

The Changing Trend of Collaboration Patterns in the Social Sciences: Institutional Influences on Academic Research in Korea, 2013-2016

Ho-Dae Chong, Jong-Kil Kim

Abstract—Collaborative research has become more prevalent and important across disciplines because it stimulates innovation and interaction between scholars. Seeing as existing studies relatively disregarded the institutional conditions triggering collaborative research, this work aims to analyze the changing trend in collaborative work patterns among Korean social scientists. The focus of this research is the performance of social scientists who received research grants through the government's Social Science Korea (SSK) program. Using quantitative statistical methods, collaborative research patterns in a total of 2,354 papers published under the umbrella of the SSK program in peer-reviewed scholarly journals from 2013 to 2016 were examined to identify changing trends and triggering factors in collaborative research. A notable finding is that the share of collaborative research is overwhelmingly higher than that of individual research. In particular, levels of collaborative research surpassed 70%, increasing much quicker compared to other research done in the social sciences. Additionally, the most common composition of collaborative research was for two or three researchers to conduct joint research as coauthors, and this proportion has also increased steadily. Finally, a strong association between international journals and co-authorship patterns was found for the papers published by SSK program researchers from 2013 to 2016. The SSK program can be seen as the driving force behind collaboration between social scientists. Its emphasis on competition through a merit-based financial support system along with a rigorous evaluation process seems to have influenced researchers to cooperate with those who have similar research interests.

Keywords—Co-authorship, collaboration, competition, cooperation, Social Science Korea, policy

I. INTRODUCTION

COLLABORATIVE research has long been an intriguing subject for many researchers. Particularly, they are interested in what facilitates collaborative research in the academic field, why researchers engage in collaborative research, and whether this research actually yields better results than that of single research. Recently, many scholars have been conducting various studies on so-called “scientific” or “intellectual” collaboration [1], [2]. Some studies found that the nature of the discipline itself is an important factor in promoting individual or collaborative research [3]. The humanities are distinguished from the natural sciences by the researchers performing in-depth studies on specific subjects alone. On the other hand, in the case of natural sciences, it is

often said that it is universal to do collective research in a laboratory-like space. However, with regard to this issue, [4] showed that a “teamwork model” has become a more prevalent research pattern than an “individual-based model (solo authors)” across disciplines such as science and engineering, social sciences, and arts and humanities.

A series of studies conducted in the field of social sciences show that there is an increasing trend of collaboration among social scientists [5]-[7]. Reference [7] suggested that collaborative research is prominent in the disciplines where quantitative research is widely used. In this case, researchers who are competent in quantitative analysis and researchers who are fluent in theoretical interpretation or who are experts in a specific subject will try to complement each other's weaknesses by conducting collaborative research. Indeed, Moody found increasing co-authorship is commonly observed in research trends beyond disciplinary boundaries. After examining two major sociology journals – *Korean Journal of Sociology (KJS)* and *Economy and Society (ES)* – in Korea, [6] reported that the share of joint research papers has increased steadily since the 2000s. *Korean Journal of Sociology (KJS)* is the Korean Sociological Association's official journal. KJS was first published in 1964 and is currently published four times a year. *Economy and Society (ES)* is a social science journal that has been published since 1988 by the Critical Sociological Association of Korea, which is an academic association centered around sociologists who have a more critical orientation towards social problems. It is now in the form of a quarterly journal. In the case of *KJS* over a period of fifty years (1964-2014), Some 20% of all research papers were published by two or more authors while 80% were published by a single author. However, looking at the trends from 2010 to 2014, co-authorship pattern in *KJS* has reported an annual average of 30-40%. In the case of *ES*, the majority of papers were published by a sole author up to 2002. However, since the late 2000s, the rate of collaborative forms increased, but until 2014, the proportion remains relatively small.

Although existing studies point out the increasing tendency of collaborative research in various academic fields, it seems that they commonly did not pay serious attention to under what institutional conditions collaborative research became more prevalent. The central concern of this work is to examine whether there have been any meaningful changes in collaborative work patterns among social scientists in Korea. Especially, this research focuses on the performance of social scientists who received research grants through the Korean

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government's academic support policy, the Social Science Korea (SSK) program. The SSK program is unique in that it provides a huge amount of financial support for up to 10 years to social scientists who are selected through a screening process. The SSK program launched in 2010 with researchers receiving a total of \$13 million, and since then, the amount given in grants has risen to \$28 million annually. If there are any identifiable changing trends in collaborative research, this study attempts to retrieve what they are and what might be triggering factor(s) that facilitate collaboration patterns by examining co-authorship trends over time.

Research Background: The SSK

The Korean government implemented a merit-based large-scale financial support program, the Social Science Korea (SSK) research support program since 2010. The SSK has started to respond to the criticism that social sciences in Korea were failing to respond effectively despite mounting social problems such as rapid aging of the population, rapid decline in fertility, the advent of a multicultural society, an increase in the rate of youth unemployment, and the deepening of socio-economic inequality in Korean society. Thus, the main purpose of the SSK program is to advance Korean social sciences so as to foster research groups that deliver world-

class research achievements. At the same time, it is expected that social science research that is generated through this program would be able to provide an appropriate diagnosis and desirable solutions to the aforementioned social problems [8].

As an initial step for this program, the National Research Foundation of Korea (NRF), which can be compared with the National Science Foundation (NSF) in the USA, conducted exploratory research to choose relevant research subjects that would be worthy of research with financial support. Then, from 2010 to 2013, the NRF annually selected research teams. The selected research teams were evaluated for their research performance once a year. These research teams also received a comprehensive evaluation of their research achievements three years after the research began. Such a comprehensive assessment is referred to as a "stage evaluation." If the research team passes the assessment, they will receive a research grant for the next three years. One interesting point here is that research teams that have passed the stage evaluation receive more financial support in their next grant. In other words, the logic of competition and survival of the fittest is working in the evaluation process.

TABLE I
COLLABORATIVE RESEARCH PATTERNS AMONG RESEARCHERS PARTICIPATING IN THE SSK PROJECT, 2011-2016

# of authors per paper	Year of Publications								
	2011	2012	The 1 st half of 2013	2011-2013**	The 2 nd half of 2013	2014	2015	The 1 st half of 2016	2013-2016
1	104 (43.0)*	166 (32.8)	94 (30.6)	364 (34.5)	126 (29.2)	167 (26.1)	204 (24.9)	107 (23.1)	604 (25.7)
2	78 (32.2)	193 (38.1)	118 (38.4)	389 (36.9)	152 (35.3)	231 (36.0)	288 (35.2)	175 (37.8)	846 (35.9)
3	43 (17.8)	97 (19.2)	61 (19.9)	201 (19.1)	89 (20.6)	134 (20.9)	197 (24.1)	104 (22.5)	524 (22.3)
4	7 (2.9)	31 (6.1)	27 (8.8)	65 (6.2)	41 (9.5)	52 (8.1)	71 (8.7)	32 (6.9)	196 (8.3)
≥ 5	10 (4.1)	19 (3.8)	7 (2.3)	36 (3.4)	23 (5.3)	57 (8.8)	59 (7.2)	45 (9.7)	184 (7.8)
N	242 (100)	506 (100)	307 (100)	1055	431 (100)	641 (100)	819 (100)	463 (100)	2354

* Numbers in parentheses indicate percentages

** As already mentioned in footnote 6, the data from 2011 to 2013 are based on [9]. Since the Jong-Kil Kim is a coauthor of this work as well as a corresponding author of [9], this work uses some of data under Kim's permission.

In addition to the competitive mechanism, the SSK program underscores cooperation. This is designed to encourage research cooperation through step-by-step growth from research team (small) to research group (medium) to research center (large). The minimum requirements for the formation of a research team are that it should consist of researchers with at least three PhD holders, including one principal investigator. Research groups and research centers have the same composition as research teams in that they should be composed of researchers with a PhD including a single principal investigator. However, there is a difference in the number of the researchers. Research groups and research centers should be composed of at least seven and 13 researchers, respectively. A research team receives a research grant of about \$100,000 a year. Research groups and research centers, which have grown in size, receive \$230,000 and \$450,000 a year, respectively. In particular, the SSK program actively encourages autonomous coalition among research teams sharing similar research interests. Encouraging

collaboration among research teams is reflected in the assessment process. If two or three research teams join together and want to receive a stage assessment, the NRF makes a relatively favorable assessment of the combined research groups. The emphasis on cooperation is due to the following diagnosis that in the case of Korean social sciences, active academic exchange and cooperation between different disciplines are relatively rare. By breaking down the barriers between branches, it is encouraging cross-sectional cooperation in the intention to create an academic climate where more creative and innovative research results can be generated in the Korean social science system.

II. DATA AND METHODS

The primary interest of this research is to identify what type of collaborative research is prevalent and taking place among researchers involved in the SSK project. For this purpose, data sets based on the information provided by the NRF are constructed for quantitative analyses. This work particularly

focuses on the publication results of academic journals by researchers who belonged to the research groups from 2013-2016. During this period, more than 500 social scientists belonging to a total of 25 research groups conducted research with financial support from the SSK program. A total of 92 research teams were selected in 2010 when the SSK project began. In 2013, there was a stage assessment of the three years of research achievements conducted by researchers. As a result, a total of 38 small-scale research teams were selected and developed into mid-sized research groups capable of carrying

out research with more financial support. Since 2010, there have been numerous unions between research teams or between research teams and research groups. In 2016, stage assessments of research groups were undertaken. Seventeen of the 25 research groups passed the stage assessment and are currently growing into research centers. The results of quantitative analyses in this study are grounded on scholarly performances – that is, publication records of the 25 research groups.

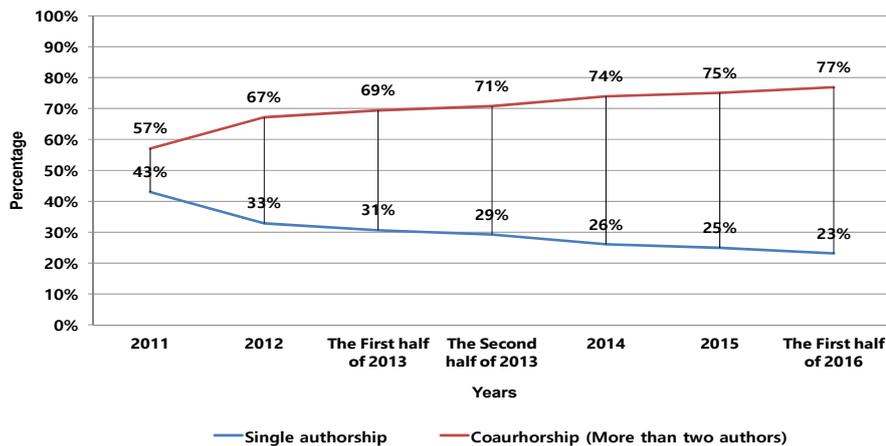


Fig. 1 The Comparison of Single Authorship and Co-authorship Research by the Members of the SSK Project in South Korea, 2011-2016. Note: This figure shows an increasing trend in co-authorship works among Korean social scientists who received financial support under the umbrella of the SSK project from 2011 to 2016. Of the papers that were analyzed in this study, the proportion of single authors decreased from 43% in 2011 to 23% in 2016. On the other hand, papers published by two or more authors increased from 57% in 2011 to 77% in 2016

Moreover, while conducting basic analysis, the major interest was in the characteristics of collaborative research patterns in a total of 2,354 papers published by researchers in peer-reviewed scholarly journals from 2013 to 2016. Although data sets were constructed by collecting information from a wide variety of publications, for a more focused analysis, scholarly works published in the form of books or book chapters were excluded. This is due to the fact that scholarly journals generally have a more rigorous publication process than books or book chapters in the field of social sciences. Three issues were focused on in the analysis of collaborative research patterns First, the degree of individual research and joint research in the whole study was analyzed. If the paper was written by two or more researchers, this was considered a collaborative work. Second, in the case of collaborative research, the number of researchers working together to publish a paper was examined. Lastly, after classifying the journals into two categories, international versus domestic journals, the proportion of joint research between the two was compared.

III. RESULTS AND DISCUSSIONS

The first notable finding of our analysis is that the share of collaborative research is overwhelmingly higher than that of individual research. This trend has been consistent across the

years from 2013 to 2016.

For a more in-depth comparison of the share of collaborative and individual research and their changing trends, this work takes into account what happened in 2011-2013 after the start of the SSK program. To do so, this study refers to the study of [9]. Reference [9] conducted an analysis of the publication records produced by the members of research teams of the SSK project since 2010, over a period of three years (2011-2013). The data presented in this paper from 2011 to the first half of 2013 are based on [9]. Since Jong-Kil Kim, a coauthor of this paper, was a corresponding author in the paper of [9], this work uses some of Park et al.'s data under Kim's permission.

Fig. 1 clearly shows the changing trend of collaborative research over the years of 2011 to 2016 (see also Table I). During this period, the share of collaborative research increased from 57% in 2011 to 77% in 2016. By contrast, the share of individual research decreased from 43% in 2011 to 23% in 2016. In addition, the share of overall independent research during the first three years (2011-2013) of the SSK project was 34.5%, but it decreased to 25.7% during the next three years (2013-2016). Therefore, based on the research, it can be said that about three quarters of the recent results generated by the researchers involved in the SSK project are the result of collaborative research.

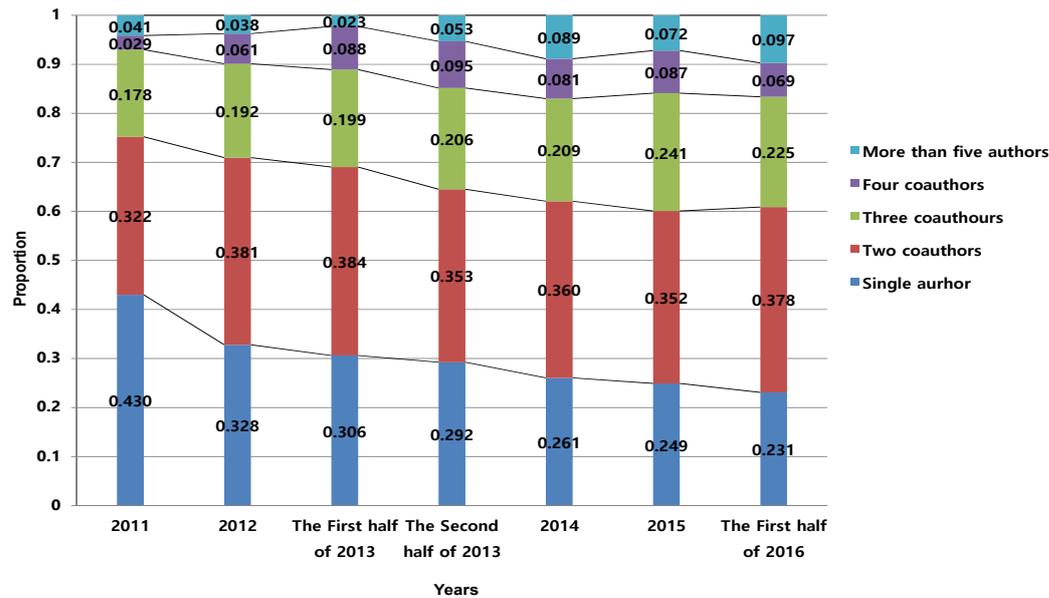


Fig. 2 The Concrete Changing Proportion of Collaborative Research Trends by the Members of the SSK Project in South Korea, 2011-2016. Note: This figure shows how researchers performed their research – single or joint research – when publishing their research in the form of a scholarly paper, and how many people worked together if they conducted collaborative research. In 2011, the proportion of independent research papers was the highest (0.43=14/242). The proportion of joint research articles written by two and three persons was 0.32 and 0.18, respectively. However, in 2016, the share of joint research papers by two persons increased to 0.38 (0.38=175/463), accounting for the largest proportion of total research papers analyzed, while the proportion of independent research papers fell to 0.23. In addition, the share of joint research papers by three authors was 0.23, which was higher than 0.18 in 2011

Second, after identifying collaborative research as a more dominant form of research, the composition of collaborative research was examined in more detail; that is, how many researchers were involved per paper in the case of collaborative research. Fig. 2 displays the concrete proportion of collaborative research (see also Table I). The most common way was for two researchers to conduct joint research as coauthors. This trend continued through the early (2011-2013) and middle stage (2013-2016) of the SSK project. At the same time, the proportion has also increased from 0.32 in 2011 to 0.38 in 2016. The second most prominent form of collaborative research was the case of three researchers working together. This type of collaborative research also increased from 0.18 in 2011 to 0.24 in 2015, and then decreased slightly to reach 0.23 in 2016.

Let us look briefly at what these analyses implicate. Collaborative research is much more widely used and preferred than single research for researchers participating in the SSK program. Recall that in the case of *KJS*, co-authorship for 2010-2014 is about 30-40% of the total number of articles in the journal [7]. However, research under the umbrella of the SSK program showed levels of collaborative research surpassing 70%. Compared to other research done in the social sciences [10], [11], the increase in speed of collaboration within the SSK program was far superior. The explanation that can be drawn from these findings is that financial support and evaluation that characterize the SSK program can function as carrots and sticks promoting collaborative research for social scientists.

Lastly, after classifying the journals into two categories, international versus domestic journals, it is examined whether there is a meaningful difference in the co-authorship ratio between the papers published in international journals and those published in domestic journals. It is the odds ratio that is used for this analysis. Table II presents the value of odds ratio (θ) in each year. The odds ratio in the 2nd half of 2013 is 2.06. It means that the odds of co-authorship paper in international journals are an estimated 2.06 times the odds of a co-authorship paper in domestic journals. The 95% confidence interval for this odds ratio is between 1.23 and 3.43. International journals are considered to be associated with co-authorship since being published in international journals raised the odds of taking the forms of co-authorship paper. This positively strong association between international journals and co-authorship patterns is consistent throughout this research period even though there are some variations ($\theta = 1.35$ in 2014, $\theta = 1.72$ in 2015, $\theta = 1.9$ in 2016 with 95 % confidence interval).

How should it be understood when the proportion of joint research is overwhelmingly larger than that of single research in the case where research results under the SSK program are published in international rather than domestic journals? Today, most social scientists are basically nesting in higher education institutions or research institutes at the national level. They are also involved in academic exchanges in a variety of ways such as associations, journals, and councils at the international level. Yet, the field of globalized social sciences is not flat but hierarchical. There are countries or regions that dominate the

global academic arena and dynamically drive the production and consumption of knowledge and ideas [12]-[14]. Therefore, it is implicitly acknowledged that publishing articles in international journals is much more challenging and requires

more effort than domestic ones. This study indirectly shows that collaborative research could be a more useful way of gaining scholarly recognition than individual research in highly competitive international academic fields.

TABLE II
SINGLE AND CO-AUTHORED CLASSIFICATIONS BASED ON INTERNATIONAL JOURNALS AND DOMESTIC JOURNALS, 2013-2016

# of Authors per Paper	The 2 nd half of 2013			2014			2015			The 1 st half of 2016		
	Int'l. J.*	Dom. J.**	Total	Int'l. J.	Dom. J.	Total	Int'l. J.	Dom. J.	Total	Int'l. J.	Dom. J.	Total
≥ 2	96 (80.7)***	209 (67.0)	305 (70.8)	145 (78.0)	329 (72.3)	474 (73.9)	190 (81.9)	425 (72.4)	615 (75.1)	113 (84.3)	243 (73.9)	356 (76.9)
1	23 (19.3)	103 (33.0)	126 (29.2)	41 (22.0)	126 (27.7)	167 (26.1)	42 (18.1)	162 (27.6)	204 (24.9)	21 (15.7)	86 (26.1)	107 (23.1)
N	119 (100)	312 (100)	431 (100)	186 (100)	455 (100)	641 (100)	232 (100)	587 (100)	819 (100)	134 (100)	329 (100)	463 (100)
Odds Ratio (θ)	2.06			1.35			1.72			1.9		
95% Confidence Interval	(1.23, 3.43)			(0.91, 2.03)			(1.18, 2.52)			(1.12, 3.22)		

*International journals (Int'l. J.) represent academic journals that are counted as SCI, SSCI, A&HCI, SCIE, and SCOPUS.

**Domestic journals (Dom. J.) are academic journals published in Korea. In Korea, academic journals are commonly categorized as registered journals and unregistered journals. The National Research Foundation of Korea (NRF) regularly conducts an evaluation of the quality the journals. Once the journals are classified as registered journals, the journals receive financial support from the government for publication.

***Numbers in parentheses indicate percentages.

IV. CONCLUDING REMARKS

Collaborative research patterns are becoming increasingly important. However, this is not because they are more popular or prevalent across disciplines, but because collaborative research seems to bring about innovative ideas and vitalize intellectual interactions among scholars. It is critical to note that it is now a fairly lax argument to explain the prevalence of collaborative research by simply reducing it to the attributes of a particular academic discipline. The case of the SSK program provides vital counterevidence to the argument that the activation of collaborative research is centered on attributes.

The significance of collaborative research lies not so much in the attributes of individual scholars or a single discipline. Rather, it is in scholarly relations (as contents) and relationships (as forms) among researchers and different disciplines [15]-[17]. As is well-known, [18] showed that financial support tended to facilitate collaborative research in the natural sciences. Government-led large-scale support policies for scientific research functioned as a stimulant to formulate an institutionalized academic community in general and collaborative research patterns in particular. But financial support is not enough. Rather, a policy that emphasizes competition and cooperation among scholars must be combined with financial aid to truly be effective.

The SSK program can be regarded as the institutional backdrop that motivated collaboration between scholars. It is competition and cooperation that are the two central mechanisms sustaining the SSK program. The underscoring of competition, which is constantly triggered by a merit-based financial support policy and constant evaluation, seems to motivate collaborative research among those who share research interests so as to result in a more productive outcome. The stress on cooperation beyond interdisciplinary boundaries by the SSK program is likely to lead to collaborative research patterns among social scientists.

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