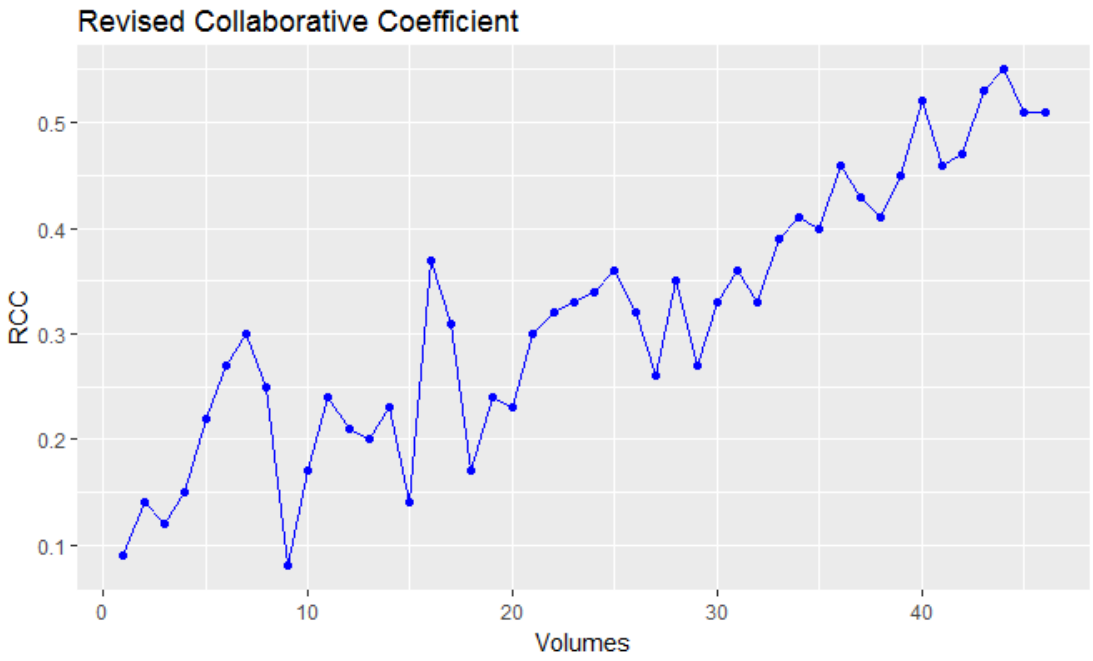

Figure 5 4 Revised collaborative coefficient

Volumes	DC	CI	CC	RCC
1-5	0.24	1.33	0.07	0.07
6-10	0.4	1.56	0.13	0.13
11-15	0.36	1.47	0.2	0.2
16-20	0.43	1.7	0.25	0.25
21-25	0.59	1.83	0.33	0.33
26-30	0.55	1.77	0.3	0.3
31-35	0.66	2	0.33	0.33
36-40	0.77	2.29	0.33	0.33
41-45	0.83	2.48	0.42	0.42
46	0.83	2.54	0.47	0.47

Table 5 2 Measures of collaboration by 5-volumes

Table 5.2 shows the values of collaborative measures by 5-volume.Overall.it is observed how collaboration is increased during the volumes

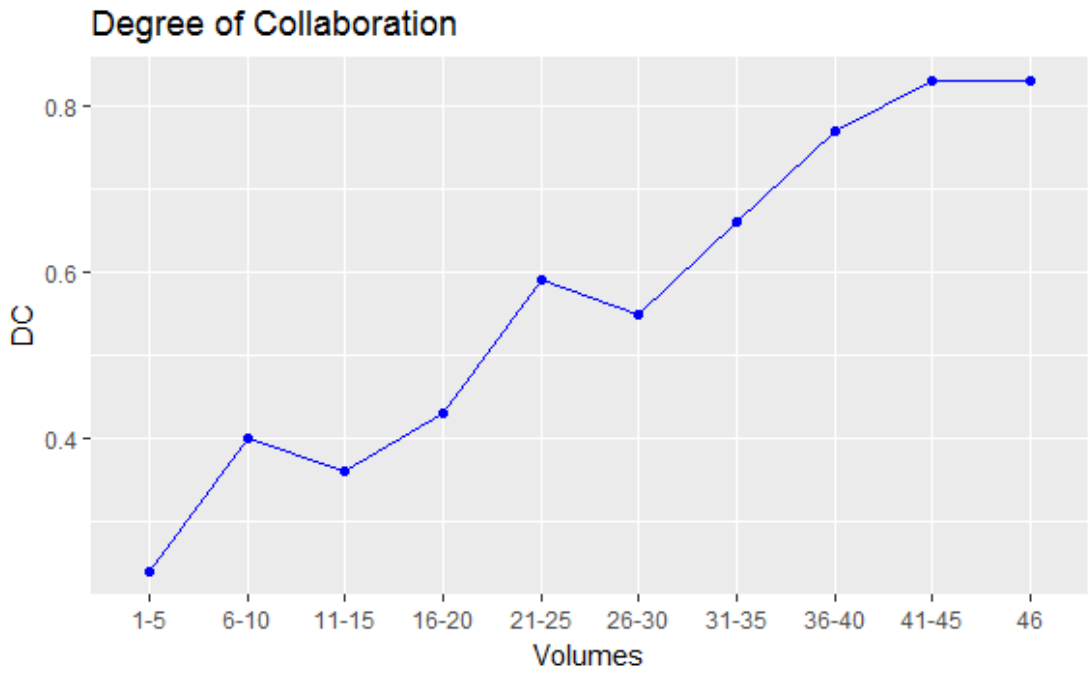

Figure 5 5 Degree of collaboration by 5-volumes

In Figure 5.5 indicates clearly that Degree of Collaboration during nine 5-volumes and one volume periods. follows an upward trend from 0.24 to 0.83 except for 2 periods in which notice reduce.

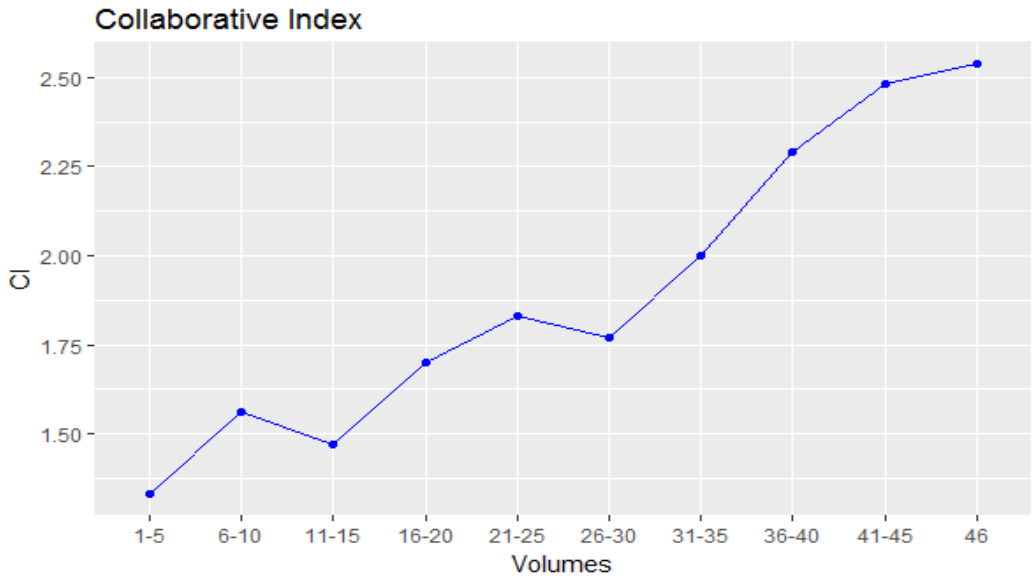

Figure 5 6 Collaborative index by 5-volumes

In Figure 5.6 can be seen better the Collaborative Index during nine 5-volumes and one volume periods. which ranges from 1.33 to 2.54.except for 2 periods in which notice reduce.

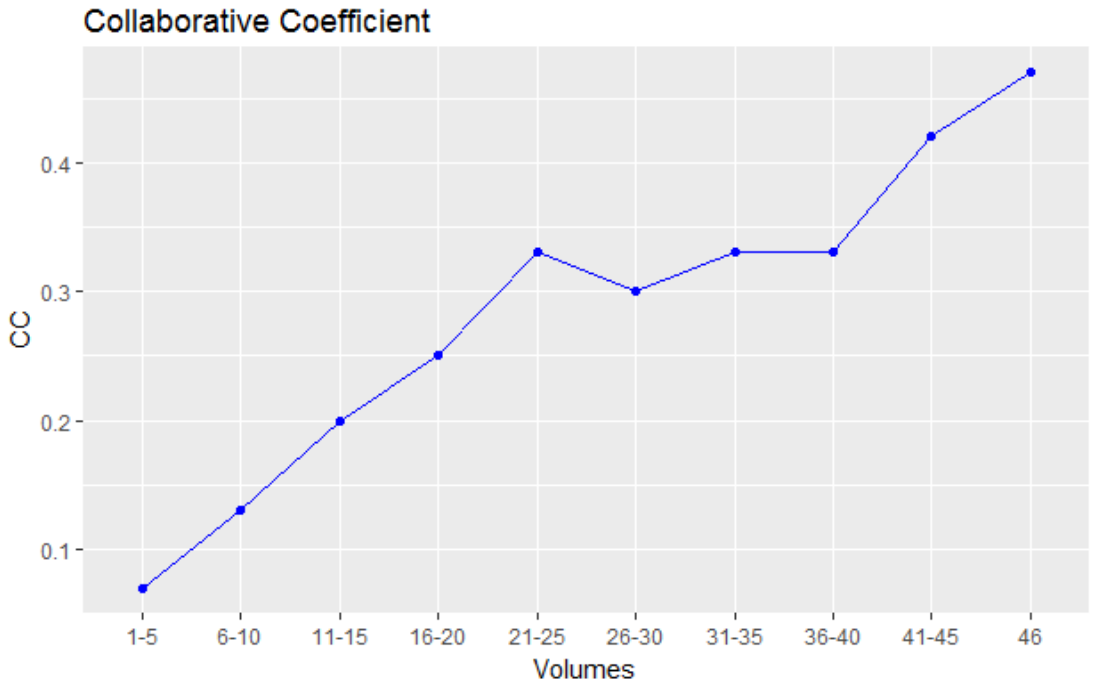

Figure 5 7 Collaborative coefficient by 5-volumes

In Figure 5.7 can be seen better the Collaborative Coefficient during nine 5-volumes and one volume periods. which varied from 0.07 to 0.47.except for 2 periods in which notice reduce.

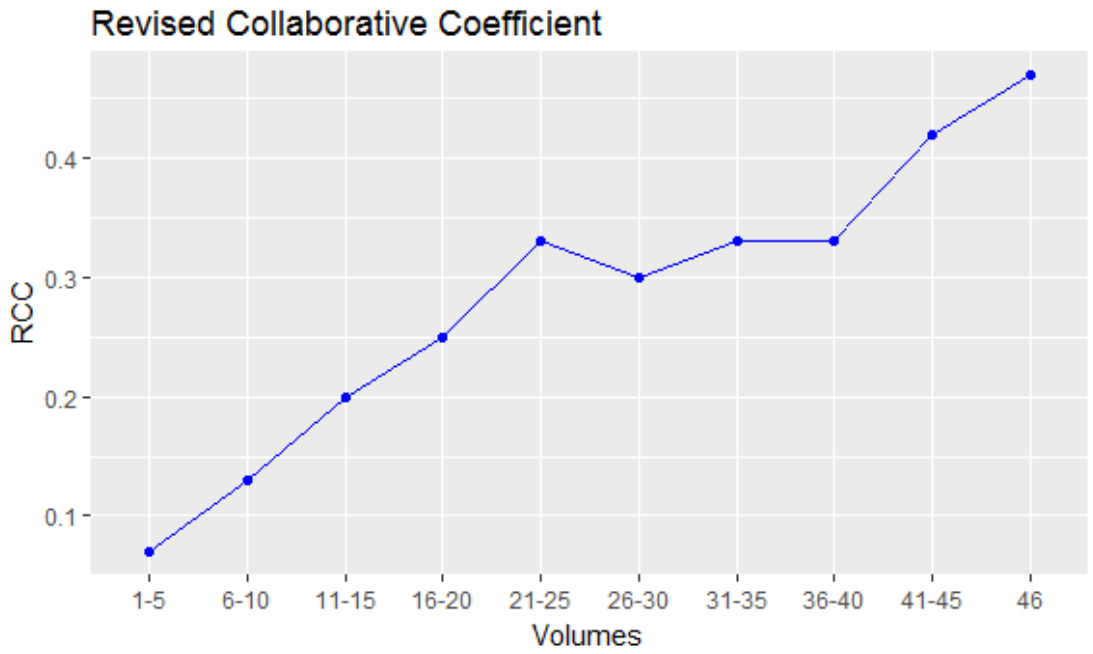

Figure 5 8 Revised collaborative coefficient

6.Conclusions

In present diploma thesis were examined the publication contents of journal Research Policy during the period 1971-2017. Through the bibliometric analysis is created a portrayal of publications of journal. In this study were answered the questions which brought up. Below is provided a summary of findings:

- As it seems both the number of published documents and the number of pages by volume follow exponential growth according to Price model.
- Out of 3630 published documents, the most common type of them is research articles 2841(78.26%).
- The vast majority of research articles (73.25%) have length between 11-20 pages and it notice an upward trend.
- The 66.77% of publications are contributed by multiple authors.
- The 73.94% of authors wrote only one research article. The results show that author's productivity follows Lotka's law
- According to method normal counting the most prolific author was Von Hippel E. with 20 research articles while the fractional counting was Nelson R.R. with 11.28 followed by Von Hippel E.
- The vast majority of research articles derive from United States affiliations.
- A degree of collaboration 0.67 shows that there is collaborative trend among authors.

6.1 Future research

In this study is not covered all issues, therefore we recommend proposals for future studies. In future we could study the citations of journal. Furthermore, we could evaluate the authors affiliations in order to count the productivity of each affiliation. In addition to, we could use measures to determine the nature of collaborations. Finally, another possible study is co-authorship networks.

References

1. **Ajiferuke I., Burell Q., Tague J..** Collaborative coefficient: A single measure of the degree of collaboration in research. *Scientometrics.* 1998, Vol. 14, 5-6, pp. 421-433.

2. **Andres A.** Measuring academic research: How to undertake a bibliometric study. 2009.

3. **Biradar N., Tadasad P.G.** Authorship patterns and collaborative research in economics. *Journal of Indian Library Association.* 2015, Vol. 51, 4, pp. 21-29.

4. **Bookstein A..** Explanations of the bibliometrics laws. *Collection Management.* 1980, Vol. 3, 2-3, pp. 151-162.

5. **De Bellis N.** *Bibliometrics and Citation Analysis: From the Science Citation Index to Cybermetrics.* 2009.

6. **Egghe L..** Theory of collaboration and collaborative measures. *Information Processing & Management.* 1991, Vol. 27, 2-3, pp. 177-202.

7. **Egghe L., Rousseau R., Van Hooydonk G.** Methods for accrediting publications to authors or countries: Consequences for evaluation studies. *Journal of the American Society for Information Science.* 2000, Vol. 51, 2, pp. 145-157.

8. **Fanelli D.** Do Pressures to Publish Increase Scientists' Bias? An Empirical Support from US States Data. *PLOS One A peer-reviewed open access journal(e-journal).* 2010.

9.**Jincy J..** Bibliometric study of journal Marketing Research 2008-2016. *International Journal of Scientific and Research Publications.* 2017, Vol. 7, 5.

10. **Hartmink A.E., McBratney A.B., Cattle J.A.** Developments and trends in soil science: 100 volumes of Geoderma 1967-2001. *GEODERMA.* 2001, Vol. 100, pp. 217-268.

11. **Glanzel W..** *Bibliometrics as a research field: A course on theory and application of bibliometric indicators.* 2003.

12. **Liao C.H, Yen H.R.** Quantifying the degree of research collaboration: A comparative study of collaborative measures. *Journal of Informatics.* 2012, Vol. 6, 1, pp. 27-33.

13. **Li J., Li H.-J., Zhen L.** Research output of journal Technovation: A scientometrics study. *COLLNET Journal of Scientometrics and Information Management.* 2016, Vol. 10, 2, pp. 255-272.

14. **Lotka A.J..** The frequency distribution of scientific productivity. *Journal of the Washington Academy of Sciences.* 1926, Vol. 16, 12, pp. 317-324.

15. **Melin G., Person O.** Studying research collaboration using co-authorships. *Scientometrics.* 1996, Vol. 36, 3, pp. 363-377.

16. **Nageswara Rao K., Sharma R.K., Girija Devi S., Muralidhar S.** Bibliometric analysis of the Journal of Propulsion and Power 1985-2013. *DESIDOC Journal of Library & Information Technology.* 2014, Vol. 34, 3, pp. 271-276.

17. **Neil U.S.** Publish or perish, but at what cost? *The Journal of Clinical Investigation.* 2008, Vol. 118, 7, p. 2368.

18. **Sarwesh P..** A bibliometric analysis of the literature of IFLA journal during 2001-2010. *Library Philosophy and Practice(e-journal).* 2013.

19. **Singh M.K..** Authorship pattern and collaboration coefficient of India in Biotechnology research during 2001-2016: Based on Scopus database. *Library Philosophy and Practice(e-journal).* 2017.

20. **Subramanian N..** Authorship patterns and degree of collaboration of Sri Lankan scientific publications in Social sciences and humanities-a picture from Scopus. *Library Philosophy and Practice(e-journal).* 2014.

21. **Subramanyam K..** Bibliometric studies of research collaboration: A review. *Journal of Information Science.* 1983, Vol. 6, pp. 33-38.

22. **Swain D. K.** International Information and Library Review: A ten year bibliometric study. *The International Information and Library Review.* 2014, Vol. 46, 3-4, pp. 113-124.

23. **Van Nunen K., Li J., Reniers G., Ponnet K.** Bibliometric analysis of safety culture research. *Safety Science.* 2018, Vol. 108, pp. 248-258.

24. **Zainab A.N, Anuar N.B, Anyi U.** A single journal study: Malaysian Journal of Computer Science. *Malaysian Journal of Computer Science.* 2009, Vol. 22, 1, pp. 1-18.

25. **Zainab A.N, Anuar N.B, Wan K., Anyi U.** Bibliometric studies on single journals: A review. *Malaysian Journal of Library and Information Management.* 2009, Vol. 14, 1, pp. 17-55.

Relative links

https://en.wikipedia.org/wiki/Publish_or_perish#cite_note-10

https://www.researchtrends.com/issue-38-september-2014/publish-or-perish-the-rise-of-the-fractional-author/

https://www.journals.elsevier.com/research-policy

https://en.wikipedia.org/wiki/Periodical_literature

https://en.wikipedia.org/wiki/Lotka%27s_law

http://shodhganga.inflibnet.ac.in/bitstream/10603/5109/10/10_chapter%201.pdf