

Academic Experience, Overseas Experience and Chinese Scholars' Propensity Towards International Collaboration

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Abstract

Taking the Chinese inland scholars' co-authorships in the 10 leading international academic journals in the field of technological innovation management from 1990 to 2016 as the sample, the article empirically investigates factors which influence Chinese inland scholars' propensity towards international collaboration with Logistic regression model. The empirical results show that Chinese inland scholars who have overseas education background show higher propensity towards international collaboration. However, both the overseas academic exchange experience and academic experience have no significant impacts on the propensity towards international collaboration.

Keywords: Propensity towards international collaboration; Academic experience; Overseas experience

1. Introduction

At the beginning of the 20th century, scientific papers written by more than one author were relatively rare (Acedo et al., 2006). However, interdisciplinary interdependence and penetration have facilitated collaboration among researchers in recent decades. It has become a common phenomenon that scholars from different countries and institutions cooperate to publish papers (Gazni et al., 2012).

Previous literature on international co-authorships among scholars mainly focuses on three research themes. First, one of the research streams focuses on the driving factors of international co-authorships among scholars. It has been claimed that both the advent of information technology (such as e-mail) and the lower international communication costs provided more international collaboration opportunities for scholars (Ding et al., 2010). Wagner & Leydesdorff (2005) argue that individual researchers adopted the preferential attachment mechanism in order to achieve higher reputation and visibility. In addition, Georghiou (1998) finds that the increasing number of bilateral research agreements, particularly those involving "big science" projects, have facilitated international cooperation researches. Furthermore, in order to improve the competitive edge in specific research areas, policy makers also encourage scientists using "co-competition" strategies for interdisciplinary, cross-department, cross-organization and cross-borders in scientific research (Brandenburger & Nalebuff, 1996). The Second research stream focuses on analyzing the characteristics of international co-authorships in specific research areas or research institutions. Leydesdorff & Wagner (2008) examines the international co-authorship network for the Science Citation Index (SCI) from 1990 to 2005, and find that at the global level the network exists primarily as a self-organizing system. Finally, another research stream focuses on analyzing the impact of international co-authorships on their research outputs (Goldfinch et al., 2003; Fu et al., 2011). Goldfinch et al. (2003) find that scientists working on the periphery looking to increase the visibility of their research should strive to link their research to the international research community, particularly through co-publication with international authors. Besides, Fu et al. (2011) find that international collaboration has effectively improved the citations of Chinese scholars.

In conclusion, the extant literature mainly investigates the driving factors of international co-authorships, the patterns and characteristics of international co-authorships, and the influence of international co-authorships on scientific research output. The literature contributes to a more comprehensive understanding of the phenomenon of international co-authorships and their policy implications. However, the extant literature still has the following research limitations: First, it has been suggested that information technology, preferential attachment and government incentives are the main driving factors for establishing international co-authorships among scholars (Ding et al., 2010; Wagner & Leydesdorff, 2005; Brandenburger & Nalebuff, 2011). However, these external factors cannot be used to explain the heterogeneity in the individual scholars' propensity towards international collaboration. Secondly, it has been emphasized that international collaboration may promote the quality of research output, but few literature has investigated factors which influence the quality of research output under the background of international co-authorships. Finally, the literature on international co-authorships of Chinese scholars has not distinguished scholars from mainland China and those from Chinese Hong Kong, Chinese Macao

and Chinese Taiwan. As the distribution of international collaboration among Chinese regions is highly skewed (Zhou & Glanzel, 2010), universities and research institutions in Chinese Hong Kong, Chinese Macao and Chinese Taiwan have higher degree of internationalization characteristics and higher proportion of international co-authored papers than that of inland China, which covers the fact that Chinese inland scholars have a lower proportion of international co-authored papers. In view of this, the article takes the Chinese inland scholars' co-authorships in the field of technological innovation management as the sample, and analyzes the influence of Chinese inland scholars' academic experience and overseas experience on the propensity towards international collaboration.

2 Research Design

2.1 Sample Selection and Data Sources

Academic papers are the "explicit product" of scientific research cooperation (Katz & Martin, 1997). The article analyzes the Chinese inland scholars' co-authorships in the field of technological innovation management from 1990 to 2016. The bibliometric data was sourced from Thomson Reuters' Web of Science (WoS). The data collection process is as follows: Firstly, 10 leading international academic journals in the field of technology innovation management were listed by the International Association for the Management of Technology (IAMOT) in 2009, which includes *Research Policy*, *Technovation*, *IEEE Transactions on Engineering Management*, *R&D Management*, *Journal of Product Innovation Management*, *Technological Forecasting and Social Change*, *Technology Analysis and Strategic Management*, *International Journal of Technology Management*, *Research Technology Management*, *Journal of Engineering and Technology Management*. These journals are used as the source of article retrieval; Secondly, using the advanced retrieval function provided by Web of Science, We use the option of "SO (publication name)" and "AD (address)" for joint retrieval. For example, "SO = Research Policy AND AD = China". A total of 578 papers were retrieved, and the date of retrieval was January 15, 2017. Based on the search results, the bibliographic information is collected, including the title of articles, the names of all authors, the institutions, and the countries. We also summarize the number of collaborators and the number of countries as well as the number of citations.

To some extent the author's signature order reflects the author's contributions to the academic papers, we only consider Chinese inland scholars with signature in the top three. Firstly, according to the condition whether the affiliation of the top three authors contains "China", and 411 authors were screened out; Secondly, we eliminated authors whose affiliations were not located in inland China (excluding Chinese Hong Kong, Chinese Macao and Chinese Taiwan) as well as their affiliations belong to Sino-foreign cooperative education (Such as Xi'an Jiaotong-Liverpool University); Thirdly, this paper mainly investigates the international co-authorships of Chinese inland scholars. Therefore, we further excluded 45 scholars with solo-authored articles; Finally, in order to avoid the same surname and given name, we make use of the author's name and affiliation to match one by one. If necessary, we search the scholars' personal home page or faculty information in their affiliations to ensure that the list of authors is not duplicated. In addition, some variables are measured by the author's biographical information in the empirical analysis. We removed authors whose personal information is missed and a total of 164 Chinese inland scholars were identified.

2.2 Variable Measurement

2.2.1 Dependent Variable: Propensity Towards International Collaboration

This paper divides the co-authorships among Chinese inland scholars into two categories: domestic co-authorships and international co-authorships, and domestic co-authorships including intra-institutional collaboration and inter-institutional collaboration. The collaborative propensity indicates a scholar's predominant authorship category compared to other authorship categories or the average of all the scholars. It is measured by the authorship category with the largest proportion of papers. For some scholars, who have the same proportion for two or three categories, we further divided the proportion by the average proportion of each category among all the 164 scholars, and found the category with the largest ratio to represent a scholar's collaborative propensity (Li et al., 2015). For example, we know the average percentages of internationally co-authored and domestically co-authored papers among all the 164 scholars are 56% and 44% respectively, and the percentages for each category for scholar i are 60% and 40% respectively, we therefore consider that scholar i has a propensity towards international collaboration. By way of further example, if the percentages for each category for scholar j are 50% and 50% respectively, we divide the percentages by the average percentages and get results of 89% ($50\%/56\%$) and 114% ($50\%/44\%$) respectively. Based on the results, we consider scholar j to have a propensity towards domestic collaboration. The propensity towards international collaboration of the Chinese inland scholar i is taken as a dummy variable in the empirical analysis: The value equals 1 if the scholar i has a propensity towards international collaboration, and otherwise the value is 0.

2.2.2 Independent Variables

Academic experience reflects the problem solving methods accumulated by individual scholars in the process of

research. Lee & Bozeman(2005) find that senior scholars (such as tenured professor and research group leaders) have more professional knowledge and scientific and technological human capital. Moreover, through long-term communication and interaction with other scholars, they have accumulated rich cooperation experience and thus are more likely to publish high-quality academic papers. In addition, the existing literature (e.g. Fu et al., 2011) has shown that international co-authorships usually improve the quality of scientific research outputs of individual scholars. Therefore, we predict that the inland scholars who participate in or establish international co-authorships in order to improve the quality of scientific research output and obtain higher academic influence, are more likely that international co-authorship will be the predominant authorship category. In this article, the time interval (year) is from the year of inland scholar i obtaining a Ph. D. degree to the year 2016, which is used as a measure of the academic experience for inland scholars; if the inland scholar i did not obtain a Ph.D. degree, we used the time interval (year) as an alternative proxy for academic experience, which is measured from the year of the first SSCI/SCI article published by the scholar to the year 2016.

Overseas experience involves overseas education background and overseas academic exchange experiences of inland scholars. Jonkers & Cruz-Castro (2013) have shown that scholars with foreign work experiences prefer to publish papers through international co-authorships, and these scholars usually publish papers in journals with high-impact factors. On the one hand, individual scholars who have obtained a Ph. D. degree abroad or overseas academic exchange experience can more easily acquire knowledge and skills from foreign universities or research institutions, which are more likely to improve the quality of research. On the other hand, scholars with overseas experience are more easily to access overseas academic networks and obtain international academic resources, which are more likely to establish international co-authorships with foreign scholars. Therefore, we expect that the overseas education background and overseas academic exchange experiences of inland scholars will have a positive impact on inland scholars' propensity towards international collaboration. An individual scholar's overseas education background is measured by whether he/she has earned a Ph.D. degree at abroad. An individual scholar's overseas academic exchange experience is measured by the time (month) of further education abroad, overseas visit or post-doctoral research.

Moreover, gender is the standard control variable in the study of individual behavior. Thus we add gender as a control variable into the model when analyzing the inland scholars' propensity towards international collaboration.

Table 1 Definition and Measurement of Research Variables

Variable	Description	Measurement
CollPatt	Measurement of propensity towards international collaborations (Dependent variable)	The value is 1 if the scholar i has a propensity towards international collaboration, and otherwise the value is 0.
AcadExpe	Measurement of academic experience (Independent variable)	The time interval (year) is from the year of inland scholar i obtaining a Ph.D. degree to the year 2016, which is used as a measure of the academic experience; if the inland scholar i did not obtain a Ph.D., we used the time interval (year) as an alternative proxy, which is from the year of the first SSCI/SCI article published by the scholar to the year 2016.
OverExch	Measurement of overseas academic exchange experiences (Independent variable)	The accumulative time (month) of scholar i studying abroad, visiting or post-doctoral research, values are nonnegative integers.
DumPhD	Measurement of overseas education background (Independent variable)	The value is 1 if the scholar i holds a Ph.D. degree granted by a foreign university, and otherwise the value is 0.
Gender	Measurement of gender (control variable)	The value of this variable is 1 if the scholar i is "male", and otherwise the value is 0.

3 Empirical Research

3.1 Descriptive Statistics and Correlation Matrix

Before the empirical analysis, we conducted the descriptive statistical analysis and the correlation analysis for all variables (see Table 2). As seen in Table 2, more than half (55%) of Chinese inland scholars prefer international co-authorships in the field of technological innovation management. On average, the time for Chinese inland scholars to obtain Ph.D. degrees or publish the first SSCI/SCI paper is about 2004. The overseas academic

exchanges experience of Chinese inland scholars has an average of more than half a year. Moreover, about 30% of the Chinese inland scholars obtained Ph.D. degrees abroad. The proportion of male scholars is 82% in the sample.

From table 2, it can be seen that Chinese inland scholars who obtain Ph. D. degrees abroad have a significant positive correlation with their propensity towards international collaboration; it shows that Chinese inland scholars have a particular form of "resources", which may be influencing factors for their propensity towards international collaboration. Besides, there are also significant correlations between overseas academic exchange experience, overseas education background and academic experience.

Table 2 Descriptive Statistics and Correlation Matrix

Variable	Mean	S.D.	(1)	(2)	(3)	(4)
(1)CollPatt	0.55	0.499	1			
(2)AcadExpe	11.87	6.846	-0.7	1		
(3)OverExch	7.622	10.6443	-0.64	0.24***	1	
(4)DumPhD	0.3	0.459	0.19**	-0.274***	-0.205***	1
(5)Gender	0.82	0.383	-0.163**	0.124	-0.16	-0.82

P<0.05, *P<0.01

3.2 Influential Factors of Propensity Towards International Collaboration of Mainland Scholars: Logical Regression Results And Discussion

This article takes academic experience, overseas academic exchange experience and overseas education background as the influence factors of Chinese inland scholars' propensity towards international collaboration. Because the dependent variable propensity towards international collaboration is a dummy variable, so we construct a Logistic regression model. The empirical analysis results are shown in Table 3.

As can be seen from Table 3, as one of the measurements on overseas experience, the Chinese inland scholars of overseas education background (DumPhD) has a significant positive impact on their propensity towards international collaboration ($\beta = 0.904, p < 0.05$, odds ratio=2.471), which means that in the aspect of propensity towards international collaboration, the probability of inland scholars who have obtained Ph. D. degrees abroad is 2.471 times as much as that of inland scholars without foreign Ph. D. degrees, this shows that inland scholars who have obtained Ph. D. degrees abroad have higher propensity towards international collaboration. The inland scholars who have obtained Ph. D. degrees abroad have accumulated some kind of transnational capital while studying or working abroad, thus they have an opportunity to enter the international academic network and obtain international academic resources.

However, as another measurement on overseas experience, the overseas academic exchange experience (OverExch) has no significant influence on its propensity towards international collaboration. On the one hand, this may be due to the fact that the inland scholars who have obtained Ph. D. degrees abroad often have frequent interpersonal interaction with foreign scholars (especially the tutors), who are more likely to establish international cooperation relationships with foreign scholars. On the other hand, in the short term, it's difficult to establish a strong interpersonal relationship with foreign scholars for the inland scholars who have the experience of overseas academic exchanges (the average time of overseas academic exchange is 7.6 months). Therefore, the influence on the international collaboration propensity is not obvious.

Table 3 The Logistic regression results

Variable	B	S.E.	odds ratio
AcadExpe	0.129	0.096	1.138
AcadExpe ²	-0.004	0.003	0.996
OverExch	-0.009	0.016	0.991
DumPhD	0.904**	0.392	2.471
Gender	-0.86*	0.463	0.423
R ²	0.095		
-2 Log likelihood	213.659		

*P<0.1, **P<0.05

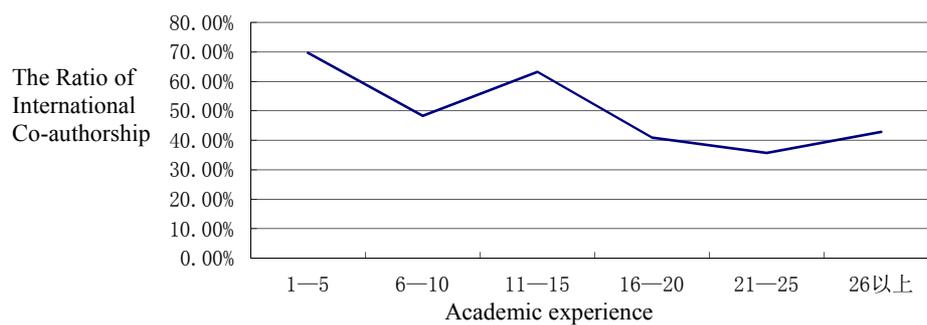


Figure 1 The Relationship Between Academic Experience and the Ratio of International Co-authorship

However, contrary to our expectation, the empirical results of Table 3 show that the academic experience of inland scholars (AcadExpe) has no significant impact on their propensity towards international collaboration. We classify the academic experience of inland scholars in terms of 1~5, 6~10, 11~15, 16~20, 21~25 and over 26 years, and calculate the average proportion of international cooperation of inland scholars in each category. Figure 1 shows that the relationships between the academic experience of inland scholars and the proportion of international cooperation. It can be seen from Figure 1, there is no obvious regularity between the propensity towards international collaboration and academic experience of inland scholars. We further analyze the propensity towards international collaboration of thirteen academically experienced inland scholars (academic experience more than 20 years). Seven of them tend to form domestic co-authorships, and six of them tend to form international co-authorships. This means that academic experience may not have a significant impact on the inland scholars' propensity towards international collaboration.

4. Conclusion

In recent years, the phenomenon of international co-authorships from emerging economies, especially Chinese scholars, has become a hot topic. The article analyzes the Chinese inland scholars' co-authorships in the 10 leading international academic journals in the field of technological innovation management from 1990 to 2016, and empirically investigates factors which influence Chinese inland scholars' propensity towards international collaboration. The empirical results show that Chinese inland scholars who have overseas education background show higher propensity towards international collaboration. However, both the overseas academic exchange experience and academic experience have no significant impacts on the propensity towards international collaboration.

For universities and research institutions in inland China, the proportion of faculties with Ph. D. degrees abroad has become an important indicator to measure the strength of scientific research in universities, and the recruitment of foreign talents is also an important tool for universities of inland China to enter the world class universities. Because the inland scholar with overseas education backgrounds have higher propensity towards international collaboration, universities of inland China may be inclined to recruit scholars who obtained Ph. D. degrees abroad in the development of talent recruitment policies. These scholars can serve as a "bridge" between the inland universities and the international academic network, and they may contribute to improving the scientific research ability of inland universities through cooperation with foreign scholars.

We recognize some limitations of our study which could be useful in designing future research. First, taking the Chinese inland scholars in the field of technological innovation management as the research sample, although it is helpful to deepen the understanding of international co-authorships and the quality of scientific research output in this field, the conclusion of this study may not be generalized to other disciplines. Thus, we need more cases and empirical analyses to verify the conclusion of this article. Second, this article examines the influence of individual characteristics of inland scholars on their propensity towards international collaboration, because the individual scholars are embedded in co-authorships with other scholars, and the structure of co-authorships network and the position of inland scholars in the co-authorships network may also influence their propensity towards international collaboration. Therefore, the future research should address this question with social network theory.

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