

**THE CHANGING LANDSCAPES IN INDUSTRIAL RELATIONS RESEARCH:
ANALYSIS OF RESEARCH TRENDS USING TEXT MINING METHODS**

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INTRODUCTION

There is a growing sense that industrial relations (IR), as a field of academic study, has been in decline over the past twenty to thirty years. It is said that this is mainly because of the narrow focus of industrial relations on the traditional topics such as union and collective bargaining. In this situation, scholars in the field of industrial relations hold divergent opinions about what strategy industrial relations should adopt, and thus, the focus of industrial relations has been altered following different argumentation of various scholars. Therefore, it is important to examine how the topics and focus of the academic field of industrial relations have changed throughout the ages, and to predict future research trend in academic field of industrial relations.

Accordingly, the purposes of this paper are, first, to investigate what topics industrial relations has focused on so far, and, second, to make a guess what topics future research in industrial relations would concentrate on. In other words, this paper examines where industrial relations has been, and predicts where industrial relations would go. To achieve these goals, this study uses text mining methods. By analyzing the frequency of keyword appearance in abstracts in industrial relations journals, this paper examines how traditional topics (e.g. union, collective bargaining) of industrial relations have changed and what topics are newly-emerging.

LITERATURE REVIEW

Is Industrial Relations Research facing Crisis?

Academic field of industrial relations is facing a lot of challenges. In academia, a number of scholars in the field of industrial relations have argued that the field has been on the wane or at least at a crossroad (e.g. Kaufman, 2004a, b; Whitfield & Strauss, 1998). Indeed, several features have driven industrial relations into the crisis since the late of 1980s. Decreased union density and collective bargaining coverage, globalization, the development of human resources management (HRM), and the new forms of employment are the examples of the driving factors. Let's look at the challenges industrial relations is experiencing one by one.

First of all, a number of commentators criticize that, even though both collective bargaining coverage and union density in all European and OECD countries has fallen (Edwards, 2003; Hyman, 2007; Lansbury, 2009; Wood, 2000), the field of industrial relations narrowly focused on union and collective bargaining (Kaufman, 2008; Lansbury, 2009; Piore, 2011; Strauss, 1987). Decreased union membership and collective bargaining coverage have dramatically changed the landscapes of the world of work, but the field of industrial relations was at stand still. For this reason, the critics argue that industrial relations has lost its audiences by concentrating on too limited scope of work (Edwards, 2003; Giles, 2000; Hyman, 2007; Kaufman, 2008; Piore, 2011; Strauss, 1987).

Second, globalization also greatly affects the various aspects of work, and alters the situations of working environments. Jackson et al (2013) identify that the globalization of productions, the transnational dimension of politics, and the growth of financial markets around the world are the challenges that today's' workers are encountering. Also, Lansbury &

Michelson (2005) and Lansbury (2009) argue that globalization combined with neo-liberal economic agenda promotes the value of flexibility in employment, and this has exerted pressured on job security in a number of countries. Furthermore, the International Confederation of Free Trade Unions (1996) once described globalization as 'the greatest challenge facing trade unions'.

Thirdly, the widespread development of human resources management has weakened the position of industrial relations by replacing academic research and teaching of industrial relations. Kaufman (1993) argued that the narrow scope of industrial relations in the United States made it vulnerable to challenges by human resources management. Similarly, in United Kingdom, Dunn (1990) expressed concerns about the rise of 'the new industrial relations' which was more oriented in HRM. In Australia, according to Lansbury (2005), the popularity of HRM programs at school has certainly played a role in diminishing the area of industrial relations in teaching and research

Fourth, new forms of employment have certainly impacted on the world of work and the field of industrial relations. The composition of labor market has changed toward more part-time and casual employment (Lansbury, 2005). Plus, the portion of temporary or contract workers in labor market is extensively growing. The issues regarding immigrant workers and the consequential forms of employment also have risen in many countries. Also, in the employment context, self-employed, which is a totally different form of employment is hard to be understood. This situation collectively weakens the role of traditional institutions of workers representation

Last, the field of industrial relations is criticized for its focus on relations only in the workplace, to the neglect of links with the family and other aspects, and for the absence of an explicit ethical dimension (Acker, 2002). This criticism can be again about the narrow scope of industrial relations.

In sum, the key logic of the criticisms towards industrial relations is that industrial relations has too narrowly focused on the scope of work, and, by doing so, industrial relations has not well coped with the changing nature of work and organizations in which people are employed. As the result of incomplete, unskillful reactions of industrial relations to the changes in the world of work, the membership in industrial relations association and the number of departments or schools of industrial relations have been declining, and the field of industrial relations has reached a crisis

What Are The Answers Of The Scholars Of Industrial Relations?

To overcome the crisis, a number of scholars in the field of industrial relations have actively discussed the future of industrial relations to figure out where to go and what is to be done. There are mainly three streams of the strategy that industrial relations should take.

First, it is argued that the current study on industrial relations should return to original version of industrial relations, which includes both union and non-union sectors, personnel, human resource management, and labor–management relations (e.g. Kaufman). Second, some scholars (e.g. Hyman, 2007; Kelly, 1998) argue that study on industrial relations will be revitalized in a repeated history cycle. Hence, they argue that the field and focus of industrial relations does not need to change. Last, other scholars (e.g. Jackson) insist

that studies of industrial relations should turn its attention to newly emerged labor problems such as contract workers and migrant workers. From the next paragraph, we will take a close look at each argumentation one by one.

The first proposition is that the field of industrial relations should return to an updated version of original 'employment relations' paradigm (Kaufman, 2008). Kaufman identifies two reasons why the field of industrial relations has faced with significant challenges. One is that the severity of labor problems and capital-labor conflict is much decreased recently, and the other is that the field has abandoned its original broad paradigm and opted for a narrower 'labor-management' paradigm. Identifying the definition of industrial relations as all manners of employment relationships, Kaufman supports the strategy to back to the past, which means to return to the broad original paradigm of industrial relations, and to make employment relationship and all forms of labor problems again the core subject in the field. Kaufman argues that movement in this direction has already begun in the mid-1990 (Blyton & Turnbull, 1994; Edwards, 1993; Hills, 1995). There are other scholars that hold similar arguments with Kaufman. McMillan and Casey (2010) mention that industrial relations research apparently seems to attempt to find a new paradigm or return to the original industrial relations.

The second proposition is related to 'union renewal' or 'union revitalization'. Proponents of this position argue that the erosion of union and collective bargaining is not permanent, and it is not irreversible (Peetz, 1998). The decline of trade unionism and collective bargaining coverage is only ephemeral for them. For example, Kelly (2012) and Frege & Kelly (2004) argue that the ups and downs of industrial relations follow the long

waves in the economy. Kelly argues that the decreased levels of unionization and collective bargaining coverage does not imply that the same situation will continue in the future, and that industrial relations have changed in the past and will continue to do so in the future. He adds that long wave theory suggests that the decline of classical labor movement is more likely to be on the threshold of resurgence. Hyman has similar opinion. He argues (2007) that the practical field of industrial relations has not yet reached its final stage and that the particular case of the United States and United Kingdom does not represent the case of Europe. Hyman argues that the central question in current European debate is how to re-institutionalize the employment relationship at societal level. The advocates of 'union revitalization' argue that the field and focus of industrial relations does not need to change, and that the field is simply experiencing some 'disciplinary turbulence' from which it will emerge unscattered.

The third proposition is that the field of industrial relations needs to expand its scope beyond employment, to engage more with other disciplines, and to deal with newly emerging labor problems. For example, Jackson et al. (2013) argue that the distinctive strengths and perspectives of employment relations scholarship are able to engage and make contributions across disciplinary boundaries to a far greater degree than currently the case is. They also identify key emerging arenas within global employment dynamics, and argue that employment relations research should expand its dialogue with wider debates in the social sciences and contribute to the social sciences. Similarly, Giles (2000) argues that industrial relations should shift its paradigm from industrial relations or employment relations to work relations. He asserts that a focus on work relations is a promising avenue through which to develop a less ethnocentric, more theoretically provocative approach than would be the case if the field of industrial relations simply stays on its present path towards employment

relations. Wood (200) makes common comments in his editorial statement of *British Journal of Industrial Relations*, saying that feedback from readers suggest that the Journal needs to keep expanding its scope, both methodologically and substantively. Wood also identify three aims of the Journal at the beginning of new millennium; it aims to broaden the scope of substantive issues covered, to extend the range of disciplines from which it draws contribution, and to intensify its process of internationalization.

METHODS

Again, the first purpose of this paper is to examine research trend in the history of industrial relations research. To achieve this goal, we use bibliometrics and text mining technique. Bibliometrics is an empirical, quantitative methodology that can describe the underlying structure of an intellectual field and help identify paradigms within that field. Bibliometrics is the collection, the handling, and the analysis of quantitative bibliographic data, derived from scientific publications (Mcmillan & Casey, 2010). Although the term ‘‘bibliometrics’’ is rather recent dating back to the late 1960s, the field itself has roots reaching back at least 80 years (Lotka, 1926).

Combining with bibliometrics, we also adopt text mining technique. Text mining, also known as text data mining or knowledge discovery from textual databases, refers generally to the process of extracting interesting and non-trivial patterns or knowledge from unstructured text documents (Tan, 1999; Feldman & Danger, 2007). Text mining is also defined as 'the use of large online text collections to discover new facts and trends about the world itself' (Hearst, 1999). It can be regarded as an extension of data mining or knowledge discovery from (structured) databases. Text mining can also be one of nonstructural data

analysis tools in big data analysis with a focus on frequencies of terms appearing in texts.

Moreover, text mining is a new and exciting area of computer science research that tries to solve the crisis of information overload by combining techniques from data mining, machine learning, natural language processing, information retrieval, and knowledge management (Feldman & Danger, 2007). Text mining, however, is also a much more complicated task than general data mining because text mining involves dealing with text data that are inherently unstructured and fuzzy. Text mining is a multidisciplinary field that involves information retrieval, text analysis, information extraction, clustering, categorization, visualization, database technology, machine learning, and data mining.

This study presents an actual attempt to apply text mining technique in the context of a real industrial relations research setting. We extract and analyze the abstracts in the representative journals in the field of industrial relations. Particularly, we choose traditional keywords and newly-emerging keywords in the field of industrial relations. Next, we investigate how the frequency of the keywords changes since the late of 1940s. Plus, we will provide frequency ranking by decades in the appendix

In order to analyze the text data, we use text mining (tm) package (Meyer et al, 2008) of R 3.0.1 version. Tm package contains various functions; removal of special character, number removal, stop word removal, stemming functions, decapitalizing function, and so on (Feinerer, 2013). Removal of stop words function lets us to get rid of meaningless words in the text data, such as 'it', 'and', 'but', 'he', 'the', 'a', 'in', 'for', 'that', and so forth. Stemming function is for searching for the root of different words. For example, 'union' and 'unions' are regarded as the same word under the stemming function. The procedure of the functions is

decapitalizing, removing special characters, removing numbers, removing stop words, and then stemming.

DATA

Our data are from three worldwide, representative journals in the field of industrial relations: *Industrial and Labor Relations Review* (published since 1947), *Industrial Relations: A Journal of Economy and Society* (published since 1961), and *British Journal of Industrial Relations* (published since 1963). Our data include all the abstracts in the journals. *Industrial and Labor Relations Review* has published since 1947, *Industrial Relations: A Journal of Economy and Society* has published since 1961, and *British Journal of Industrial Relations* has published since 1963.

However, not all abstracts in each article has been provided since when the journal was started publishing. *Industrial and Labor Relations Review* has provided the abstracts of its articles since 1947, which is the beginning year of the journal, but *Industrial Relations: A Journal of Economy and Society* has not provided the abstracts of its articles until 1987, and *British Journal of Industrial Relations* started to provide the abstracts of its articles since 1990. Therefore, we analyze the abstracts after the year of 1947, 1987, and 1990, respectively. Furthermore, not all articles provide abstracts. Usually, articles such as editorial statement does not contain abstract. Table 1 and Table 2 present the number of articles and abstract. We include and analyze the titles of the articles as well for the supplemental analysis. For the supplemental analysis, see the appendix. Referentially, the number of title and the number of articles are identical.

Table 1 here

Table 2 here

Our primary objective of this analysis is to examine the frequency of the keyword appearance only in the abstracts of the three journals. The point here is that we only include abstracts and exclude titles of the articles. There are a few reasons for this. First, abstracts of each article necessarily contain the essence of the each article, and the length of each abstract is relatively similar. Therefore, analysis of abstracts is more appropriate than the analysis of title or whole contents. Second, the number of keywords in titles is too few, so that analysis of the number of title could lead to misunderstanding. Third, the titles of the journal include book review, which could be out of focus of the journals. In short, we analyze the abstracts only for the main study for these reasons.

RESULTS

To better understand how frequently particular keywords appear in the literature of the field of industrial relations, we divide the number of appearance of the keywords within a year with the number of articles of the year. In other words, the number of appearance of the keywords within a year is numerator, and the number of articles of the year is denominator.

We name this term as appearance ratio. Following equation briefly represents the appearance ratio within a year.

$$\textit{Appearance Ratio (AR)} = \frac{\text{The number of appearance of a keyword within a year}}{\text{The number of articles within a year}}$$

We first analyze the frequency ratio of traditional keywords. The traditional topics in the field of industrial relations are, for instance, union, collective bargaining, strike and so on. And, then we analyze the frequency ratio of newly-emerging topics, and we make them visualized. The examples of newly-emerging topics are gender, family, women, immigrant workers, temporary workers, and so forth. We also visualize the result with figure, graph and trend curve, so that we can have deeper understanding about research trends.

Traditional topics in the field of industrial relations

To begin with, we examine how the most traditional topics of industrial relations have changed thus far. Then, what are the traditional topics of the field of industrial relations? The most commonly discussed themes in the field of industrial relations included trade unions, collective bargaining, and strikes (Lansbury, 2009). Especially, collective bargaining was once described as 'the great social invention that has institutionalized conflict' (Dubin, 1954; Purcell, 1993). Furthermore, traditional topics of industrial relations are related to institutional organizations and its intervention between labor and management, so we included 'dispute', 'negotiation', 'mediation', 'arbitration' in the analysis of traditional topics of industrial relations.

Figure 1 presents the appearance ratio of the keyword 'union'. The topics related with 'union' have reached their peaks in the mid 1950s and mid 1990s. The frequency ratios of those times are 1.24 and 1.18 respectively. The lowest level (about 0.35) of union research happened in the late 1960s and early 1970s. In the late 1990s and early 2000s, the research frequency of union seems to decline, but rebound soon at the early 2010s. In general, trend line of research related with 'union' shows fluctuating curve line.

Figure 1 here

Next traditional topic of the field of industrial relations is collective bargaining. We count all the words containing the root 'bargain' by stemming function, and regard 'bargain' as the meaning of 'collective bargaining'. Therefore, figure 2 can represent the appearance ratio of the keyword 'collective bargaining'. As, seen in Figure 2, the research on collective bargaining has its peak in the late 1940s (0.77) and early 1980s (0.8). After the early 1980s, the research trend on collective bargaining became on the decline. In the late 2000s and early 2010s, the research on collective bargaining again rebounds, but it is not that high. Overall research frequency of collective bargaining is lower than the research frequency of 'union', and the fluctuating variation is also smaller than 'union's'.

Figure 2 here

The third traditional topic that we investigate is 'strike'. Figure 1 presents the appearance ratio of the keyword 'strike'. Research related with 'strike' was most actively conducted in the period between the late 1970s and early 1980s. Its peak time is the year of 1986. The appearance ratio of the year is 1.11. However, the frequency of research related to 'strike' continuously decreases after the late 1980s.

Figure 3 here

We further investigate some other topics relevant to traditional industrial relations. The keywords we examine are concerning governmental or institutional intervention between labor and management. This topic includes the keywords of 'dispute', 'mediation', 'arbitration', and 'negotiation'. Figure 4, 5, 6, and 7 respectively presents the appearance ratio of the keywords of 'dispute', 'mediation', 'arbitration', and 'negotiation'.

First, figure 4 presents the appearance ratio of the keywords 'dispute'. Dispute was frequently researched topic until the late 1960s. It declines after the late 1960s, but rebounds in very recent years. The appearance ratios of dispute in 2011, 2013, and 2014 are 0.09, 0.07, and 0.13, respectively.

Figure 4 here

Figure 5 presents the appearance ratio of the keywords 'mediation'. Research with regard to mediation has not been conducted actively. The average appearance ratio of mediation is 0.03 through the history of industrial relations research. However, the trend line shows that mediation research was relatively actively conducted in the 1950s, and rarely conducted in the following years.

Figure 5 here

Arbitration is more frequently researched topic than mediation. The average appearance ratio of arbitration is 0.13, while the average appearance ratio of mediation is 0.03. Figure 6 shows research trend related to arbitration. Researches related with arbitration are steadily through the period between the late 1940s and early 1990s. However, after that period, research on arbitration continuously decreases.

Figure 6 here

Figure 7 presents the appearance ratio of the keywords 'negotiation'. Negotiation research in the field of industrial relations was most actively conducted in the late of 1980s. As shown in figure 7 it declined after the late of 1980s, and rebounds in recent years.

Figure 7 here

Newly-emerging topics in the field of industrial relations

To examine whether the field of industrial relations tries to respond to the changing nature of work and labor, we select several keywords that can reflect the changes in the world of work. The keywords are 'nonunion', 'contract', 'temporary', 'contingent', 'global', 'immigrant', 'family', 'gender', and 'women'. We choose 'nonunion' because union density in most of OECD countries is declining, and, relatively, non-union sector is growing. The reason why we choose the keywords of 'contract', 'temporary', and 'contingent' is that the composition of labor market tends to change toward more part-time and casual employment (Edwards, 2004; Lansbury, 2005). The keywords 'global' and 'immigrant' are chosen because we investigate how well research in the field of industrial relations reflects the world of work in globalized contexts. Last, the keywords 'family', 'gender', and 'women' are for examining various aspects of work beyond employment. Gender is evidently central to understanding employment relations and its neglect has been amply demonstrated (Greene, 2003; Wajcman, 2000). Also, according to Wajcman (2000), traditional industrial relations took the male workers as the norm and saw women as marginal or of secondary interest. Therefore, 'women' is an important topic that a number of scholars attempt to include (e.g. Wood, 2000) in the field of industrial relations.

We begin our analysis with 'non-union'. Research related with non-union was small in its quantity until the 1980s (Figure 8). In the 1980s, non-union research gets attention, and soon diminishes in its popularity. However, research related to non-union is again conducted

in the beginning of the 2010s.

Figure 8 here

The appearance ratio of the keywords 'contract', 'temporary', and 'contingent' shows quite similar pattern (Figure 9, 10, and 11, respectively). The appearance ratio of the keyword 'contract' appears high in the mid 1980s and the early 2010s, and it is still growing in a very recent year. The research related with the keyword 'temporary' is steadily growing through the whole history of industrial relations. The research related to 'contingent' also grows until the early 2000s, but slightly decreases after the 2000s. Collectively, we can observe that research related to the keywords 'temporary', and 'contingent' are getting more attention from scholarly world.

Figure 9 here

Figure 10 here

Figure 11 here

Next, we investigate the keywords 'global' and 'immigrant'. These keywords reflect the research related to globalization and immigrant workers. The research related to the keywords 'global' and 'immigrant' shows similarly growing trends (see Figure 12 and 13). The keyword 'global' emerges first in 1992, and appearance ratio of it is continuously growing from the year of 1992. Research related to 'immigrant' is also shows growing pattern through the 1960s, 1970s, 1980s, 1990s, 2000s, 2010s.

Figure 12 here

Figure 13 here

'Family', 'gender' and 'women' can also be regarded as newly emerging topics (Figure 14, 15, and 16, respectively). Attention to 'family' has been constantly growing from 1940s until today. Research on 'gender' started to grow in the late 1970s, and sharply grows in very recent days. Appearance ratio of 'women' rapidly grew from the 1980s to the mid 1990s and is gradually declining after its peak in the mid 1990s.

Figure 14 here

Figure 15 here

Figure 16 here

Other topics related to industrial relations research

We examine further research keywords such as 'safety', 'injury', 'health', and 'wage'. Those keywords are related to safety issues at workplace. 'Safety' (Figure 14) rarely gets attention in the field of industrial relations research. Instead, the researches concerning 'injury' and 'health' are conducted relatively more than 'safety' research. For 'injury' case (Figure 15), even though the number of research is not that many, we can observe that the number of research related with 'injury' and appearance ratio is gradually growing. When it comes to 'health' (Figure 16), research was conducted in some degree in 1950s, and soon decreased, and started to increase from 1970s until now.

Figure 17 here

Figure 18 here

Figure 19 here

'Wage' is the most frequently appeared keyword in the field of industrial relations. That is, 'wage' has always been an interesting topic since 1940s. Figure 17 presents the appearance ratio of 'wage'. From the late 1940s, the appearance ratio of 'wage' continuously grows until a recent date. This could be interpreted that more and more scholars in the field of industrial research are conducting research related with wage.

Figure 20 here

For the supplement information, we investigate the 30 most frequently appear keywords by decades. Refer to the appendix for the ranking information.

DISCUSSION AND CONCLUSION

Research trend related with union, which is one of the traditional topics in industrial relations, seems to follow Kelly and Hyman's argumentation. Our analysis shows that the ups

and down of union research repeats in a history cycle. Research trends related both collective bargaining and strikes are went through the top in the mid 1980s, and generally decline in the subsequent years. This tendency could be interpreted that research on collective bargaining and strikes are losing its popularity in the academic world. Or, this research trends reflect the decreased levels of collective bargaining and strikes. Other traditional topics such as dispute, mediation, arbitration, and negotiation also less frequently appear in the recent research trends than they do in the past. To sum up, most of traditional topics in the field of industrial relations are not frequently researched in recent days only except union research.

On the other hand, newly emerging topics are actually 'newly emerging'. Recently, research on non-union, contract workers, temporary workers, contingent workers, immigrant workers, family, gender, women, and globalization is gaining popularity in academia. This proves that the field of industrial relations is trying to cope with the changing nature of work, and reflect the various aspects of work. These changes are quite congruous with Kaufman's statement (2008) that industrial relations should return to broad and original industrial relations. Alternatively, the field of industrial relations is expanding its scope beyond employment (Giles, 2000; Wood, 2000).

The trend of IR research to expand its scope could be directed toward HRM. HRM has begun to focus on workers well-being (Peccei et al, 2013; Van de Voorde et al, 2012). While HRM is still concerning with management development, HRM is increasingly concentrating on the double agenda of performance and well-being (Boxall, 2014). In this situation, the field of industrial relations and HRM can reach the common ground under mutual cooperation.

LIMITS

This study is not without limitations. First of all, we were not able to filter out words with multiple meanings. For example, the keyword 'contract' not only means the 'contract' in 'contract worker', but also has verbal meaning. We were not able to get rid of the words with verbal meaning. Nevertheless, we expect the not that many words with different meaning are included in our analysis. Second, we assume that the particular keywords can indicate particular topics, but not all keywords necessarily indicate the topic. Last, we select three most influential journals in the field of industrial relations for the analysis; *Industrial and Labor Relations Review*, *Industrial Relations: A Journal of Economy and Society*, and *British Journal of Industrial Relations*. However, it can be doubted whether the three journals can represent the whole research trend in the world or not. The situations of research or reality in the field of industrial relations are quite different from country to country. Particularly, there could be a big difference in the situations of developing countries and developed countries. And, our data usually represent the research trend of developed countries. Therefore, future research should widely include research journals that represent the situation of developing countries.

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Table 1] the number of articles and abstracts

year	ILRR		IR		BJIR	
	the number of articles	the number of abstracts	the number of articles	the number of abstracts	the number of articles	the number of abstracts
1947	9	9	0	0	0	0
1948	36	31	0	0	0	0
1949	27	26	0	0	0	0
1950	27	26	0	0	0	0
1951	36	36	0	0	0	0
1952	36	29	0	0	0	0
1953	33	29	0	0	0	0
1954	38	35	0	0	0	0
1955	35	32	0	0	0	0
1956	35	33	0	0	0	0
1957	29	28	0	0	0	0
1958	34	32	0	0	0	0
1959	28	27	0	0	0	0
1960	33	31	0	0	0	0
1961	30	27	10	0	0	0
1962	28	27	22	0	0	0
1963	35	31	26	0	33	0
1964	29	27	28	0	32	0
1965	32	30	33	0	27	0
1966	31	28	23	0	19	0
1967	34	29	19	0	27	0
1968	30	26	23	0	27	0
1969	32	26	27	0	24	0
1970	31	28	31	0	27	0
1971	30	26	32	0	23	0
1972	32	27	35	0	31	0
1973	30	28	35	0	25	0
1974	31	31	36	0	24	0
1975	29	23	39	0	30	0
1976	31	21	39	0	28	0
1977	41	30	40	0	28	0
1978	32	33	42	0	26	0
1979	29	28	41	0	28	0
1980	33	31	42	0	26	0
1981	35	35	34	0	27	0
1982	32	32	37	0	23	0

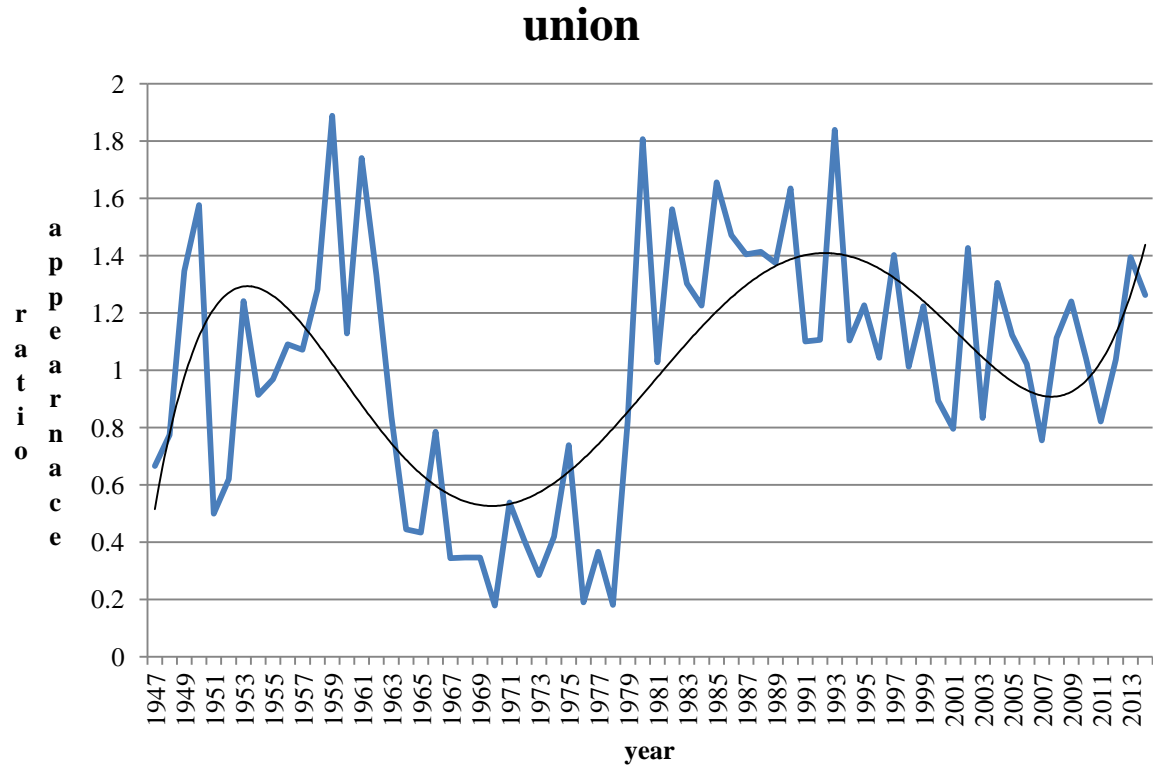
Table 1 continued

1983	34	33	33	0	22	0
1984	32	31	34	0	22	0
1985	32	32	28	0	19	0
1986	38	36	24	0	24	0
1987	36	35	29	12	26	0
1988	34	33	27	25	21	0
1989	41	35	29	29	21	0
1990	55	51	34	30	47	12
1991	46	46	31	30	35	33
1992	48	43	30	28	28	23
1993	35	35	26	25	34	27
1994	37	35	33	25	26	26
1995	44	43	35	31	39	14
1996	39	37	34	30	24	24
1997	30	30	30	22	25	25
1998	31	31	39	25	21	24
1999	31	31	44	23	17	22
2000	32	32	43	29	19	24
2001	42	40	40	26	14	22
2002	33	32	40	24	19	26
2003	34	34	46	31	25	31
2004	27	27	50	37	21	31
2005	30	29	41	28	24	24
2006	29	29	43	33	29	30
2007	25	25	47	29	24	32
2008	28	28	42	30	21	30
2009	21	21	42	31	23	31
2010	36	35	39	31	27	29
2011	36	36	37	28	43	48
2012	39	38	39	39	63	32
2013	44	43	37	28	27	33
2014	31	25	31	22	43	29
Total	2,263	2,119	1,851	781	1,408	682

Table 2] Total number of articles and abstracts

	total number of articles	total number of abstracts
ILRR	2,263	2,119
IR	1,851	781
BJIR	1,408	682
Total	5,522	3,582

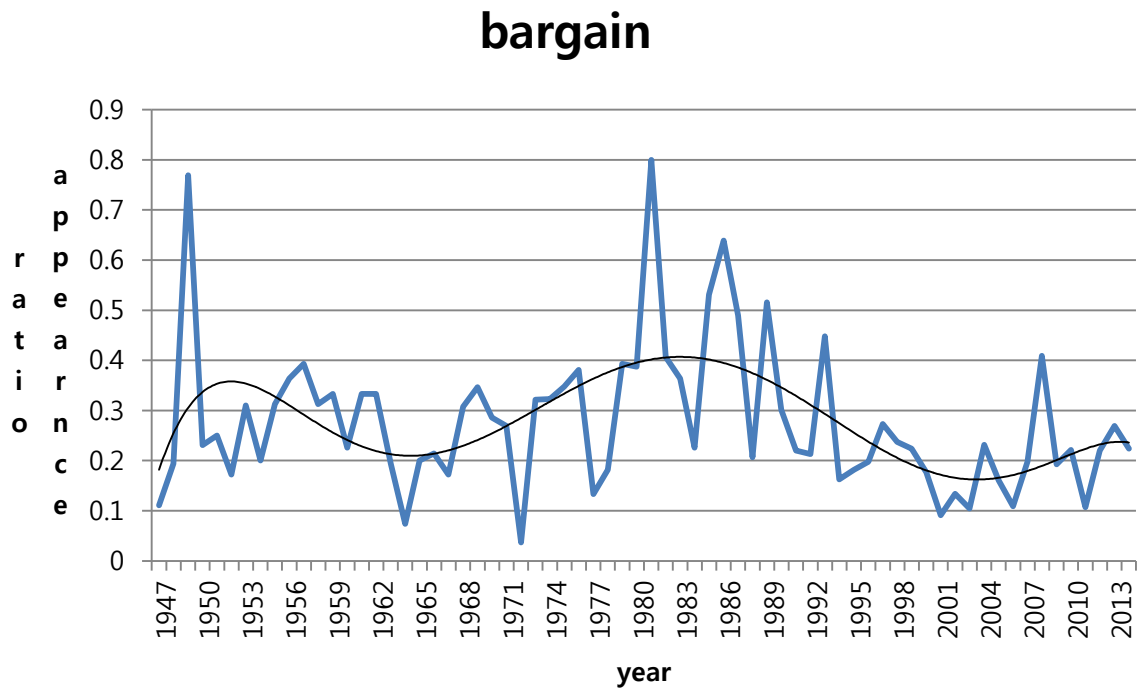
Figure 1] the appearance ratio of 'union' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

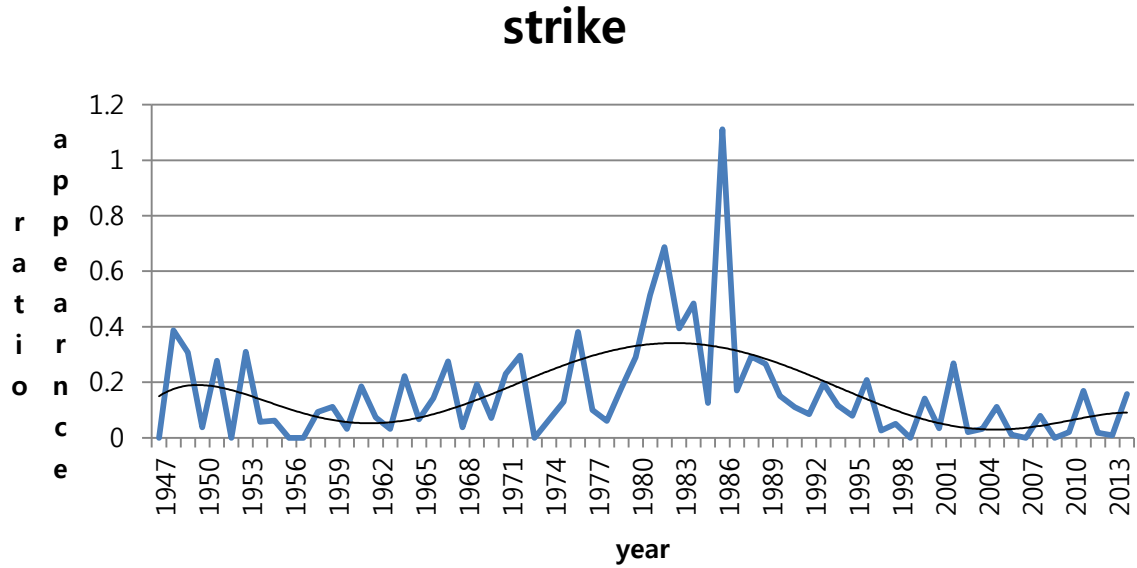
Figure 2] the appearance ratio of bargain' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

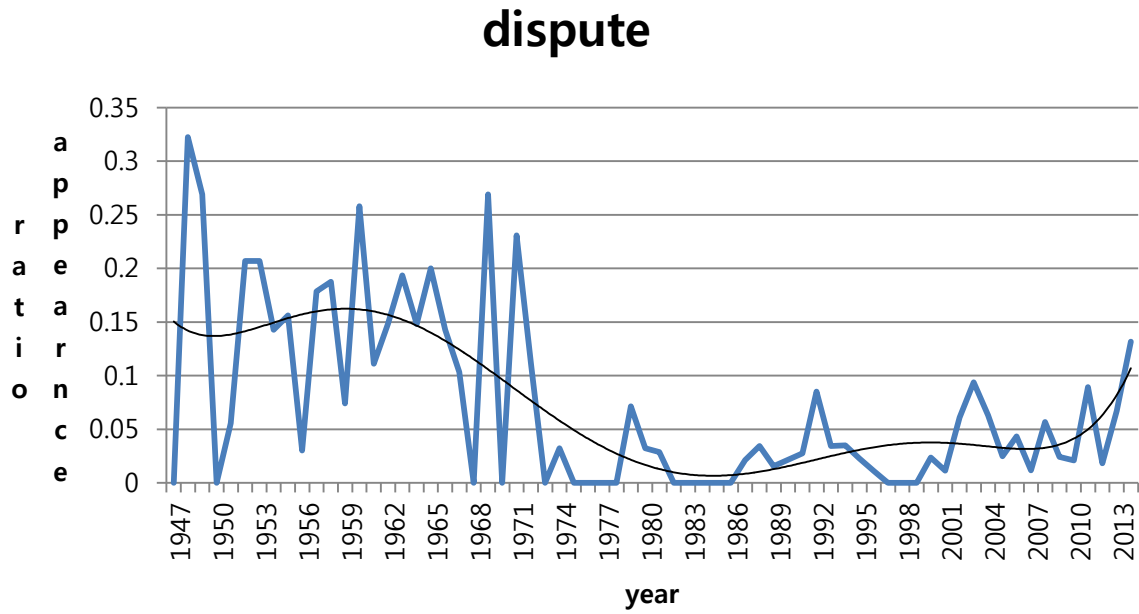
Figure 3] the appearance ratio of 'strike' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

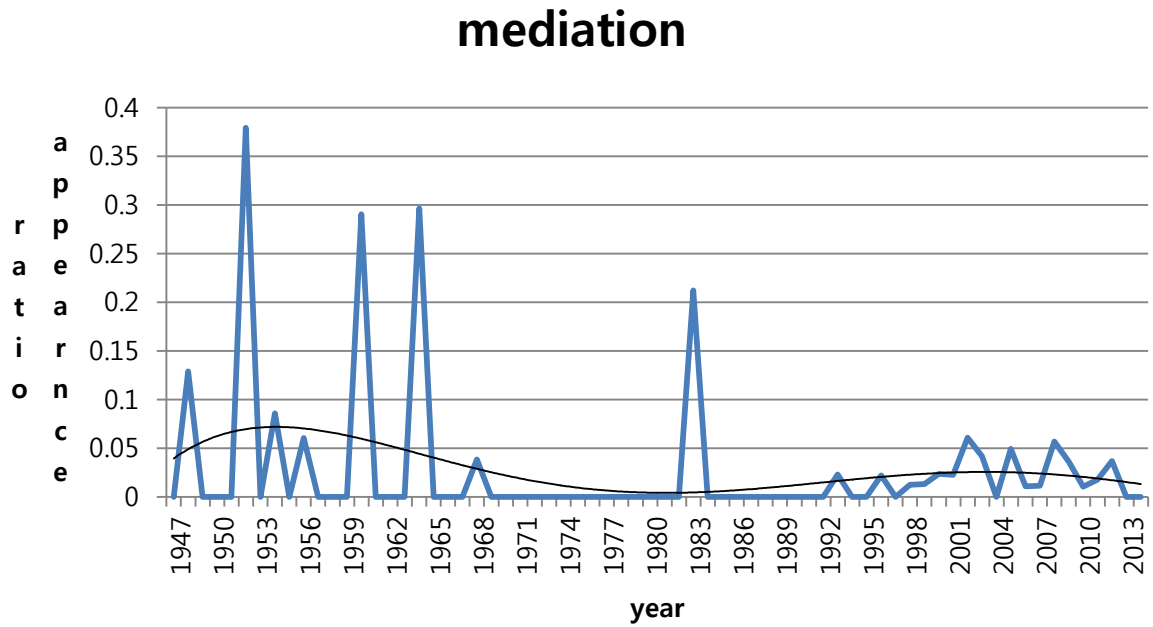
Figure 4] the appearance ratio of 'dispute' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

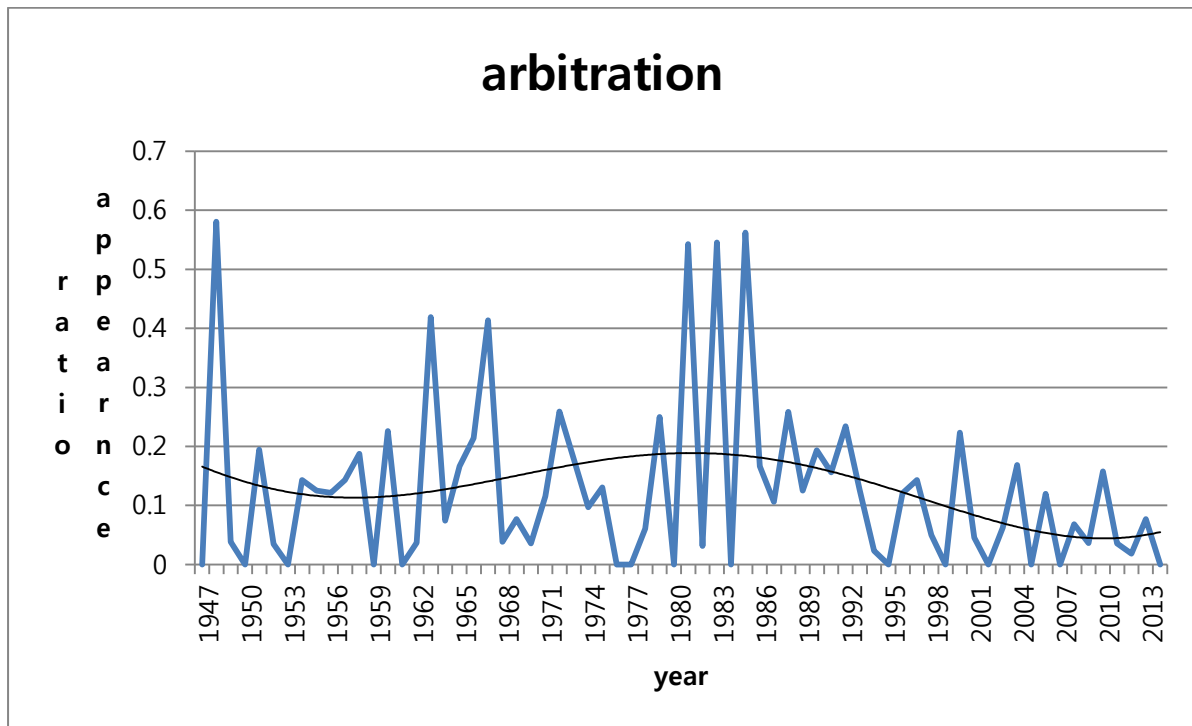
Figure 5] the appearance ratio of 'mediation' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

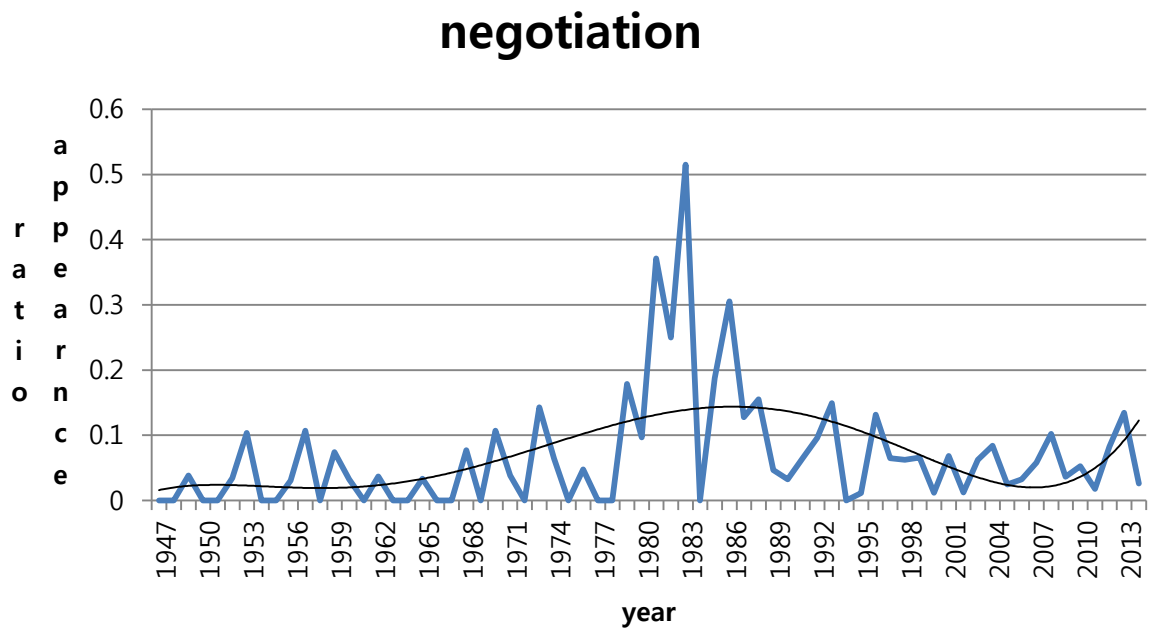
Figure 6] the appearance ratio of 'arbitration' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

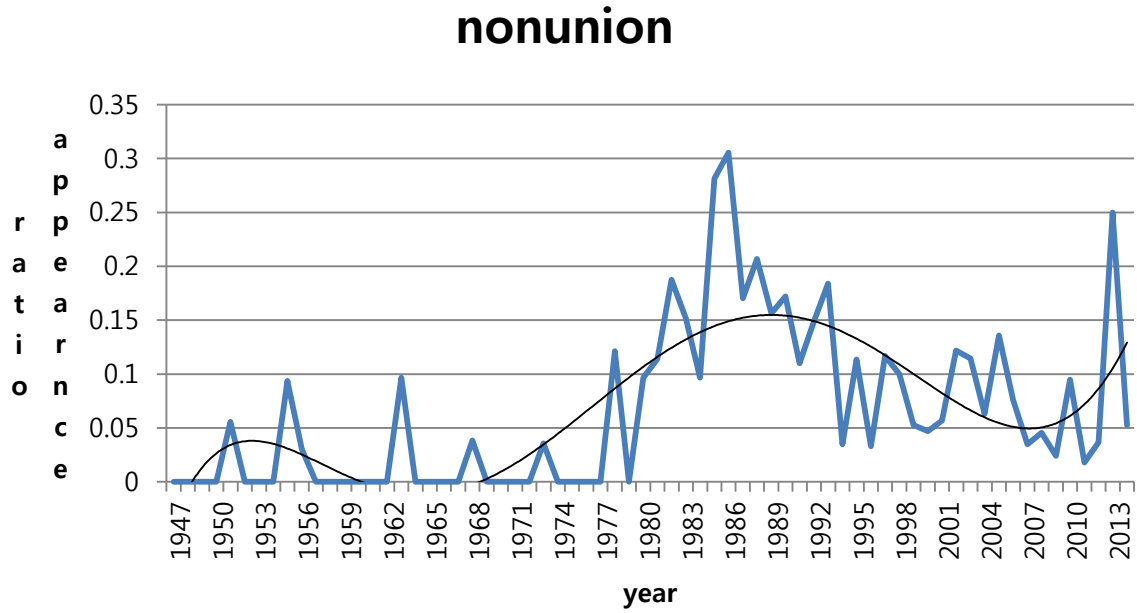
Figure 7] the appearance ratio of 'negotiation' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

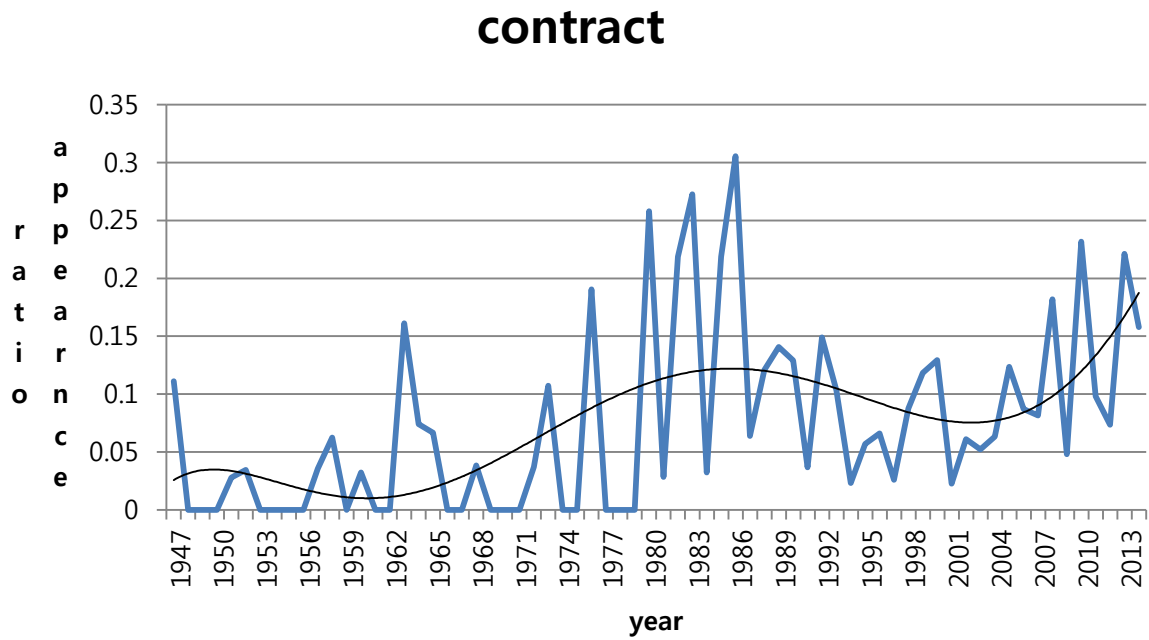
Figure 8] the appearance ratio of 'nonunion' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

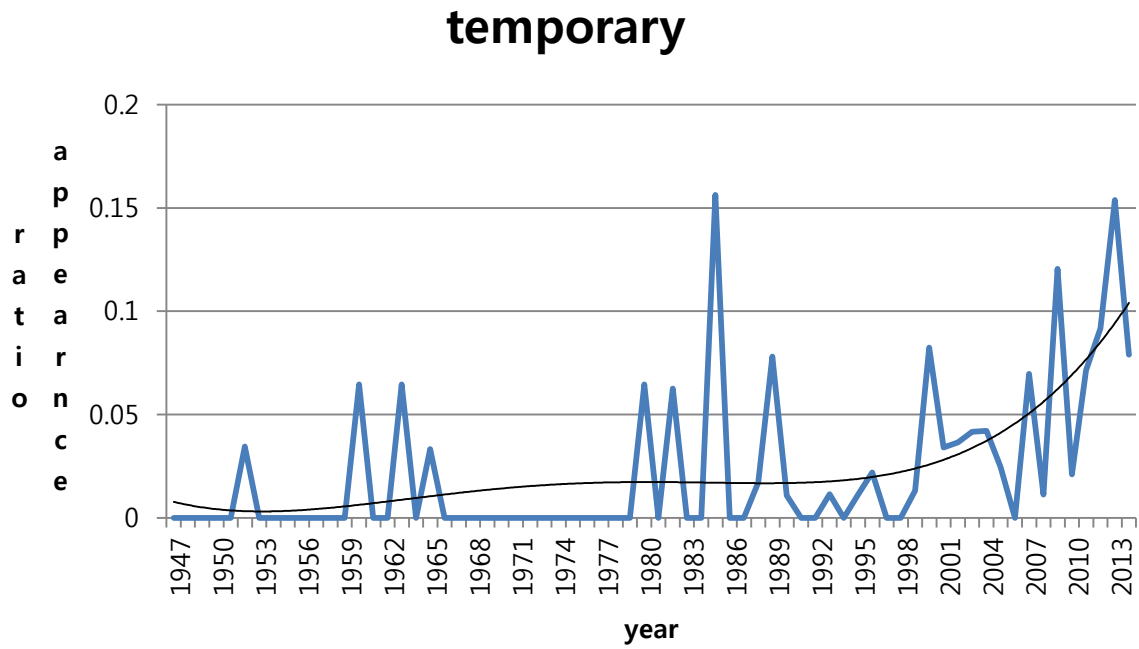
Figure 9] the appearance ratio of 'contract' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

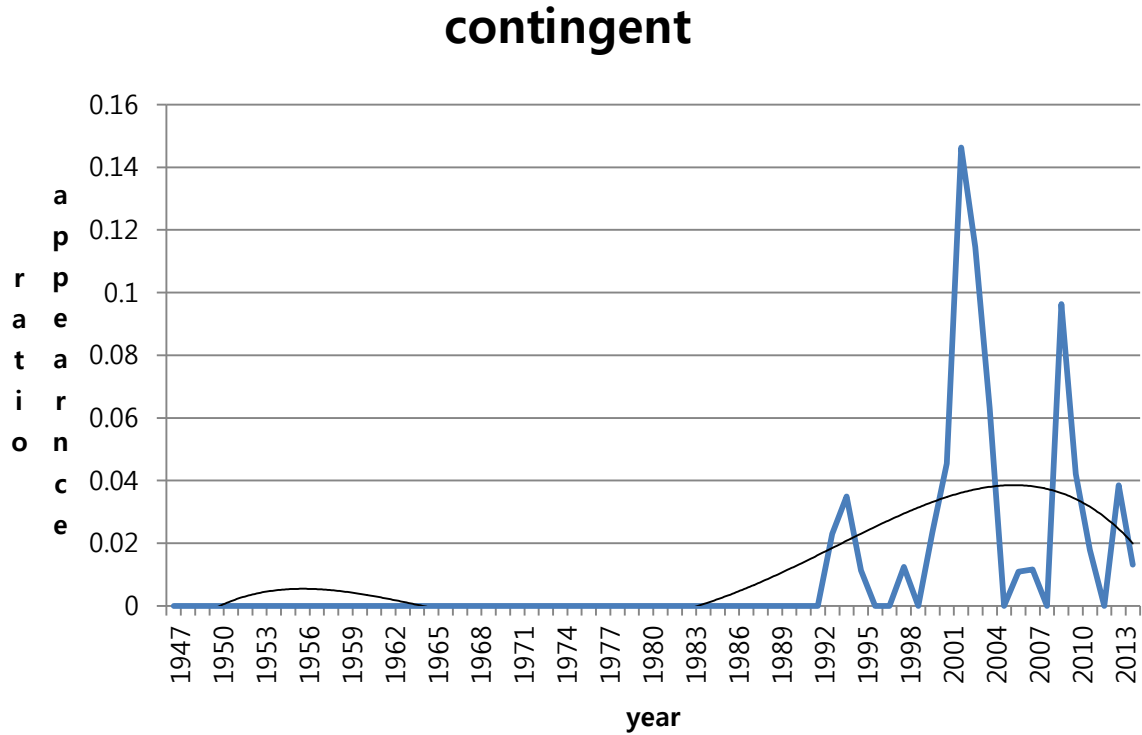
Figure 10] the appearance ratio of 'temporary' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

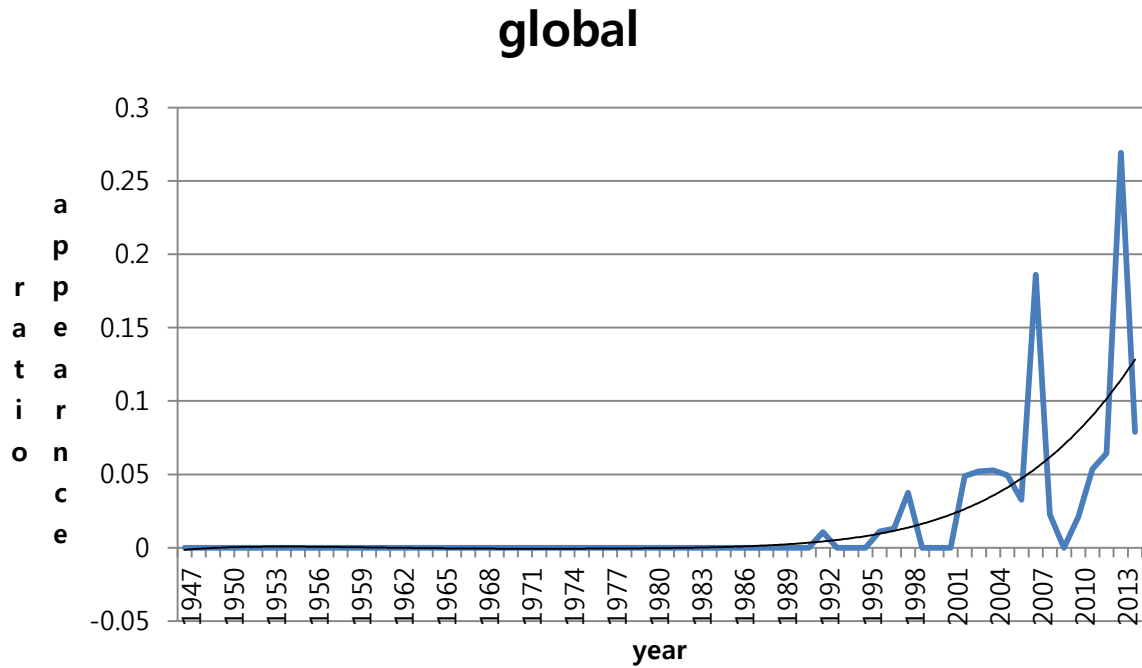
Figure 11] the appearance ratio of 'contingent' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

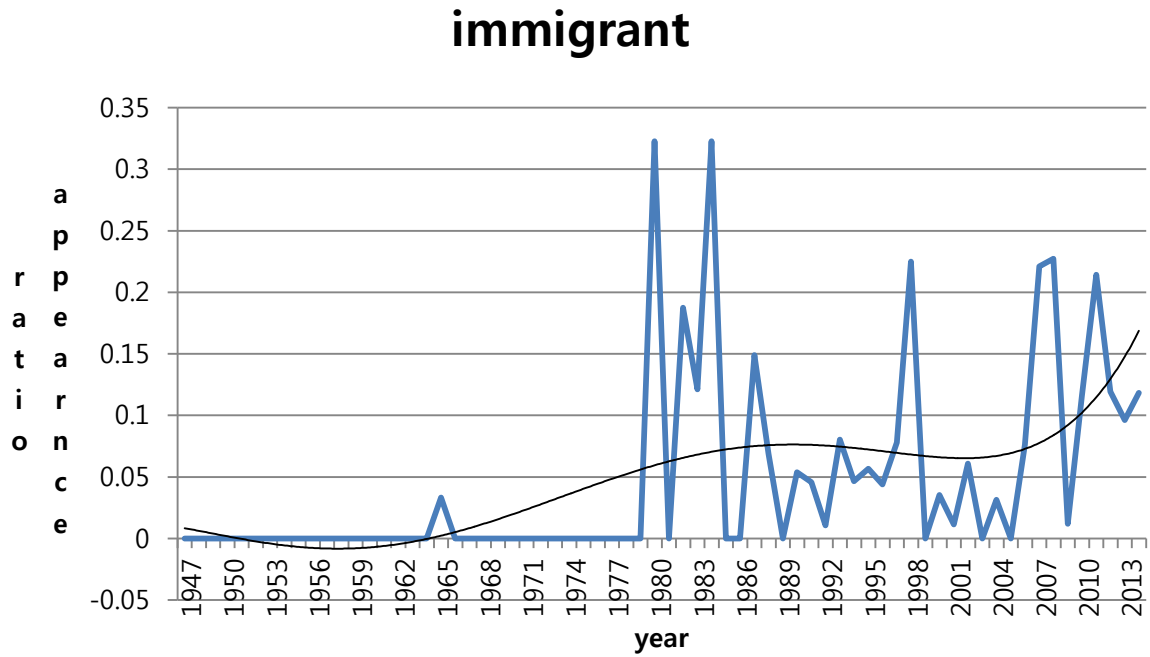
Figure 12] the appearance ratio of 'global' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

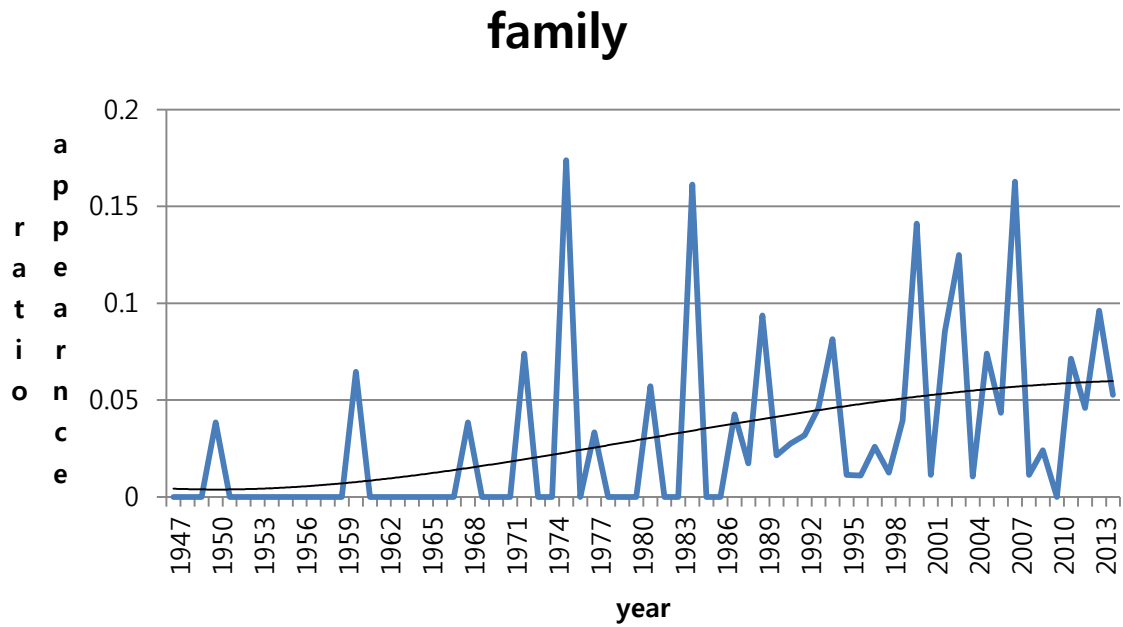
Figure 13] the appearance ratio of 'immigrant' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

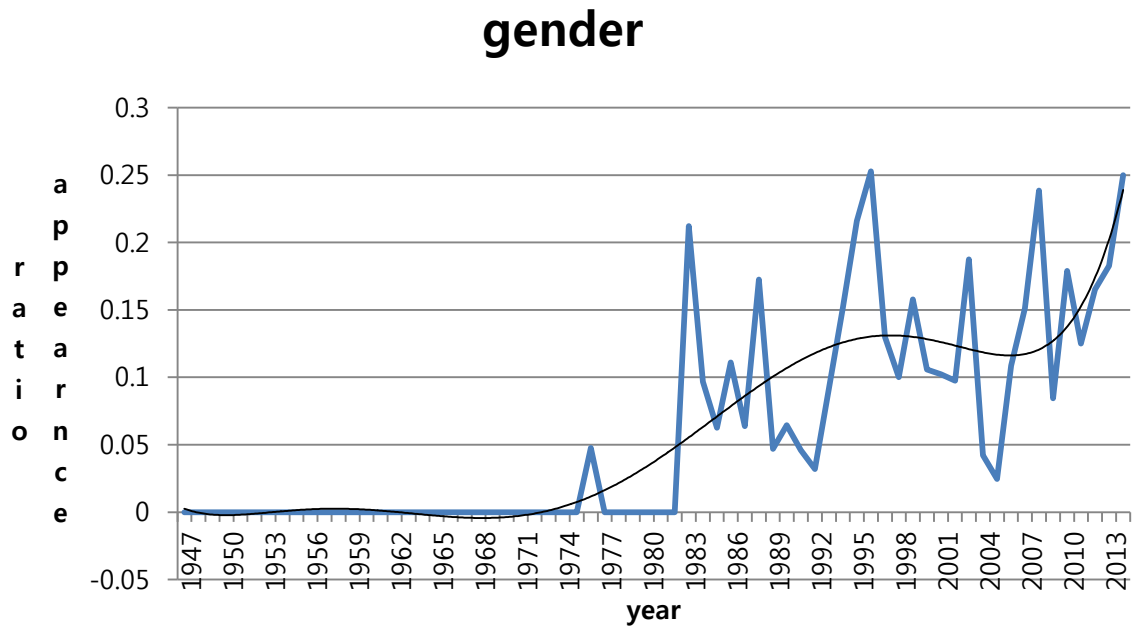
Figure 14] the appearance ratio of 'family' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

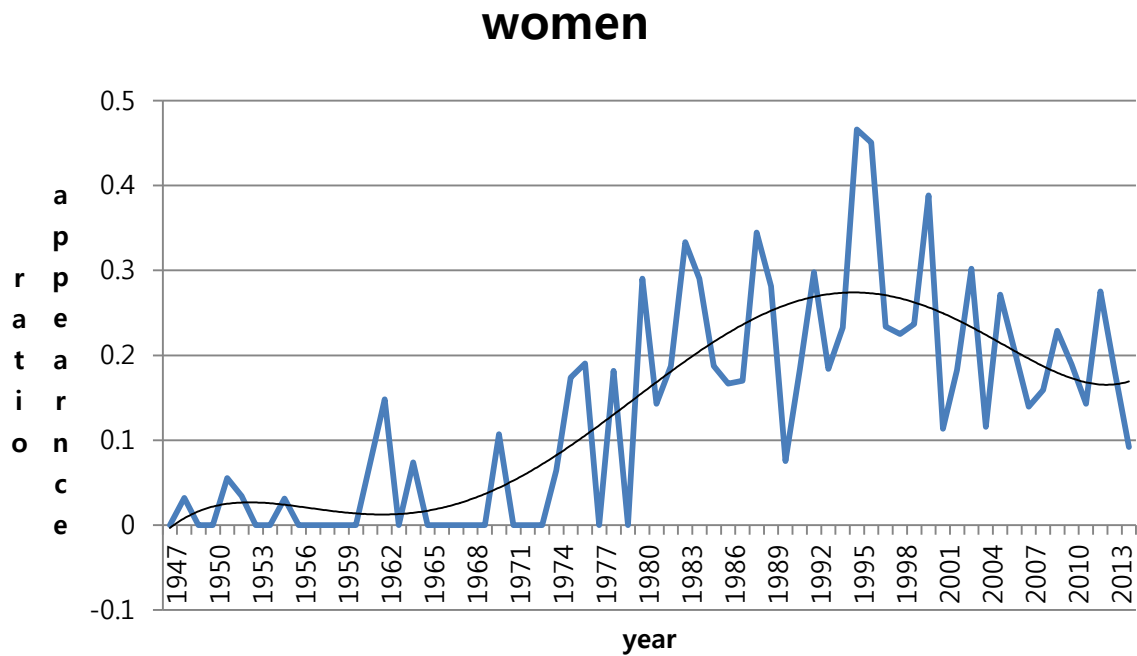
Figure 15] the appearance ratio of 'gender' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

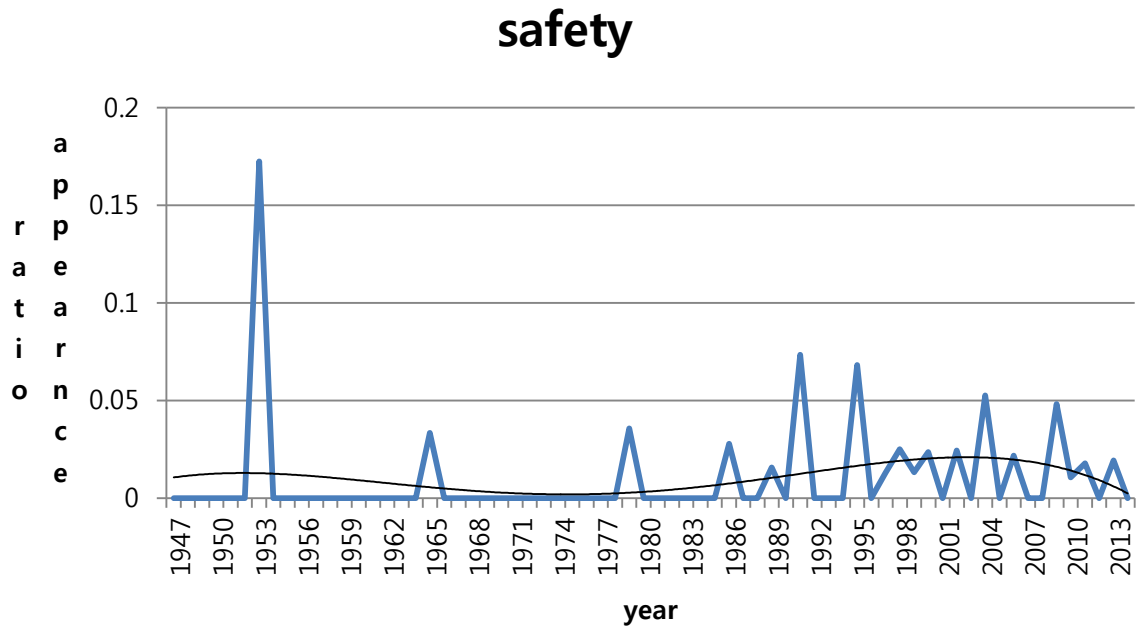
Figure 15] the appearance ratio of 'women' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

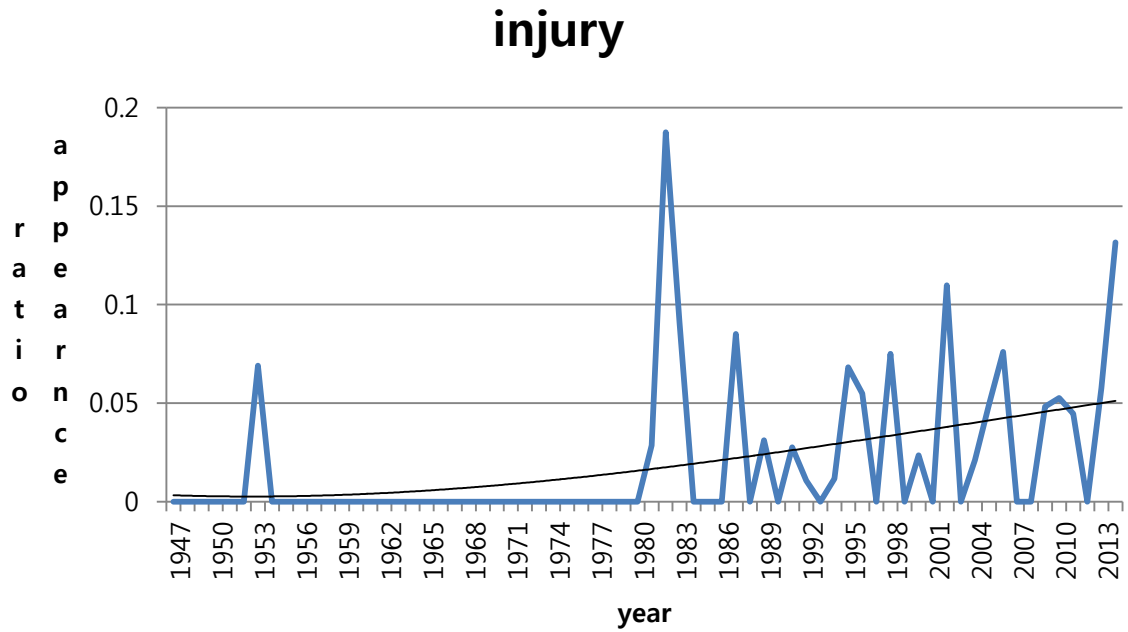
Figure 17] the appearance ratio of 'safety' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

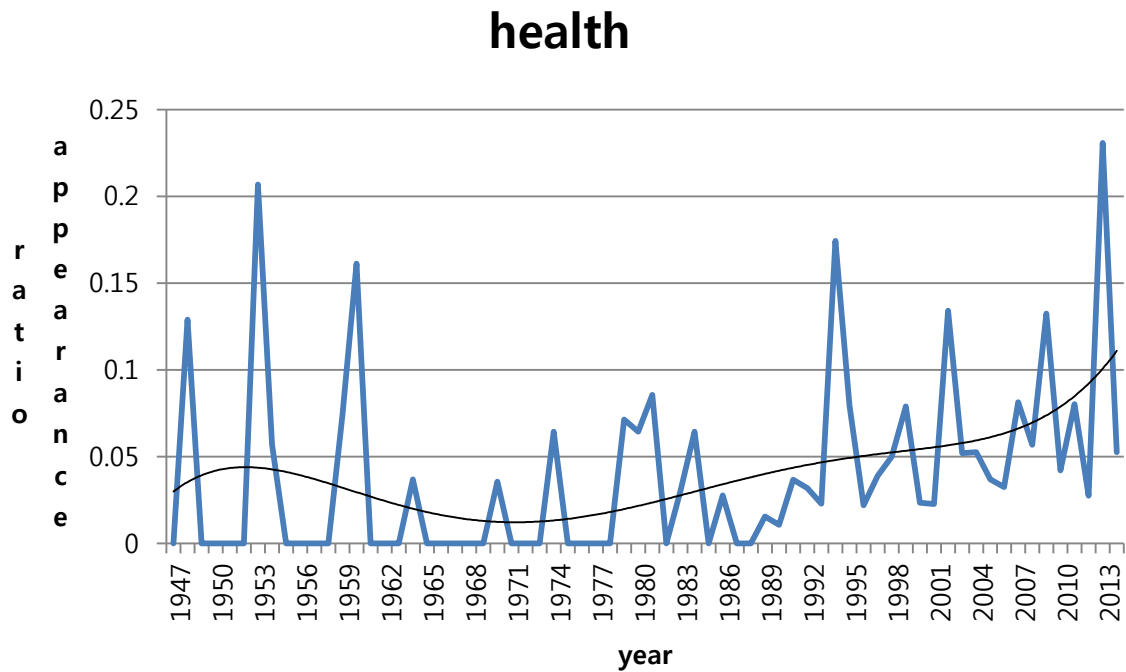
Figure 18] the appearance ratio of 'injury' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

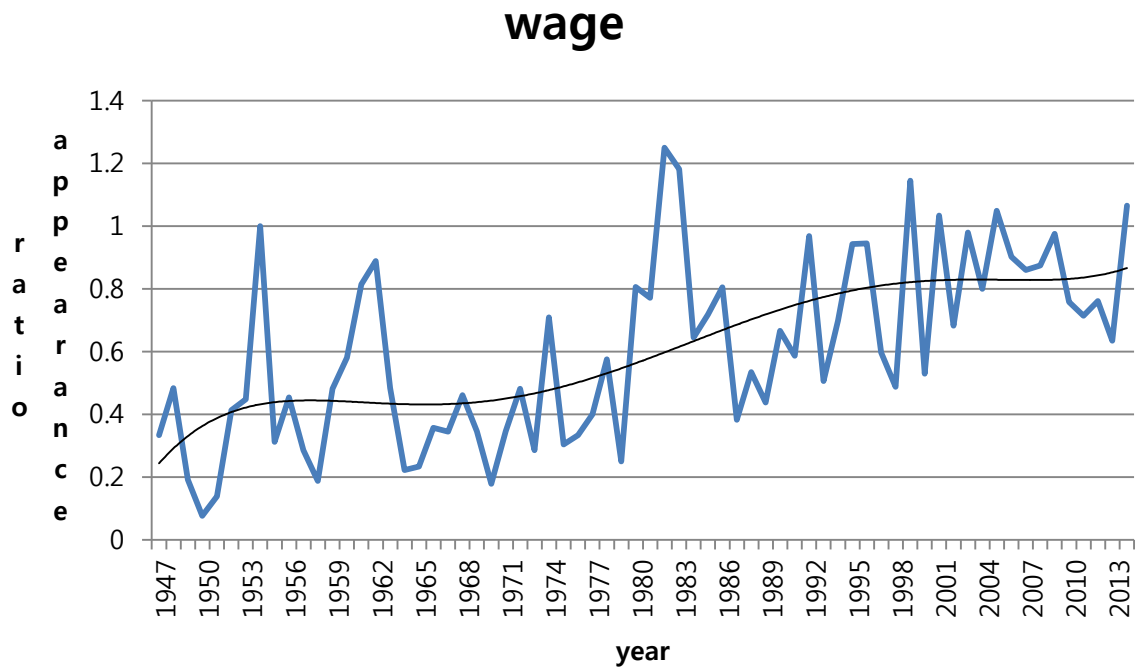
Figure 19] the appearance ratio of 'health' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

Figure 20] the appearance ratio of 'wage' by years



* $Appearance\ Ratio\ (AR) = \frac{\text{The number of appearance of a key word within a year}}{\text{The number of articles within a year}}$

* Black line is trend line.

APPENDIX. APPEARANCE RANKING BY DECADES

1947~1949

rank	keyword	1947	1948	1949	total
1	labor	15	26	27	69
2	union	6	24	35	65
3	relat	6	24	19	49
4	industri	2	27	16	45
5	bargain	1	6	20	27
6	manag	2	6	17	25
7	organ	2	10	13	25
8	wage	3	15	5	23
9	employ	3	11	8	22
10	problem	10	7	5	22
11	econom	2	10	9	21
12	act	0	7	13	20
13	strike	0	12	8	20
14	worker	4	10	6	20
15	arbitr	0	18	1	19
16	collect	1	6	12	19
17	product	3	13	3	19
18	state	0	10	9	19
19	plan	0	16	2	18
20	disput	0	10	7	17
21	employe	0	13	4	17
22	work	3	7	6	16
24	educ	13	1	1	15
25	polit	2	7	6	15
26	member	3	9	2	14
27	program	3	6	5	14
28	develop	3	8	2	13
29	public	2	6	5	13
30	board	0	5	7	12

APPENDIX. (Continued)

1950~1959

rank	keyword	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	total
1	union	41	18	18	36	32	31	36	30	41	51	334
2	labor	21	31	17	25	26	28	34	21	44	33	290
3	industri	14	17	10	29	11	19	29	16	20	26	191
4	relat	14	10	11	13	26	11	9	8	21	11	134
5	wage	2	5	12	13	35	10	15	8	6	13	119
6	worker	14	15	9	13	11	16	11	10	4	14	117
7	employ	5	6	9	4	12	5	7	14	17	16	95
8	bargain	6	9	5	9	7	10	12	11	10	9	88
9	state	7	14	5	5	4	6	4	5	18	16	84
10	organ	5	4	8	6	6	11	15	6	4	10	75
11	econom	2	1	5	14	6	17	6	3	8	7	69
12	collect	4	8	7	5	6	8	10	6	6	8	68
13	problem	6	2	4	9	7	9	3	4	15	7	66
14	trade	11	3	5	9	5	4	8	3	2	11	61
15	movement	3	8	6	4	6	6	8	2	5	11	59
16	act	2	9	2	4	2	0	2	5	30	2	58
17	program	2	16	10	2	2	5	4	5	1	10	57
18	develop	6	3	4	3	3	6	5	3	12	9	54
19	polici	1	2	2	3	8	7	4	4	9	12	52
20	chang	0	4	3	1	5	6	4	4	12	10	49
21	unit	5	11	1	2	3	7	10	2	2	6	49
22	govern	2	3	2	2	6	0	2	6	12	12	47
23	market	1	2	2	2	3	8	6	13	2	7	46
24	work	3	0	8	3	7	5	5	7	3	5	46
25	polit	1	2	3	2	6	5	6	1	10	9	45
26	group	5	0	5	2	11	6	2	5	0	8	44
27	import	3	3	2	4	6	3	8	3	3	9	44
28	use	4	3	5	4	4	3	8	3	4	6	44
29	nation	2	10	2	5	3	0	2	3	6	10	43
30	differ	1	3	2	5	4	5	5	6	3	8	42

APPENDIX. (Continued)

1960~1969

rank	keyword	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	total
1	labor	41	48	25	23	26	19	20	25	9	13	249
2	union	35	47	36	26	12	13	22	10	9	9	219
3	industri	15	23	27	17	13	13	6	11	12	5	142
4	wage	18	22	24	15	6	7	10	10	12	9	133
5	relat	14	17	20	12	19	7	5	8	3	4	109
6	state	14	9	5	13	13	16	13	11	3	5	102
7	employ	8	6	23	8	11	3	6	9	7	9	90
8	worker	17	23	10	12	3	0	0	3	9	7	84
9	develop	17	12	11	9	9	5	4	7	7	2	83
10	unit	9	4	5	7	6	15	12	14	5	4	81
11	chang	19	5	13	13	4	2	4	6	2	6	74
12	econom	9	18	10	4	9	5	5	1	7	3	71
13	problem	6	10	15	11	10	8	1	4	1	2	68
14	bargain	7	9	9	6	2	6	6	5	8	9	67
15	public	9	3	16	7	6	2	4	5	2	12	66
16	unemploy	11	2	2	10	6	2	14	10	6	0	63
17	market	9	7	7	4	2	5	5	12	6	0	57
18	collect	9	7	7	6	4	0	6	2	5	8	54
19	organ	7	14	7	9	6	3	3	1	2	2	54
20	arbitr	7	0	1	13	2	5	6	12	1	2	49
21	increas	12	6	8	4	8	0	3	5	3	0	49
22	social	24	9	1	1	9	1	0	0	3	1	49
23	work	6	5	9	8	9	3	1	1	5	0	47
24	polic	8	7	7	4	3	2	2	4	3	6	46
25	disput	8	3	4	6	4	6	4	3	0	7	45
26	trade	3	11	14	2	2	2	6	1	0	4	45
27	employe	3	1	5	4	10	1	1	5	8	6	44
28	govern	11	4	7	5	5	1	2	4	0	4	43
29	movement	8	9	9	0	6	6	1	2	1	0	42
30	structur	1	7	7	3	1	3	7	8	2	3	42

APPENDIX. (Continued)

1970~1979

rank	keyword	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	total
1	labor	14	20	10	16	19	16	11	15	14	10	148
2	union	5	14	11	8	13	17	4	11	6	23	112
3	unit	8	10	10	11	17	10	17	7	15	7	112
4	wage	5	9	13	8	22	7	7	12	19	7	109
5	state	6	11	10	10	17	11	15	7	15	6	108
6	industri	5	20	13	8	6	7	5	5	5	4	78
7	bargain	8	7	1	9	10	8	8	4	6	11	72
8	unemploy	6	2	6	2	11	5	7	25	1	5	70
9	relat	4	5	6	11	9	15	6	4	5	4	69
10	employ	7	9	14	9	1	5	5	3	7	8	68
11	earn	2	2	2	2	2	4	3	5	18	9	49
12	worker	6	5	5	2	13	0	5	2	7	4	49
13	public	5	5	3	7	4	4	2	5	4	8	47
14	program	6	1	9	3	6	0	9	6	4	1	45
15	relationship	2	5	4	7	11	0	2	8	0	3	42
16	collect	6	6	0	5	7	4	4	0	5	2	39
17	strike	2	6	8	0	2	3	8	3	2	5	39
18	chang	2	6	6	3	0	7	1	2	5	6	38
19	econom	3	3	2	3	2	3	3	14	0	5	38
20	differenti	3	1	2	2	3	1	6	4	10	3	35
21	employe	6	5	2	2	5	0	1	4	4	6	35
22	occup	4	4	2	5	5	1	8	0	2	4	35
23	system	1	0	1	4	6	6	3	10	1	3	35
24	incom	3	4	10	2	3	2	4	2	2	2	34
25	polici	3	5	6	3	5	3	2	4	1	2	34
26	rate	3	2	3	6	5	1	2	7	2	2	33
27	differ	1	2	0	4	5	2	5	2	7	4	32
28	sector	3	0	2	0	7	4	2	3	6	5	32
29	act	0	13	3	4	3	2	0	0	3	3	31
30	arbitr	1	3	7	5	3	3	0	0	2	7	31

APPENDIX. (Continued)

1980~1989

rank	keyword	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	total
1	union	56	36	50	43	38	53	53	66	82	88	565
2	wage	25	27	40	39	20	23	29	18	31	28	280
3	worker	20	23	18	31	24	27	14	37	46	34	274
4	employ	14	20	13	19	14	30	16	18	26	42	212
5	industri	11	5	9	34	13	24	23	15	28	41	203
6	bargain	12	28	13	12	7	17	23	23	12	33	180
7	labor	12	27	14	8	16	18	19	16	26	23	180
8	strike	9	18	22	13	15	4	40	8	17	17	163
9	relat	18	13	11	15	10	12	13	12	29	27	160
10	increas	17	15	13	14	18	8	15	16	17	19	152
11	job	4	24	9	7	14	14	6	20	21	17	136
12	differ	12	15	9	14	7	18	9	16	10	24	134
13	chang	8	18	11	10	1	7	16	12	8	23	114
14	analysi	9	14	16	13	9	7	15	12	10	8	113
15	earn	9	8	13	6	9	2	4	19	29	13	112
16	work	2	18	16	7	4	8	3	12	12	29	111
17	market	10	20	4	5	5	8	14	8	13	18	105
18	product	9	7	1	12	2	8	22	18	11	12	102
19	signific	6	3	10	9	9	11	10	16	17	9	100
20	firm	3	8	7	4	6	5	7	12	15	31	98
21	rate	9	18	12	9	9	3	12	6	10	10	98
22	women	9	5	6	11	9	6	6	8	20	18	98
23	benefit	12	16	13	17	0	2	16	7	6	8	97
24	sector	7	10	8	4	13	17	6	1	14	12	92
25	arbitr	0	19	1	18	0	18	6	5	15	8	90
26	men	4	5	8	7	16	5	7	10	15	11	88
27	employe	4	4	7	6	8	19	2	12	9	14	85
28	level	5	7	6	7	4	5	8	8	15	19	84
29	survey	3	4	5	3	8	10	9	10	19	12	83
30	determin	4	11	10	5	2	7	10	8	12	12	81

APPENDIX. (Continued)

1990~1999

rank	keyword	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	total
1	union	152	120	104	160	95	108	95	108	81	93	1116
2	wage	62	64	91	44	60	83	86	46	39	87	662
3	worker	43	69	41	54	45	66	63	71	64	49	565
4	industri	36	65	51	48	41	47	49	36	77	36	486
5	use	48	62	57	40	58	45	46	36	50	44	486
6	relat	52	42	49	45	52	48	48	43	57	42	478
7	employ	28	53	47	47	38	38	56	39	62	30	438
11	labor	40	29	27	21	35	28	26	27	40	23	417
8	firm	42	48	45	41	31	57	40	27	25	20	376
9	job	23	38	33	26	22	35	42	20	48	35	322
10	chang	19	37	22	37	23	38	34	30	33	33	306
12	employe	28	58	14	19	27	20	30	30	19	32	277
13	increas	26	21	37	21	22	26	27	19	27	38	264
14	work	12	31	22	24	22	27	33	35	23	30	259
15	differ	22	23	21	22	30	18	51	18	22	26	253
16	market	29	25	37	26	21	32	22	20	25	15	252
17	product	28	27	38	25	21	23	24	24	20	12	242
18	women	7	20	28	16	20	41	41	18	18	18	227
19	bargain	28	24	20	39	14	16	18	21	19	17	216
20	signific	30	31	22	16	15	25	27	12	14	19	211
21	train	10	29	3	10	17	32	44	24	18	13	200
22	manag	24	20	11	31	24	13	27	8	24	16	198
23	level	20	24	27	16	16	23	17	15	24	12	194
24	perform	39	18	14	17	16	18	32	10	4	19	187
25	rate	21	25	13	15	26	20	17	13	14	20	184
26	pay	25	7	19	22	23	18	24	5	9	21	173
27	earn	17	27	18	6	14	19	28	11	15	17	172
28	system	11	11	26	11	18	10	19	13	30	23	172
29	among	18	20	15	11	20	13	20	11	18	21	167
30	men	11	22	16	12	12	10	27	20	19	16	165

APPENDIX. (Continued)

2000~2009

rank	keyword	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	total
1	union	76	70	117	80	124	91	94	65	98	103	918
2	wage	45	91	56	94	76	85	83	74	77	81	762
3	employ	62	63	47	64	91	54	82	69	62	90	684
4	worker	50	75	57	77	75	59	65	78	52	62	650
5	work	40	43	37	73	62	48	51	58	34	70	516
7	labor	54	27	28	53	47	21	35	30	36	23	491
6	relat	44	57	37	54	42	53	43	35	48	34	447
8	employe	40	34	18	26	55	26	55	21	36	33	344
9	job	16	43	29	32	33	55	31	25	42	38	344
10	industri	32	46	43	33	22	31	38	47	28	22	342
11	increas	29	44	22	20	41	33	29	39	34	20	311
12	differ	23	35	29	28	18	22	30	39	38	24	286
13	firm	14	20	43	23	33	27	38	35	27	20	280
14	market	28	14	23	43	31	19	42	35	16	21	272
15	chang	19	26	24	23	38	38	19	22	28	22	259
16	workplac	20	26	13	13	35	15	37	27	39	16	241
17	associ	16	21	14	24	28	20	23	29	25	24	224
18	suggest	15	25	26	27	27	20	16	19	30	15	220
19	practic	29	21	20	24	17	18	30	19	24	12	214
20	manag	24	20	19	23	28	14	26	12	18	17	201
21	system	22	9	29	15	26	6	24	20	13	27	191
22	earn	19	24	14	22	18	20	17	15	32	8	189
23	women	33	10	15	29	11	22	19	12	14	19	184
24	organ	19	20	20	18	16	13	30	15	15	13	179
25	perform	18	14	19	23	19	15	23	14	17	12	174
26	level	23	20	15	16	15	20	13	18	19	14	173
27	relationship	16	11	13	21	27	13	17	23	25	6	172
28	rate	23	20	14	18	16	26	13	16	10	13	169
29	new	18	17	15	14	22	16	25	14	13	13	167
30	pay	17	5	12	14	22	8	12	24	41	11	166

APPENDIX. (Continued)

2010~2014

rank	keyword	2010	2011	2012	2013	2014	total
1	union	99	92	113	145	96	545
2	worker	86	101	81	73	54	395
3	employ	65	65	101	77	75	383
4	wage	72	80	83	66	81	382
5	labor	47	40	52	48	25	325
6	work	78	65	61	71	35	310
7	job	59	43	66	59	41	268
8	firm	17	61	64	62	59	263
9	relat	37	55	69	62	25	248
10	employe	43	44	58	60	24	229
11	differ	49	37	45	59	24	214
12	increas	42	38	47	34	30	191
13	industri	21	39	43	32	22	157
14	chang	25	26	44	26	29	150
15	market	29	28	37	30	14	138
16	practic	25	31	36	32	13	137
17	state	30	20	38	28	21	137
18	estim	21	35	29	17	23	125
19	workplac	36	20	18	28	20	122
20	associ	21	28	19	28	23	119
21	institut	18	17	43	25	13	116
22	individu	30	22	16	28	19	115
23	product	17	21	40	32	5	115
24	organ	19	23	28	27	16	113
25	level	10	20	33	33	13	109
26	model	26	26	21	17	18	108
27	pay	28	22	16	25	17	108
28	perform	26	30	22	20	10	108
29	research	21	21	19	28	18	107
30	time	33	29	21	17	5	105