



The Determinants of China's Academic Entrepreneurial Intention: The Moderating Effects of University and Research Type

Yong Tang

Management School, Hunan City University, Yiyang, China

Email: tyzyhtt@126.com

How to cite this paper: Tang, Y. (2022) The Determinants of China's Academic Entrepreneurial Intention: The Moderating Effects of University and Research Type. *Open Access Library Journal*, 9: e8720. <https://doi.org/10.4236/oalib.1108720>

Received: April 14, 2022

Accepted: May 10, 2022

Published: May 13, 2022

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Abstract

The objective of this research is to better understand the determinants of academic entrepreneurial intention under China's universities. Referring to traditional entrepreneurial model and some research on academic entrepreneurial intention, this paper constructs a model linking China's university context and academic researcher's psychological variables with the formation of academic entrepreneurial intention. Based on 364 samples from China's teaching and research-based universities, we adopt SEM to test the model with the results indicating: 1) personal attitude, entrepreneurial self-efficacy and personal social network can significantly affect academic entrepreneurial intention respectively; 2) university type and research type can both moderate the relation between self-efficacy and academic entrepreneurial intention and the relation between personal social network and academic entrepreneurial intention; 3) university type can significantly moderate the relation between personal attitude and academic entrepreneurial intention. The results highlight significant meaning to China's policy to motivate more academic entrepreneurship around universities and the strategy to build the entrepreneurial university.

Subject Areas

Business Management Education

Keywords

Academic Entrepreneurial Intention, Personal Attitude, Entrepreneurial Self-Efficacy, University and Research Type

1. Introduction

Within the public sponsored university system in China, most investment and

financial support to universities are manipulated by various levels of administrative bodies. However, the output from this sponsorship is gradually questioned by in and out of universities recently: the taxpayers, also the source of China's public investment, are expecting the system's economic and social contribution when a large number of universities are passionate in "pure research" to "entertain themselves", while the universities, confined by "insufficient capital input", are suffering the risk to sustain their research, though most of which could hardly bear any financial fruits and could amass another round of investment.

Academic entrepreneurship, which bridges the academic research and its application into industry, has been advocated by some educational administration bodies recently, especially by China's top educational administration, the Ministry of Education (MOE)

(http://www.gov.cn/gongbao/content/2017/content_5191706.htm). One of the polices, the Strengthening of Transferring and Transformation of Scientific and Technological Achievements in Colleges and Universities, published by MOE, emphasizes the urgency to build an awarding system to price the commercial values for the teachers' licensing, patenting, spin-offs and other entrepreneurial activities in universities. Thus, "the fourth function", or academic entrepreneurship besides some traditional functions as teaching, research and social service, has been granted the legal identity around China's universities. In response to this policy, the increasing number of universities, particularly the research-based ones, initiates the academic entrepreneurial action plan to motivate their teachers to explore and seize the technology commercialization opportunities.

Academic entrepreneurship has been widely studied in prior research (Etzkowitz, 2004 [1], 2016 [2]; Zhang *et al.*, 2014 [3]; Hayter *et al.*, 2018 [4]; Bizri *et al.*, 2019 [5]), but most literatures are from developed countries. In China, the scholars, mostly affected by traditional Chinese culture, always consider the entrepreneurial activities as ironic and greedy. Thus in China, though encouraged by high profile administration bodies, the teachers are not so passionate in creating their own business. In order to better motivate the entrepreneurial activities in China's universities, exploring the factors which could inspire the teachers to participate in business creation is essential.

In traditional entrepreneurial research, scholars have unanimously believed that the career choice between entrepreneurship and employment is not solely affected by human demographic attributes, but also by some psychological factors, such as personality, attitude, etc. Among all the psychological variables, Ajzen (1991) [6] confirmed that intention is the most robust and significant indicator of behavior. Subsequently, some scholars confirmed that entrepreneurial intention should accordingly be adopted as the antecedent variable to determine entrepreneurial behavior (Thompson, 2009 [7]; Hsu *et al.*, 2019 [8]).

On the trial to incorporate traditional entrepreneurial intention into academic entrepreneurial intention model, we constructed an "academic entrepreneurial intention" to bridge the individual's career choice and to explore the stimulation

of China's university academic entrepreneurship. Our main purpose is to understand the determinants of academic entrepreneurial intention in different types of China's universities.

The structure of this paper is as follows. First, we present the theoretical background supporting the establishment of the theoretical model. Second, in empirical study section, we explain the survey method and the structural equation modeling (SEM) adopted in the study, followed by analytical results. Finally, we conclude the paper with discussions and future research possibilities.

2. Literature Review and Research Hypotheses

As earlier studies, entrepreneurial intention may be affected by individual attributes and context variables (Ajzen, 1991 [6]; Thompson, 2009 [7]; Hsu *et al.*, 2019 [8]). Many scholars proved that some factors such as social network, demographical features and environments are the main propellers for entrepreneurial intention formulation (Krueger *et al.*, 2000 [9]; Herdjiono *et al.*, 2017 [10]). Along with the classical paradigm, we select 3 categories of determinants to predict the academic entrepreneurial intention: the first category is on individual psychological attributes, including attitude and self-efficacy. The second category is mainly reflecting the interactive features, and in this paper, we select the variable of personal social network. And the third category reflects the social context. In this paper, we adopt university and research types under China's context.

2.1. Academic Entrepreneurial Intention

Early research on entrepreneurial choice mainly assumed that the entrepreneurial selection was determined by individual physiological or demographic characteristics (Evans & Jovanovic, 1989) [11]. However, some scholars (Ajzen, 1991 [6]; Krueger *et al.*, 2000 [9]) found that the most predictable indicator to entrepreneurial selection is entrepreneurial intention, which matters when the individual's desirability to a specific entrepreneurial activity has been aroused and the feasibility to start a business has been weighted. Accordingly, Thompson (2009) [7] developed a two-phase entrepreneurial intention model and examined the predicability of academic entrepreneurial intention on entrepreneurship selection.

Also, there are numerous literatures discussing the formulation of entrepreneurial intention: Krueger *et al.* (2000) [9] concluded that personal attitudes, self-efficacy, personal network and learning experience may contribute to the formulation of entrepreneurial intention. Prodan & Drnovsek (2010) [12] constructed a model of academic entrepreneurial intention, in which some psychological variables such as attitudes, self-efficacy are introduced. Zhang *et al.* (2014) [3] developed the university student's entrepreneurial intention model, and found that entrepreneurship education is essential in stimulating the students' entrepreneurial intention.

Furthermore, the facts in academic entrepreneurship could provide us more information to solicit the determinants. In some highly developed universities with the academic entrepreneurship tradition, for example, MIT, the teachers and students have strong intention to transfer their academic abilities into practice. MIT \$100 K, a program to award qualified future entrepreneurs among MIT students, is widely spread annually (<http://www.mit100k.org/>). Enterprise Forum (MITEF), another program in MIT, directly commit to “building connections to technology entrepreneurs and their communities in which they reside”, making more entrepreneurial knowledge and successful entrepreneurial cases reachable to the academia (<http://www.mitef.org>). Enlightened by these cases above, this paper thinks some factors such as university orientation and the connections inside and outside the university should also be included in academic entrepreneurial intention model.

2.2. Personal Attitude

Personal attitude is personal interest in and desirability for a particular behavior (Ajzen, 1991) [6], which states the negative or positive perception of being an academic entrepreneur. Therefore, personal attitudes are always regarded as the self-evaluated. From the theory of Ajzen (1991) [6], the intention to undertake specific behavior is affected by individual’s attitude, and positive attitude will enhance its intention to fulfill upcoming jobs. Personal attitude measures the extent to which the individual is willing or unwilling to conduct specific behavior, thus it contains both emotional perception (such as “entrepreneurship is attractive to me”), and evaluative considerations (such as “entrepreneurship can bring benefit to me”) (Liñán & Chen, 2009) [13].

We can find out some evidences both from theoretical and practical areas to explain the relation between attitude and academic entrepreneurial intention. In the work of Fernández-Pérez *et al.* (2014) [14], the contribution of entrepreneurial attitude, both as a mediating and a direct variable, has been supported in the formulation of academic entrepreneurial intention. And from practical analysis, we can find that, in earlier times, university mainly took the function of teaching and research, thus university scientists intuitively viewed the function of entrepreneurship as “negative”. With the extension of functions among universities, university scientists gradually sensed the commercialization of their research can both increase their income and enhance the sustainability of their universities. With more roles around them emerging from the entrepreneurial ranks, young teachers and students can more sense the appropriateness to take part in entrepreneurship. It is worth noting that every researcher in specific university has stable and comparatively high income source from its post while entrepreneurship is a business filled with cost and risk. Under this situation, the attitude to academic entrepreneurship may be various even when the individuals are exposed to a group of entrepreneurs, therefore, attitude is more specific to individuals and much easier to be submissive to context” (Sjoerd van den Heuvel *et al.*, 2017) [15]. From the analysis above, we conclude that the teachers or stu-

dents with positive attitudes to entrepreneurship can much more easily ignite their enthusiasm in accepting the entrepreneurial behavior. As a result, they have stronger intention to conduct academic entrepreneurship.

Hypothesis 1: personal attitude can positively affect academic entrepreneurial intention.

2.3. Academic Entrepreneurial Self-Efficacy

According to social cognitive theory, self-efficacy is embodied as the belief to enact, experience, persuade and control (Wood & Bandura, 1989) [16]. Thus self-efficacy is the extent or strength of one's belief in one's own ability to complete the targeted tasks and reach the goals, and it influences both the power to face challenges competitively and the choices most likely to make. When making the entrepreneurial choice, the individual should have the ability (the function of self-efficacy) to evaluate his or her own entrepreneurial ability to achieve the target (Chen *et al.*, 1998) [17]. Thus, those individuals who sense higher entrepreneurial self-efficacy can be more likely to take their entrepreneurial behaviors in the long run (Krueger & Dickson, 1994 [18]; Chen *et al.*, 1998 [17]).

Though lots of early research concludes that attitudes and self-efficacy are both cognitive determinants, these two terms have specific meanings in academic entrepreneurship study: From one hand, academic entrepreneurship is generally based on sophisticated technology (Etzkowitz, 2004) [1]; only the scientists who pay high interest and have strong desirability on advanced technology will consider the possibilities to conduct entrepreneurship. Therefore, Fernández-Pérez *et al.* (2014) [14] confirmed the mediating effect of self-efficacy on the formulation of academic entrepreneurial intention. From another hand, the desire to further make use of a scientist's technology (mostly put the technology into the market) is one of the dominant motivations to sustain his or her research, and we can assume that personal attitude will affect the self-efficacy. Also, we can see that the marvelous merit of MIT on academic entrepreneurship is both rooted in the scientists' confidence in future entrepreneurial behavior and their belief in advanced technology and entrepreneurial conditions they embrace (Boh *et al.*, 2016) [19]. Thus, we conclude that the attitude to academic entrepreneurship is the antecedent variable to the academic entrepreneurial self-efficacy, and entrepreneurial self-efficacy can impact the academic entrepreneurial intention. Therefore, it is proposed that:

Hypothesis 2: personal attitude can positively affect the academic entrepreneurial self-efficacy.

Hypothesis 3: academic entrepreneurial self-efficacy can positively affect academic entrepreneurial intention.

2.4. Personal Social Network

In social networks, individuals may be directly or indirectly interconnected based on social relations. Humans are embedded as well as affected behaviorally

by the norms of the social networks, thus this network is the bridge connecting the micro and macro world (Granovetter, 1985) [20]. In addition, an individual can derive benefits from these connections when appropriately responds (Carlington *et al.*, 2005) [21]. As for the rationale of social network on resource acquisition, numerous scholars believed that the ties from a focal node can facilitate mutual understanding, and form trust and interdependency among the nodes (Burt *et al.*, 2013 [22]; Fernández-Pérez *et al.*, 2014 [14]). In entrepreneurial social network study, a person can better understand the career characteristics and make career choice more appropriately if he is always embedded into a social group full of entrepreneurs (Leyden *et al.*, 2014) [23], thus Guo *et al.* (2019) [24] considered that the social network is one of the key factors to determine academic entrepreneurship success. In another word, the social network can reinforce the formulation of entrepreneurial intention.

Social network has a wider meaning under China's culture: effective social network, or "guanxi" in Chinese terminology, must be built on the premise of long-term and reciprocal communications, and has the advantages of requesting/receiving favors and the obligation to repay (Hwang *et al.*, 2009) [25]. The nodes within such kind of social network regard time spent and fortune contributed as the gauge of their loyalty and obedience to other connected nodes (Su *et al.* 2015) [26].

In a social network composed of scientists, the majority of nodes are featured as peripheries though some key scientists occupy the core positions (Breschi & Catalini, 2010) [27]. Entrepreneurship is a system developed by the participants of capital providers, market brokerages (such as technology transferring office) and co-researchers, etc. In MIT, the famous Entrepreneurship and Innovation Club holds some programs such as "Speakers & Workshops" to inspire the spirit of entrepreneurship among potential academic entrepreneurs, so as to get acquainted with more successful entrepreneurial roles, as well as expand their eyesight and build their confidence on starting new businesses (<https://sloaneclub.wordpress.com/>). Besides, Rahm (1994) [28] found that researchers can more greatly sense the research pressure if they are more frequently exposed to industries. According to Prodan & Drnovsek (2010) [12], the samples from international academic entrepreneurship indicate that personal social network can reinforce their potential abilities to academic entrepreneurship and increase their entrepreneurial intention.

For the vast number of researchers in China's universities who're on the peripheries of social networks, they must pay lots more extra time and cost which should be used on their research if they are intended to benefit from the network nodes communication. However, for those who have strong networking capabilities, because they are more approaching to the essential entrepreneurship skills and resources within the network, they are more likely to sense and seize the potential entrepreneurial opportunities. However, it is not certain that those who are on the focal position will realistically create their business. For the ef-

fects of Guanxi, people must balance the unpaid cost, *i.e.*, the long-term communication and large money, on different choices: if they decide to turn into an entrepreneurship career, they must be prepared to give up lots of stability from their traditional research posts and face more uncertainties from markets. Furthermore, the core advantage for entrepreneurship, mainly from the technology produced from researchers' daily work, is more difficult to be adopted by the market than traditional technology. And interestingly, it is possible to find out another conclusion in the social network: those who embedded in the network can get more sources and materials concerning with their research, and correspondingly it is possible to support and reinforce their research other than their entrepreneurship. For those reasons above, we cannot predict whether those who always involve themselves in Guanxi networks are easier to start up their business, but in China's Guanxi society, we can basically conclude that personal social network can affect academic entrepreneurial self-efficacy and academic entrepreneurial intention, though the effect directions are not clear. We then propose:

Hypothesis 4: personal social network can affect the academic entrepreneurial self-efficacy.

Hypothesis 5: personal social network can affect academic entrepreneurial intention.

2.5. University and Research Type

In their study of "entrepreneurial universities", Kalar & Antoncic (2015) [29] emphasized the importance of "research-based" universities and natural science-based research on the formulation of entrepreneurial activities. A similar case happens in the research-based universities in Norway, where more than half of teachers with technical titles higher than associate professor have entrepreneurial behavior in latest five years (Gulbrandsen & Smeby, 2005) [30]. As a leading research-based university, MIT has the most prominent scientists and the most advanced technologies. And some famous universities such as Beijing University and Qinghua University in China embrace the most sophisticated researchers. In knowledge-based area, the advanced technologies could be regarded as the core competency for a successful company. For the reason that academic entrepreneurship emphasizes the connection of technology with the market, the highly developed research-based universities such as Beijing University and Qinghua University can exert their abilities in more and highly competitive research and development activities, including the key technologies welcomed by market, and these two universities are also regarded as the cradles of China's hi-tech companies.

Besides, different disciplines have various effects on stimulating academic entrepreneurship (Kalar & Antoncic, 2015) [29]. Some basic research disciplines, such as math, physics or arts, are mostly conducted in libraries and laboratories. Their aim is to explore the basic law of society and nature, thus they are always

interest-driven and their holders basically pay little attention on market needs. However, some other disciplines, such as business and engineering, are tightly connected with industries, and their progress can be easily embodied and evaluated in real markets. Subjected to this market-driven requirement, the researchers must pay more attention on the practical significance and market response their technologies may produce. Considering these differences, we divide the traditional research into two types: the basic research and the applied research. As analysis above shown, different university type and research type can both affect the formulation of academic entrepreneurial intention. Unlike the research by Prodan & Drnovsek (2010) [12] and Thompson (2009) [7] that incorporate context elements of independent variables into the academic entrepreneurship intention models, our research proposes the moderating effects of university type and research type because we think the individual features can be moderated by context variables. Thus, we have the hypotheses:

Hypothesis 6: the university type significantly moderates the relation between personal attitude and academic entrepreneurial intention;

Hypothesis 7: the university type significantly moderates the relation between entrepreneurial self-efficacy and academic entrepreneurial intention;

Hypothesis 8: the university type significantly moderates the relation between personal social network and academic entrepreneurial intention;

Hypothesis 9: the research type significantly moderates the relation between personal attitude and academic entrepreneurial intention;

Hypothesis 10: the research type significantly moderates the relation between entrepreneurial self-efficacy and academic entrepreneurial intention;

Hypothesis 11: the research type significantly moderates the relation between personal social network and academic entrepreneurial intention.

We present the model in **Figure 1**.

3. Method

3.1. Measures

The operational definition and measurements of variables are conducted based on the review of prior research. We need then to refine the scales to ensure their validity and reliability.

Academic Entrepreneurial Intention. Chen *et al.* (1998) [17] designed a five-item scale comprising questions such the interest to start-ups, the understanding of start-ups, the preparation of start-ups, the possibility to start a new company and the earliest possible time to start a new company. Zhao *et al.* (2005) [31] designed a 4-item questionnaire to measure the average of willingness to start, purchase, develop and expand a new company. Thompson (2009) [7] adopted the individual entrepreneurial intention scale, in which six items were designed: plan to start a new company; never seek for the entrepreneurial opportunity; save for future start-up; never read any books concerning with entrepreneurship; know little about entrepreneurship; and spend time and money on accumulating

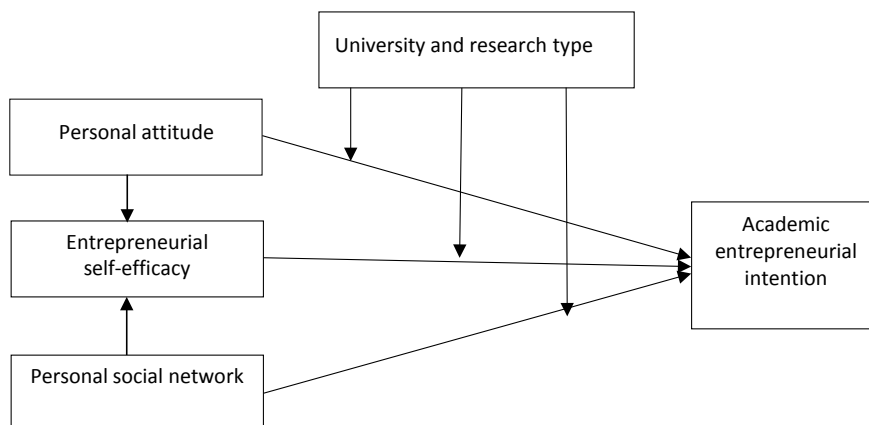


Figure 1. Theoretical model.

the entrepreneurial knowledge. Prodan & Drnovsek (2010) [12] stressed that entrepreneurial intention in universities should be based on “knowledge and technology” advantage. Referring to those scales above, and relating them to academic entrepreneurship, we design a 5-item questionnaire: you are interested in starting a new company by applying your technology; you are determined to start a new technology (knowledge) company; you will become an academic entrepreneur if your research can be commercialized; you will start a new company in the next 5 years; you will take substantial entrepreneurial actions, such as collecting market information, making technology transferring plan in the next 2 years.

Personal Attitude. When exploring the relation between entrepreneurial education and entrepreneurial intention, Liñán & Chen (2009) [13] used a 4-item scale: the comparison of entrepreneurship and employment; the preference to entrepreneurship than employment; the preference to conduct entrepreneurship after entrepreneurial education; the belief that entrepreneurship can bring more benefits. Ajzen (1991) [6] emphasized that the attitude should be expressed as “whether more favor with entrepreneurship?”. Though Huyghe & Knockaert (2015) [32] didn’t research academic attitude, they emphasized the importance of positive assessment of academic entrepreneurship role in stimulating entrepreneurial intention. Accordingly, we design a 4-items scale: being an entrepreneur is more preferential than your present job; being an entrepreneur can win more advantages than your present job; being more hopeful to start a new business than only work in a university; being more hopeful to start a new business than conduct pure academic research.

All items in the above scales are designed as Likert 5-point scales from “1 to 5”. The respondents are asked to judge the extent to which their real situations meet the descriptions. “1” represents “strongly disagree”, and “5” represents “strongly agree”.

Entrepreneurial Self-efficacy. Many scholars had designed their self-efficacy scales. One of the most influential is the entrepreneurial self-efficacy scale developed by Chen *et al.* (1998) [17]. This scale has 10 items, including the evalua-

tion of: the ability to cost control, the ability to build role in an organization, the ability to set up organizational objectives, the ability to develop new ideas, the ability to develop new products, the ability to create new service, the ability to set up the product role, the ability to expand the market, and the ability to build and achieve the goals. Prodan & Drnovsek (2010) [12] redesigned a 10-item self-efficacy scale from the perspective of academic entrepreneurship. Though Liñán & Chen (2009) [13] didn't adopt the concept of "self-efficacy", their scale of "the perception of feasibility" designed 6 questions to test whether individuals have the perception of abilities to conduct entrepreneurship and control the operation of a specific company. Therefore, we design: evaluate the survival probability if you conduct the academic entrepreneurship; evaluate the profitability if you conduct the academic entrepreneurship; evaluate your chance by which the academic technology will be adopted in future industry; evaluate your capital preparation that satisfies academic entrepreneurship; evaluate your abilities to become an academic entrepreneur.

Personal Social Network. Prodan & Drnovsek (2010) [12] designed 3 items to test social network, including the average number of hours per week the respondent spends maintaining contacts with people with whom he or she discusses business; the average number of hours per week the respondent spends developing new contacts with people to discuss business matters; the total number of people with whom the respondent discussed business matters during the previous week. Burt *et al.* (2013) [22] stressed the importance of structural hole is more important than communication frequency and tie strength. Meanwhile, we must consider the special meaning of "guanxi", which reflects the long-term and reciprocal relations. Accordingly, our design contains 4 items: evaluate the time that you spend on maintaining entrepreneurial relations; evaluate the frequency that you visit the technology transferring office or related commercialization departments; evaluate the strength of relations between you and your business partners; evaluate the network opportunities by which you know other entrepreneurs.

All items in the above scales are designed as Likert 5-point scales from "1 to 5". The respondents are asked to evaluate the extent by which their real situations reflect. "1" represents "very low (slim)", and "5" represents "very high (dense)".

University Type. The universities must have the potential to produce advanced technology and to start academic entrepreneurship, so we exclude the vocational, adult educational and teaching-based universities. According to "The Chinese University Ranking" compiled by Wu Shuliang (http://blog.sina.com.cn/s/blog_4b2cb00e0102w4xz.html) [33], our targeted universities can be categorized as research-based, and teaching and research-based. We label research-based type as 0 to and teaching and research-based type as 1.

Research Type. In light of regulation by OECD (<https://stats.oecd.org/glossary/detail.asp?ID=192>) [34] and research by Prodan & Drnovsek (2010) [12], research type is categorized as basic research and applied research. And two different categories are labeled as 0 and 1 respectively.

3.2. Data Collection

According to the intention research by Ajzen (1991) [6], the samples must be the ones who have no actual substantial entrepreneurial experience but can be freely exposed to entrepreneurial environments, by which they can be more flexible in formulating their intentions on their career choices. In the universities, the Ph.D. candidates are potential academic entrepreneurs (Bird *et al.*, 1989) [35]. From a psychological perspective, the individuals with young ages are much more sensitive to outside changes when compared with their adult counterparts, thus entrepreneurial intention can be more appropriately measured among those young ages (Obschonka *et al.*, 2010) [36]. Similarly, Prodan & Drnovsek (2010) [12] selected the samples confined to young teachers and Ph.D. students with technical background. Aldridge & Audretsch (2011) [37] suggests that scientists who have always received public funding are easier to academic entrepreneurship than those who mainly are funded by private foundations. Enlightened by prior research, we set our research targets on the Ph.D. students and young teachers under 40 years old (in China's university system, the age of 40 years is the interface of young and matured academic workers), with Ph.D. degrees in technical disciplines (computer technology, applied mathematics, physics, chemical engineering, civil engineering, mechanical engineering, etc.) and having received provincial-level financial funding or above. All samples are from research-based universities and teaching and research-based universities.

Our survey, mostly conducted through E-mail and on-site questionnaires, lasted 5 months from Apr. 2019 to Sep. 2019. We sent out 812 questionnaires and collected 364 valid questionnaires. 244 are male respondents and 120 are female respondents; 191 respondents come from research-based universities, and 173 are from teaching and research-based universities. In total, 207 samples are conducting applied research and 157 samples are mainly focused on basic research. We set our conceptual model to the test through structural equation modeling (SEM) utilizing AMOS in section 4.

4. Results

4.1. Factor Analysis

For the reason that our construct is based on earlier studies, its structural validity can be guaranteed. In order to test the convergence validity and reliability, we adopt SPSS to conduct factor analysis. Kaiser-Meyer-Olkin measure of sampling adequacy is 0.858, and approx. χ^2 is 698.19 (Sig. = 0.000), indicating that factor analysis is possible. When principal component analysis is conducted, 4 components have been extracted, and they can explain 69.69% of the variance. The extraction of components and related statistics in **Table 1** shows that the factor loadings match with the construct well. Validity test is conducted using average variance extracted (AVE) and reliability test is done by referring to Cronbach alpha, both of which are bigger than 0.7, indicating that our construct has good convergent validity and reliability (Nunally, 1978 [38]; Lowry & Gaskin, 2014 [39]).

Table 1. Principle component analysis.

Dimensions	Items	Component				Mean	Std. Deviation	Cronbach alpha/AVE
		1	2	3	4			
Academic entrepreneurial intention	AEI1	0.744	-0.230	0.382	-0.098	3.32	1.063	0.833/0.841
	AEI2	0.685	-0.125	0.360	-0.203	3.38	0.961	
	AEI3	0.729	-0.226	0.311	-0.033	3.34	0.956	
	AEI4	0.716	-0.161	0.344	-0.126	3.30	0.943	
	AEI5	0.710	-0.066	0.440	-0.190	3.40	1.031	
Personal attitude	PEA1	0.245	-0.230	0.074	0.678	3.54	0.881	0.752/0.713
	PEA2	0.403	-0.078	-0.007	0.655	3.52	0.959	
	PEA3	0.347	-0.060	-0.452	0.559	3.50	0.902	
	PEA4	0.348	-0.225	0.032	0.578	3.44	0.895	
Entrepreneurial self-efficacy	ESE1	0.146	0.866	0.011	0.105	3.11	1.142	0.904/0.910
	ESE2	0.208	0.858	0.119	0.038	3.00	1.165	
	ESE3	0.211	0.815	0.012	0.004	2.96	1.196	
	ESE4	0.304	0.776	-0.039	0.019	2.88	1.131	
	ESE5	0.228	0.769	0.155	0.119	3.13	1.156	
Personal social network	PSN1	-0.557	-0.090	0.737	-0.095	3.40	0.945	0.885/0.788
	PSN2	-0.404	-0.006	0.577	-0.065	3.41	0.893	
	PSN3	-0.520	-0.054	0.695	-0.016	3.36	0.981	
	PSN4	-0.513	-0.040	0.754	-0.142	3.40	0.968	

4.2. Path Estimation

The path estimation is conducted by AMOS.

Table 2 is the coefficients and T-value of every path. Goodness-of-Fit Statistics is illustrated in **Table 3**. All reference standards for Goodness-of-Fit Statistics in **Table 3** are provided by Bentler (1990) [40] and Browne & Cudeck (1992) [41].

Two tables above signify that our model has satisfactory Goodness-of-Fit Statistics, and all paths have bigger T-values (the reference value is 1.96, or $p = 0.05$). All potential variables in our construct have significant relations, among which entrepreneurial self-efficacy has the biggest effects on academic entrepreneurial intention (the direct effect is 0.39, $p < 0.01$), and social network and personal attitude are all positively correlated to academic entrepreneurial intention, though their path coefficients are smaller ($\gamma = 0.26$, $p < 0.001$, and $\gamma = 0.21$, $p < 0.001$ respectively). Personal attitude and personal social network can significantly improve self-efficacy ($\gamma = 0.42$, $p < 0.001$; $\gamma = 0.11$, $p < 0.001$). Thus hypothesis 1, 2, 3, 4 and 5 are supported.

Table 2. The path estimation coefficient.

Path	Standardized path coefficient	T-value
Personal Attitude→Academic Entrepreneurial Intention	0.21***	7.81
Personal Attitude→ Entrepreneurial Self-efficacy	0.42***	6.33
Entrepreneurial Self-efficacy→Academic Entrepreneurial Intention	0.39**	2.97
Personal Social Network→Entrepreneurial self-efficacy	0.11***	4.73
Personal Social Network→Academic Entrepreneurial Intention	0.26***	8.14

Note. *p < 0.05, **p < 0.01, ***p < 0.001. All regression coefficients are standardized.

Table 3. Goodness-of-Fit statistics.

Statistics	χ^2/df	GFI	NFI	CFI	IFI	TLI	RMSEA
Reference standard	Less than 5	Bigger than 0.9	Bigger than 0.9	Bigger than 0.9	Bigger than 0.9	Bigger than 0.9	Less than 0.1
Model	4.3	0.991	0.900	0.944	0.944	0.952	0.037

4.3. The Moderating Effects

To test the moderating effect, we adopt the method of multi-group SEM (MSEM) suggested by Byrne (2004) [42]. We firstly divide the samples into two groups in light of university and research type, then we test the hypotheses related to the invariance of a single measuring method across different groups in the form of baseline model conducted. In detail, we estimate the significance of the difference between the two groups by comparing the χ^2 statistics of the cross-group equality constraint model and the unconstrained model. The moderating effects of designated variables exist when there are significant differences between the groups. The significance of the difference between the two models can be identified by the χ^2 variation. According to Hedges & Pigott (2004) [43], the 95% critical value for χ^2 with 1 degree of freedom is 3.84. Under this situation, we can say that the result is statistically significant at the 0.05% significance level when a change of the degree of freedom is 1. Therefore, the pattern of variables remains consistent with the baseline model specification for each group, but if there is a significant change in the χ^2 between the constrained and un-constrained models, a moderating effect is tested and confirmed.

Table 4 is the path coefficients under grouped sampling.

Table 4 shows that the grouped data matches the baseline model well though most of the path coefficients are various to those in **Table 3**. This result reaffirms the robustness of most hypotheses from latent variables. When the values of $\Delta\chi^2/\Delta df$ are considered, we can find that all values under the university type gauge are bigger than 3.84 (in the research of Hedges & Pigott (2004) [43], the 95% critical value for χ^2 with 1 degree of freedom is 3.84), indicating that university type can moderate the relations between personal attitude and academic entrepreneurial intention, the relation between entrepreneurial self-efficacy and

Table 4. The path coefficient and statistics under grouped samples.

Path	University type					Research type				
	Research	T-value	Teaching and research	T-value	$\Delta\chi^2/\Delta df$	Basic	T-value	Applied	T-value	$\Delta\chi^2/\Delta df$
Personal Attitude→Academic Entrepreneurial Intention	0.20***	3.78	0.15*	2.83	36.2	0.19***	4.92	0.18*	2.34	1.78
Entrepreneurial Self-efficacy→Academic Entrepreneurial Intention	0.18**	3.43	0.24*	2.93	20.4	0.22*	2.01	0.26	1.99	8.03
Personal Social Network→Academic Entrepreneurial Intention	0.33***	8.21	0.31***	5.39	7.09	0.30**	3.93	0.22***	8.75	36.1

academic entrepreneurial intention and the relation between personal social network and academic entrepreneurial intention at the significance of 95%. From the column of research type, we can find that the values of $\Delta\chi^2/\Delta df$ relating to the relation between entrepreneurial self-efficacy and academic entrepreneurial intention and the relation between personal social network and academic entrepreneurial intention are bigger than 3.84, indicating that research type can moderate these two pairs of relations at the significance of 95%; unfortunately, the value relating to the path of personal attitude and academic entrepreneurial intention is only 1.78, evidently less than 3.84, indicating that the research type has no significant moderating effect on the relation between personal attitude and academic entrepreneurial intention at the significance of 95%. Thus hypothesis 6, 7, 8, 10 and 11 are supported, but hypothesis 9 cannot be supported.

Our results indicate that our construct is acceptable, and most of hypotheses are supported. In detail, personal attitude, entrepreneurial self-efficacy and personal social network can significantly affect academic entrepreneurial intention; self-efficacy can significantly mediate the relation between personal attitude and academic entrepreneurial intention, as well as the relation between personal social network and academic entrepreneurial intention. As for moderating effect tests, our findings confirm that university type and research type can moderate both the relation between self-efficacy and academic entrepreneurial intention and the relation between personal social network and academic entrepreneurial intention; furthermore, university type can significantly moderate the relation between personal attitude and academic entrepreneurial intention.

5. Discussion and Conclusions

The objective of this research is to better understand the determinants of academic entrepreneurial intention under China's universities. Referring to traditional entrepreneurial model and some research on academic entrepreneurial intention, this paper constructs a model linking China's university context, aca-

demographic researcher's psychological variables with the formation of academic entrepreneurial intention. In order to explore the determinants, we choose 5 factors and propose 11 hypotheses. In the empirical study, we collect 364 valid samples from China's research-based and teaching and research-based universities and adopt the SEM to test the theoretical model.

By applying factor analysis, we confirm that the components match well with our constructs. And through the path estimations using AMOS, we test all of our hypotheses and most are supported by the empirical study. The relations among personal attitude, entrepreneurial self-efficacy, personal social network and academic entrepreneurial intentions in earlier entrepreneurial intention studies and entrepreneurial intention studies (Krueger *et al.*, 2000 [9]; Thompson, 2009 [7]; Lián & Chen, 2009 [13]; Prodan & Drnovsek, 2010 [12]) have been proved in our model.

However, when our model is empirically studied with the samples from China's context, some results could convey specific meanings:

From the path estimations, personal social network contributes bigger effects on academic entrepreneurial intention than personal attitude does, though both have significant effects. This result is contrary to the research by Prodan & Drnovsek (2010) [12] and the research by Fernández-Pérez *et al.* (2014) [14]. The explanation could be that China has very typical characteristics of "guanxi", a kind of relation based on long-term communication and reciprocity. Under this context, the individualism must be subject to collectivism. Even for academic entrepreneurship, individuals will regard effective social network as the most dominating factor to form their entrepreneurial willingness and desirability.

One another significant finding is the incorporation of moderating variables of university type and research type into our model. Though Prodan & Drnovsek (2010) [12] used these variables, they only examined the direct effects of entrepreneurial intention. Our findings confirm that these two variables have significant moderating effects on most direct relations. These results signify that China's academic entrepreneurship is affected by context, which is important to testify the significance of adoption of some policies such as building "entrepreneurial universities" and transforming the functions in some research universities in China. However, the moderating effect of research type on the relation between personal attitude and academic entrepreneurial intention is rejected. As for the reason, we think it's arising from the university merit assessment system, in which the effect of university prestige is far more important than the effect of university discipline to teachers' psychological perception. As a result, university academic researchers will have a greater sense of university reputation than on their own research type. For the reason that attitude is more specific to individuals and much easier to be submissive to context (Sjoerd van den Heuvel *et al.*, 2017) [15], the research type contributes less effect than university type does on individual's sense of attitude to entrepreneurial intention. This finding could be used to explain why in some research-based universities or entrepreneurial universities, the researchers from any disciplines may have higher academic entre-

preneurial intention than those in other universities.

China's higher learning educational system is adopting the policy to stimulate more academic entrepreneurship around universities. Our research could be beneficial for the policy makers: since entrepreneurial intention is the most important predictor to entrepreneurial behavior, the policy focus should be moved to the determinants. Firstly, entrepreneurial education is beneficial for consolidating entrepreneurial attitude (Fayolle *et al.*, 2015) [44] and enhancing entrepreneurial self-efficacy (Piperopoulos & Dimov, 2015) [45], thus the continuous and widely covered educational education is necessary to the universities; secondly, some entrepreneurial facilities, such as technology transferring office and enterprise incubator are effective to build ties for the scientist with industries, thus policy makers can pay attention to the investments on effective entrepreneurial facilities; thirdly, university and research type can partly moderate the formation of academic entrepreneurial intention, thus policy makers can properly adjust the main functions of university (such as the transformation of the teaching and research-based to the research-based) and the discipline settings (such as the redistribution of applied disciplines). As for the scientists themselves, they can endeavor from enhancing their academic abilities, conducting their research according to the market requirements, making use of entrepreneurial education opportunities to increasing their chance to communicate with industries.

6. Limitations

Traditional entrepreneurial intentions are mostly focused on demographical variables such as age, gender, family backgrounds and some psychological variables. For the reason that our research attaches great importance to the identity (such as university type, research type) of higher-level researchers, most of the demographical variables have not been incorporated in the model. Further study can be conducted using more variables. Besides, our survey is only confined to the universities in China and our result only demonstrates the situation in China. In order to obtain a general model satisfying more universities, the questionnaire refinement and the expansion of samples are necessary for the future research.

Acknowledgements

This paper is supported by New Liberal Arts Research and Reform Practice Project of the Ministry of Education, PRC (2021140102).

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] Etzkowitz, H. (2004) The Evolution of the Entrepreneurial University. *International*

- Journal of Technology and Globalisation*, **1**, 64-77.
<https://doi.org/10.1504/IITG.2004.004551>
- [2] Etzkowitz, H. (2016) The Entrepreneurial University: Vision and Metrics. *Industry and Higher Education*, **30**, 83-97. <https://doi.org/10.5367/ihe.2016.0303>
- [3] Zhang, Y., Duysters, G. and Cloudt, M. (2014) The Role of Entrepreneurship Education as a Predictor of University Students' Entrepreneurial Intention. *International Entrepreneurship and Management Journal*, **10**, 623-641.
<https://doi.org/10.1007/s11365-012-0246-z>
- [4] Hayter, C.S., Nelson, A.J., Zayed, S. and O'Connor, A.C. (2018) Conceptualizing Academic Entrepreneurship Ecosystems: A Review, Analysis and Extension of the Literature. *The Journal of Technology Transfer*, **43**, 1039-1082.
<https://doi.org/10.1007/s10961-018-9657-5>
- [5] Bizri, R., Hammoud, J., Stouhi, M. and Hammoud, M. (2019) The Entrepreneurial University: A Proposed Model for Developing Nations. *Journal of Management Development*, **38**, 383-404. <https://doi.org/10.1108/JMD-11-2018-0347>
- [6] Ajzen, I. (1991) The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, **50**, 179-211.
[https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- [7] Thompson, E.R. (2009) Individual Entrepreneurial Intent: Construct Clarification and Development of an Internationally Reliable Metric. *Entrepreneurship Theory and Practice*, **33**, 669-694. <https://doi.org/10.1111/j.1540-6520.2009.00321.x>
- [8] Hsu, D.K., Burmeister-Lamp, K., Simmons, S.A., Foo, M.D., Hong, M.C. and Pipes, J.D. (2019) "I Know I Can, but I Don't Fit": Perceived Fit, Self-Efficacy, and Entrepreneurial Intention. *Journal of Business Venturing*, **34**, 311-326.
<https://doi.org/10.1016/j.jbusvent.2018.08.004>
- [9] Krueger, N.F., Reilly, M.D. and Carsrud, A.L. (2000) Competing Models of Entrepreneurial Intentions. *Journal of Business Venturing*, **15**, 411-432.
[https://doi.org/10.1016/S0883-9026\(98\)00033-0](https://doi.org/10.1016/S0883-9026(98)00033-0)
- [10] Herdjiono, I., Puspa, Y.H., Maulany, G. and Aldy, B.E. (2017) The Factors Affecting Entrepreneurship Intention. *International Journal of Entrepreneurial Knowledge*, **5**, 5-15. <https://doi.org/10.1515/ijek-2017-0007>
- [11] Evans, D.S. and Jovanovic, B. (1989) An Estimated Model of Entrepreneurial Choice under Liquidity Constraints. *Journal of Political Economy*, **97**, 808-827.
<https://doi.org/10.1086/261629>
- [12] Prodan, I. and Drnovsek, M. (2010) Conceptualizing Academic-Entrepreneurial Intentions: An Empirical Test. *Technovation*, **30**, 332-347.
<https://doi.org/10.1016/j.technovation.2010.02.002>
- [13] Liñán, F. and Chen, Y.W. (2009) Development and Cross-Cultural Application of a Specific Instrument to Measure Entrepreneurial Intentions. *Entrepreneurship Theory and Practice*, **33**, 593-617. <https://doi.org/10.1111/j.1540-6520.2009.00318.x>
- [14] Fernández-Pérez, V., Esther Alonso-Galicia, P., del Mar Fuentes-Fuentes, M. and Rodríguez-Ariza, L. (2014) Business Social Networks and Academics' Entrepreneurial Intentions. *Industrial Management & Data Systems*, **114**, 292-320.
<https://doi.org/10.1108/IMDS-02-2013-0076>
- [15] van den Heuvel, S., Freese, C., Schalk, R. and van Assen, M. (2017) How Change Information Influences Attitudes toward Change and Turnover Intention: The Role of Engagement, Psychological Contract Fulfillment, and Trust. *Leadership & Organization Development Journal*, **38**, 398-418.
<https://doi.org/10.1108/LODJ-03-2015-0052>

- [16] Wood, R. and Bandura, A. (1989) Social Cognitive Theory of Organizational Management. *Academy of Management Review*, **14**, 361-384.
<https://doi.org/10.2307/258173>
- [17] Chen, C.C., Greene, P.G. and Crick, A. (1998) Does Entrepreneurial Self-Efficacy Distinguish Entrepreneurs from Managers? *Journal of Business Venturing*, **13**, 295-316.
[https://doi.org/10.1016/S0883-9026\(97\)00029-3](https://doi.org/10.1016/S0883-9026(97)00029-3)
- [18] Krueger, N. and Dickson, P.R. (1994) How Believing in Ourselves Increases Risk Taking: Perceived Self-Efficacy and Opportunity Recognition. *Decision Sciences*, **25**, 385-400.
- [19] Boh, W.F., De-Haan, U. and Strom, R. (2016) University Technology Transfer through Entrepreneurship: Faculty and Students in Spinoffs. *The Journal of Technology Transfer*, **41**, 661-669. <https://doi.org/10.1007/s10961-015-9399-6>
- [20] Granovetter, M. (1985) Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology*, **91**, 481-510.
<http://www.jstor.org/stable/2780199>
<https://doi.org/10.1086/228311>
- [21] Carrington, P.J., Scott, J. and Wasserman, S. (Eds.) (2005) Models and Methods in Social Network Analysis (Vol. 28). Cambridge University Press, Cambridge.
<https://doi.org/10.1017/CBO9780511811395>
- [22] Burt, R.S., Kilduff, M. and Tasselli, S. (2013) Social Network Analysis: Foundations and Frontiers on Advantage. *Annual Review of Psychology*, **64**, 527-547.
<https://doi.org/10.1146/annurev-psych-113011-143828>
- [23] Leyden, D.P., Link, A.N. and Siegel, D.S. (2014) A Theoretical Analysis of the Role of Social Networks in Entrepreneurship. *Research Policy*, **43**, 1157-1163.
<https://doi.org/10.1016/j.respol.2014.04.010>
- [24] Guo, F., Zou, B., Guo, J., Shi, Y., Bo, Q. and Shi, L. (2019) What Determines Academic Entrepreneurship Success? A Social Identity Perspective. *International Entrepreneurship and Management Journal*, **15**, 929-952.
<https://doi.org/10.1007/s11365-019-00569-6>
- [25] Hwang, D.B., Golemon, P.L., Chen, Y., Wang, T.S. and Hung, W.S. (2009) Guanxi and Business Ethics in Confucian Society Today: An Empirical Case Study in Taiwan. *Journal of Business Ethics*, **89**, Article No. 235.
<https://doi.org/10.1007/s10551-008-9996-5>
- [26] Su, D.J. and Sohn, D.W. (2015) Roles of Entrepreneurial Orientation and Guanxi Network with Parent University in Start-Ups' Performance: Evidence from University Spin-Offs in China. *Asian Journal of Technology Innovation*, **23**, 1-19.
<https://doi.org/10.1080/19761597.2015.1008196>
- [27] Breschi, S. and Catalini, C. (2010) Tracing the Links between Science and Technology: An Exploratory Analysis of Scientists' and Inventors' Networks. *Research Policy*, **39**, 14-26.
- [28] Rahm, D. (1994) Academic Perceptions of University-Firm Technology Transfer. *Policy Studies Journal*, **22**, 267-278.
<https://doi.org/10.1111/j.1541-0072.1994.tb01467.x>
- [29] Kalar, B. and Antoncic, B. (2015) The Entrepreneurial University, Academic Activities and Technology and Knowledge Transfer in Four European Countries. *Technovation*, **36**, 1-11. <https://doi.org/10.1016/j.technovation.2014.11.002>
- [30] Gulbrandsen, M. and Smeby, J.C. (2005) Industry Funding and University Professors' Research Performance. *Research Policy*, **34**, 932-950.
<https://doi.org/10.1016/j.respol.2005.05.004>

- [31] Zhao, H., Seibert, S.E. and Hills, G.E. (2005) The Mediating Role of Self-Efficacy in the Development of Entrepreneurial Intentions. *Journal of Applied Psychology*, **90**, 1265-1272. <https://doi.org/10.1037/0021-9010.90.6.1265>
- [32] Huyghe, A. and Knockaert, M. (2015) The Influence of Organizational Culture and Climate on Entrepreneurial Intentions among Research Scientists. *The Journal of Technology Transfer*, **40**, 138-160. <https://doi.org/10.1007/s10961-014-9333-3>
- [33] Wu, S.L. (2019) The Ranking of Universities in China. http://blog.sina.com.cn/s/blog_4b2cb00e0102w4xz.html
- [34] OECD (2002) Glossary of Statistical Terms of Science and Technology Statistics—Research and Development. <https://stats.oecd.org/glossary/detail.asp?ID=192>
- [35] Bird, B. and Jelinek, M. (1989) The Operation of Entrepreneurial Intentions. *Entrepreneurship Theory and Practice*, **13**, 21-30. <https://doi.org/10.1177/104225878801300205>
- [36] Obschonka, M., Silbereisen, R.K. and Schmitt-Rodermund, E. (2010) Entrepreneurial Intention as Developmental Outcome. *Journal of Vocational Behavior*, **77**, 63-72. <https://doi.org/10.1016/j.jvb.2010.02.008>
- [37] Aldridge, T.T. and Audretsch, D. (2011) The Bayh-Dole Act and Scientist Entrepreneurship. *Research Policy*, **40**, 1058-1067. <https://doi.org/10.1016/j.respol.2011.04.006>
- [38] Nunally, J.C. (1978) *Psychometric Theory*. McGraw-Hill, New York.
- [39] Lowry, P.B. and Gaskin, J. (2014) Partial Least Squares (PLS) Structural Equation Modeling (SEM) for Building and Testing Behavioral Causal Theory: When to Choose It and How to Use It. *IEEE Transactions on Professional Communication*, **57**, 123-146. <https://doi.org/10.1109/TPC.2014.2312452>
- [40] Bentler, P.M. (1990) Comparative Fit Indexes in Structural Models. *Psychological Bulletin*, **107**, 238-46. <https://doi.org/10.1037/0033-2909.107.2.238>
- [41] Browne, M.W. and Cudeck, R. (1992) Alternative Ways of Assessing Model Fit. *Sociological Methods & Research*, **21**, 230-258. <https://doi.org/10.1177/0049124192021002005>
- [42] Byrne, B.M. (2004) Testing for Multigroup Invariance Using AMOS Graphics: A Road Less Traveled. *Structural Equation Modeling: A Multidisciplinary Journal*, **11**, 272-300. https://doi.org/10.1207/s15328007sem1102_8
- [43] Hedges, L.V. and Pigott, T.D. (2004) The Power of Statistical Tests for Moderators in Meta-Analysis. *Psychological Methods*, **9**, 426-445. <https://doi.org/10.1037/1082-989X.9.4.426>
- [44] Fayolle, A. and Gailly, B. (2015) The Impact of Entrepreneurship Education on Entrepreneurial Attitudes and Intention: Hysteresis and Persistence. *Journal of Small Business Management*, **53**, 75-93. <https://doi.org/10.1111/jsbm.12065>
- [45] Piperopoulos, P. and Dimov, D. (2015) Burst Bubbles or Build Steam? Entrepreneurship Education, Entrepreneurial Self-Efficacy, and Entrepreneurial Intentions. *Journal of Small Business Management*, **53**, 970-985. <https://doi.org/10.1111/jsbm.12116>