

# Antecedents and outcome of entrepreneurial identification: The moderating effect of role orientation

Bo Zou<sup>1,\*</sup>, Yanxia Li<sup>1</sup>, Jinyu Guo<sup>1</sup> and Feng Guo<sup>2</sup>

<sup>1</sup>Nan Gang District, School of Management, Harbin Institute of Technology, 92 West Dazhi Street, Harbin 150001, China and <sup>2</sup>College of Management and Economics, Tianjin University, 92 Weijin Road, Nankai District, Tianjin 300072, China

\*Corresponding author: E-mail: zoubo@hit.edu.cn

## Abstract

This article focuses on the entrepreneurial identification (EI), through the perspectives of social identity theory and identity theory. Using an empirical method, we investigate factors that affect the formation of EI. Results show that academic entrepreneurs' multiple identities (MI) and role conflict (RC) influence such type of formation. Moreover, we use role orientation (RO) as a moderating variable and find that, although RO of academic entrepreneurs can moderate the relationship between RC and EI, the effect of MI on EI cannot be moderated by RO in a significant way. We also discuss and validate the relationship between EI and academic entrepreneurial performance. These findings highlight the importance of certain factors in forming an EI, thus providing theoretical contributions of RO moderation in the relationship between RC and EI, as well as insights into the integration of social identity theory with identity theory.

**Key words:** multiple identities; role conflict; role orientation; entrepreneurial identification; academic entrepreneurial performance

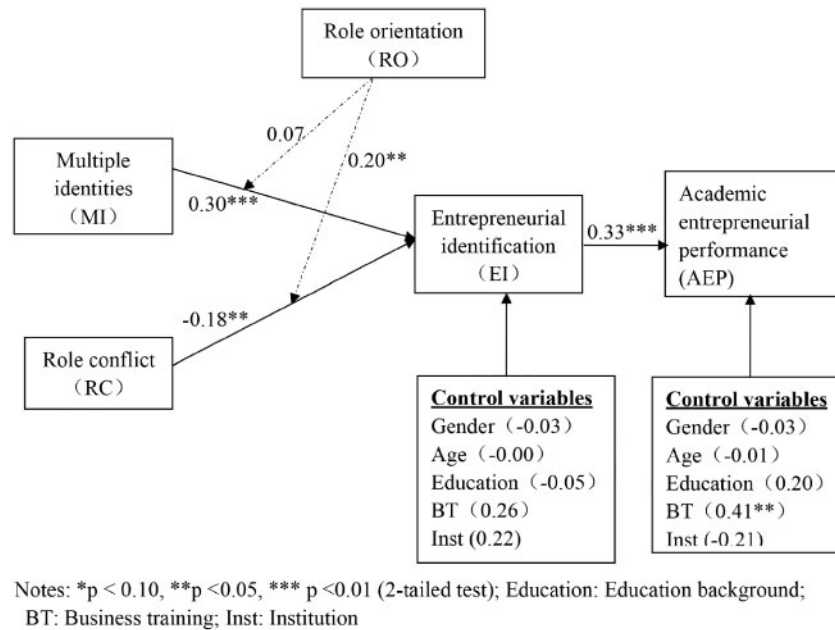
## 1. Introduction

Universities play an increasingly important role in technology transfer and market invention expertise (Guerrero and Urbano 2012). Academic entrepreneurship, defined as the commercialization process of university intellectual property or technology transfer (Albats et al. 2016), is seen as an engine of economic growth (Golob 2006) and contributes to the creation of a sustainable entrepreneurial environment (Guerrero et al. 2015). In some methods of technology transfer, such as licensing or start-up creation (Pérez and Sánchez 2003), the likelihood of success is largely influenced by academic researchers in playing their identity as entrepreneurs (Wright et al. 2004). Scholars have defined different perspectives within the concept of academic entrepreneurs such as the knowledge transfer perspective (Wright 2014) and the patents and license perspective (Duberley et al. 2007). In this article, we adopt the concept of academic entrepreneurs as defined by Armano and Scagnelli—that is, academic entrepreneurs are faculty members employed at a university or academic institution (i.e. full, associate, and assistant professors) while concurrently working as shareholders and/or directors in a science-based company (Armano and Scagnelli 2013).

In the current literature, academic entrepreneurship research has focused on three areas. One area studies on the environmental level

that includes government policies on academic entrepreneurship. For example, the government establishes financial support (Henrekson and Rosenberg 2001), innovation policy (Dodgson and Staggs 2012), and relevant laws and regulations for academic entrepreneurship, such the passage of the Bayh-Dole Act in the US Congress (Harman and Harman 2004). Research has also focused on the organization level—i.e., the university's organizational structure, governance structure, and reward system—that are greatly significant in stimulating academic entrepreneurs (Urbano and Guerrero 2013). Moreover, university incentive systems have an important influence on the attitude of academic entrepreneurs (Bercovitz and Feldman 2008). The third area is the individual level, which demonstrates that entrepreneurial growth ambition (Hayter 2015), social networks (Rasmussen et al. 2015), background (O'Gorman et al. 2008), and access to resources (Mosey and Wright 2007) are critical factors in an individual's success in academic entrepreneurship. Additionally, research has focused on academic entrepreneurs' role-identity modification (Jain et al. 2009).

Recently, although studies have shown the need to explore micro-level factors of academic entrepreneurship (Wright 2014), little attention has been paid to the academic entrepreneurial identity. In the process of academic entrepreneurship, scholars must



**Figure 1.** A theoretical framework of EI.

recognize the entrepreneurial identity and try to accept the common knowledge, values, and behavioral characteristics of entrepreneurs. Individual perceptions of a new identity may have a crucial impact on the outcome of entrepreneurship. As such, the formation of entrepreneurial identity is a key factor that influences such a transition. As noted by Hoang and Gimeno (2010), entrepreneurial identity is a crucial concept that affects the success of potential entrepreneurs. Entrepreneurial identification (EI) can guide and drive goal-oriented behavior and provide a path for entrepreneurs to achieve their goals, thus transforming potential roles into real roles (Hoang and Gimeno 2010). Such identification can also promote the success of entrepreneurship.

Although both social identity theory and identity theory purport that identity is a dynamic process of construction, and various factors affect individual identity (Hogg et al. 1995), few articles have examined the factors that influence the formation of EI among academic entrepreneurs. To complement this research, this article uses multiple identities (MI) and role conflict (RC) as independent variables, EI as a dependent variable, and role orientation (RO) as a moderating variable. Furthermore, we investigate the influence of EI on academic entrepreneurial performance (AEP).

The article is structured as follows. In the next section, we introduce the theoretical background and develop our hypotheses. We further explain the process of data collection and the results of the empirical analysis. Finally, we suggest the remaining theoretical and empirical issues, as well as future research directions. Figure 1 shows the model structure of this article.

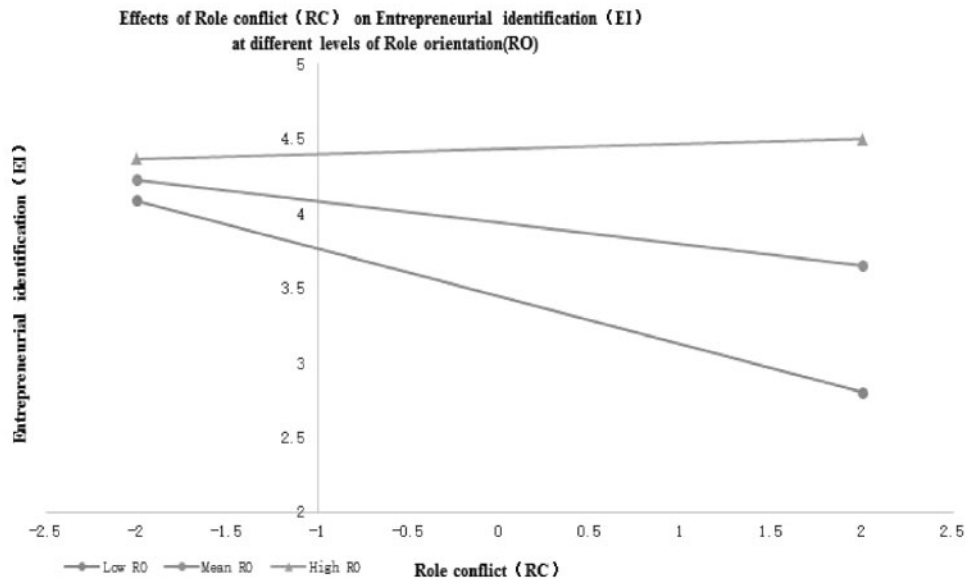
## 2. Theory background

The relationship and outcomes between entrepreneurial identity and entrepreneurial behavior has attracted increasing academic attention (Alsos et al. 2016). As an important part of social psychology, social identity theory argues that social identity is a product of communicative behaviors that are formed and developed through social interactions (Scott et al. 2010). Individuals define their sense of self in

terms of social categories or group memberships (Tajfel and Turner 1986) and achieve social identity from group members (Mills and Pawson 2012). Studies have shown that individuals generally have hybrid identities as opposed to a single social identity (Alsos et al. 2016). A large body of research attests that an individual's MI tend to have positive implications for well-being, motivation, and engagement (Ramarajan 2014). In the field of academic entrepreneurship, scholars embody MI by participating in multiple group activities before being an academic entrepreneur. This article attempts to analyze the influence of MI on the subject of EI.

Identity theory is a branch of sociological theory that describes an individual's role and role-related behavior. Identity theory assumes that different roles require individuals to act and think in different ways (Alsos et al. 2016). RC refers to an individual's perception that the demands of one role (role A) make it difficult to satisfy the demands or expectations of a competing role (role B) (Shepherd and Haynie 2009). Because academic entrepreneurs embody two roles, scholars and entrepreneurs, such roles may occasionally conflict. Relevant studies have shown that multiple role compromises can affect an individual's well-being due to uncertainty and stress caused by RC (Marks 1977). RC at work tends to increase anxiety and decrease job satisfaction (Palomino and Frezatti 2016). The current article aims to examine the effect of RC on EI.

RO is one essential outcome that the process of socialization may influence (Jones 1986). In different organizational environments, socialization tactics results in different ROs. In addition, RO is related to manner and behavior. As Parker noted, the way individuals define their roles affects their behavior (Parker et al. 1997). Even within the same job, individuals with different ROs will show different kinds of behaviors. In this sense, RO refers to how individuals define their roles, the types of tasks, goals, and problems they see as relevant to their roles, and how to effectively approach such tasks, goals, and problem (Parker 2007). For an individual, RO plays an important part in achieving both individual and organizational goals. For example, technological innovators with flexible RO are more likely to generate creative ideas (Howell and Boies



**Figure 2.** The moderating effect of RO on the relationship between RC and EI.

2004). RO plays an important role between a high performance work system and employee proactivity (Beltrán-Martín et al. 2017). When scholars become academic entrepreneurs, many differences exist between the two roles (Jain et al. 2009). Scholars must transform their academic roles and redefine their new role as academic entrepreneurs. RO is described as one’s own role construction (Howell and Boies 2004); thus RO may play an important part in the process of academic entrepreneur transformation and gaining EI. As such, this article uses ‘role orientation’ as a moderator variable to explore its effect on the two relationships—namely, MI and EI and RC and EI.

### 3. Hypotheses

#### 3.1 MI, RC, and EI

As social identity theory suggests, an individual defines himself/herself and self-behavior according to a social category or a group (Tajfel and Turner 1986) and obtains their social identity from the other group members (Mills and Pawson 2012). Organizational scholars propose that an individual’s MI can be used as an ‘energy resource’ to obtain resources at work, thus promoting success and well-being (Dutton et al. 2010). The link between MI and the EI is important for several reasons.

First, having MI can provide academic entrepreneurs with a source of social capital that helps them to form an EI. As proposed by Dutton and colleagues (2010), identities can enable individuals to increase the number and diversity of relationships they have at work thus helping them to acquire more resources to draw on during challenging or stressful periods. Scholars’ MI enable them to obtain the support of material and human resources, as well as knowledge and information through communication with different groups. Furthermore, insights, skills, and experiences individuals develop as members of different groups can be used not only as a resource for gaining entry into previously inaccessible markets, but also to reconceptualize and reconfigure work (Ely and Thomas 2001). Therefore, scholars’ MI increase academic entrepreneurial social capital and provide a variety of resources to reconceptualize

and reconfigure work. Because social capital is key to academic entrepreneurship (Mosey and Wright 2007), MI provide a resource basis for academic entrepreneurship that contributes to the formation of EI.

In addition, MI enable support from members of the community and help academic entrepreneurs adapt to the transition process, thus promoting the formation of EI. Members of multiple groups can provide social and emotional support for others (Haslam et al. 2008). Before becoming an academic entrepreneur, scholars actively participate in group activities to gain attention and emotional support from the community members. Group memberships tend to have positive implications on individuals’ well-being and help with life transitions (Haslam et al. 2008). When academic entrepreneurs face a new environment and challenges of entrepreneurship, MI help them to gain a sense of psychological stability and security, thus reducing the pressure of academic entrepreneurship and promoting the formation of EI.

Finally, the experience of managing multiple groups allows academic entrepreneurs to develop flexibility that is useful in forming an EI (Haslam et al. 2008). Before becoming academic entrepreneurs, scholars’ management of MI develops flexibility to cope with a changing environment. Flexibility has a positive effect on mitigating conflict (Halperin and Dweck 2011). Therefore, academic entrepreneurship flexibility in dealing with MI makes it possible to deal with setbacks and problems in the face of an entrepreneurial environment and contributes to EI. Based on such arguments, we hypothesize the following.

**Hypothesis 1:** MI positively influence EI.

The identity theory assumes that different roles require individuals to act and think in different ways (Guo 2011). Most academic entrepreneurs try to preserve their roles as scholars when they engage in academic entrepreneurial activities (Dodgson and Staggs 2012). However, when these two roles have inconsistent or incompatible values and norms, it leads to RC. There are many ways in which RC may influence EI.

First, over time, RC makes it difficult for academic entrepreneurs to perform more than one job simultaneously. In such a case, the individual is likely to give up his/her latest entrepreneurial identity. Scholars and entrepreneurs have different time horizons, and academic timelines are much longer than entrepreneurial timelines (Bansal and O'Brien 2012). The period of time it takes for a scholar to achieve high-quality research is often longer than it takes to deal with problems as an entrepreneur. However, finding, using, and bringing opportunities to market quickly are key dimensions in enterprise performance for entrepreneurs in a fast-moving, high-tech environment (Shepherd and Levesque 2002). In contrast, academic research takes a long time, which is not conducive in establishing a competitive advantage. Thus, the time inconsistency makes it difficult for academic entrepreneurs to meet the requirements of the two different roles. As a result, RC makes it easy for academic entrepreneurs to forgo their new identities.

Second, academic entrepreneurs' RC is also inconsistent in terms of values. RC is defined as the degree to which individual expectations are incompatible or inconsistent with values and expertise of the current role (Rai 2016). Academic entrepreneurs have taken the two roles of scholars and entrepreneurs into account. The role of an entrepreneur is to emphasize the enterprise organization goals, while scholars' pursuit is knowledge, innovation, and creation. The values and aims of these roles are inconsistent and often incompatible and, as such, the process of entrepreneurship can confuse academic entrepreneurs. In this sense, RC may raise some doubts, and academic entrepreneurs could be forced to re-examine their identities as entrepreneurs. As a result, academic entrepreneurs tend to give up EI.

Third, RC is incompatible in the structure of knowledge and ability. Entrepreneurs need to be able to manage, coordinate, and integrate multiple resources. Moreover, as entrepreneurs observe the entrepreneurial environment and market demand changes, they need to look for opportunities as determinants. However, scholars who identify an opportunity may not be able to exploit it because of a lack of required information and abilities (Urbano and Guerrero 2013). This is because as scholars, they adhere more to the frontier theory and related information in their respective fields of study. Such inconsistencies of information, knowledge, and ability required by academic entrepreneurs' two roles could lead to RC, which might also increase the conversion time necessary to gain the requisite knowledge and ability. Consequently, academic entrepreneurs may be unable to seize an opportunity in the effective time period in order to obtain academic entrepreneurship success and cause academic entrepreneurs to rethink their role of entrepreneur. As such, this article proposes the following hypothesis.

**Hypothesis 2:** RC negatively influences EI.

### 3.2 The moderating effect of RO

Innovative faculty members are more likely to become entrepreneurs (Miller et al. 2018) if they have an orientation that includes creativity and innovation as part of their academic role (Howell and Boies 2004). Hence, academic entrepreneurs with such a RO are more likely to participate in multiple groups and gain MI. This study suggests that RO may moderate the relationship between MI and EI.

On one hand, academic entrepreneurs with higher RO have more flexibility. They define and view their work in a positive way and have a positive attitude toward new entrepreneurial environment and identity. Academic entrepreneurs' MI provide diverse resource support for entrepreneurship (Dutton et al. 2010). Academic

entrepreneurs with higher RO can flexibly coordinate and manage diverse resources developed by MI. In addition, academic entrepreneurs can also forecast and solve problems arising from the business in a timely way. Hence, RO promotes the realization of entrepreneurial goals and moderates the relationship between MI and EI.

On the other hand, academic entrepreneurs with higher RO have more initiative to actively build social resources that may promote the achievement of goals (Thomas et al. 2010). Generally speaking, academic entrepreneurs with high RO have a more positive attitude in regards to their MI. Moreover, they have an increased motivation to communicate with others. In this sense, academic entrepreneurs with higher RO may garner social capital and emotional support more easily from scholars' groups. Thus, RO can positively moderate the effect of MI on EI. On the basis of these arguments, we propose the following hypothesis.

**Hypothesis 3:** RO positively moderates the relationship between MI and EI in such a way that the higher the RO, the more positive the effect on EI with MI.

When the requirements of an academic entrepreneur's two roles are inconsistent, the individual may feel RC, which is more likely to cause anxiety and pressure. Hence, RC negatively affects the formation of EI. In such cases, academic entrepreneurs need to use strategies to reduce anxiety and pressure. As Morrison and Dance noted, RO is associated with motivational states such as affective commitment (Morrison and Dance 1994). RO is a set of beliefs that can be altered according to a changing external environment (Parker 2007). In this sense, academic entrepreneurs with RO may change their motivation, beliefs, and manners to suit the changing entrepreneurial environment. In this way, RO may help reduce the effect of RC on EI.

Academic entrepreneurs with high RO are likely to be more flexible in their ability to cope with conflicts and problems in the process of entrepreneurship. As noted by Parker (2007), a flexible RO predicts a more proactive solution to a problem. In this regard, academic entrepreneurs with higher RO can solve inconsistencies timely. In addition, academic entrepreneurs actively learn and adjust their own knowledge and ability structure to meet the needs of academic entrepreneurship. Hence, academic entrepreneurs' RO could reduce the negative impact of RC on the formation of EI.

In addition, academic entrepreneurs with high RO have the initiative to adjust their positioning in response to a changing environment and conditions in a timely manner. Relevant research shows that a proactive career orientation reduces stress and uncertainty regarding the future and is associated with well-being (Flum and Blustein 2000). Academic entrepreneurs with initiative can adjust their career orientation in a new entrepreneurial environment. They are no longer seen as scholars and they gradually accept and emphasize their new identity of entrepreneur. Academic entrepreneurs with high RO could adjust their status actively, which would help to reduce anxiety and stress. Thus, RO can moderate positively the relationship between RC and EI. Hence, we hypothesize the following.

**Hypothesis 4:** RO positively moderates the relationship between RC and EI in such a way that the higher the RO, the less negative the effect of RC.

### 3.3 EI and AEP

Existing evidence suggests that EI can affect the AEP. First, EI enables them to engage in activities and goals with entrepreneurial

intentions that help to improve the AEP. As noted by Lawler (1968), identification affects job intentions or goals, which in turn affects effort and performance (Lawler et al. 1968). Academic entrepreneurs form their EI by accepting the behavioral norms, tasks, and other requirements of an entrepreneur. Therefore, they engage in entrepreneurial activity with the goals of entrepreneurs and through their own efforts to actively participate in the commercialization of research results and technology transfer. As a result, academic entrepreneurs can achieve a successful AEP.

Additionally, if academic entrepreneurs form an EI, they would engage in their work with an entrepreneurial attitude and maintain enthusiasm. In this regard, EI makes a contribution to AEP. As noted by Ajzen and Fishbein (1980), identification first affects work attitude (i.e. the behavior at work) and then the result of the work behavior (i.e. the performance of the work) (Ajzen and Fishbein 1980). Academic entrepreneurs who form EI can seize market opportunities and demand changes because of their entrepreneurial attitude. Therefore, academic entrepreneurs respond more quickly to market-changing conditions that could help to commercialize research results. Consequently, EI could facilitate a more successful AEP.

Finally, if academic entrepreneurs form an EI, they would identify an entrepreneurial group with a positive attitude and reputation. In this respect, EI makes a contribution to AEP. Research shows that when people strongly agree with a group, they are concerned about the group's status and welfare, and thus want to generate a good reputation and attitude in order to obtain the same treatment from the group members (Blader and Tyler 2009). Academic entrepreneurs form their EI and define themselves as members of the entrepreneurial group, and as such, feel concern about the welfare and status of the group. Moreover, to gain more recognition and support from the entrepreneur group, members would want to display a good attitude and AEP. In this sense, the process of seeking group identity is also the process of encouraging the entrepreneur to achieve the entrepreneurial goal of achieving better and faster results, thus helping to enhance AEP. On the basis of these arguments, we hypothesize the following.

**Hypothesis 5:** EI is positively related to AEP.

## 4. Method

### 4.1 Data collection

The current study investigates academic entrepreneurs from universities, colleges, and research institutions that are all listed on the official website of the Ministry of Education of China. A questionnaire was developed to collect data for this study. To circumvent potential common method variance biases (Podsakoff et al. 2003), the questionnaire was divided into two sections and stages. The first section covered explanatory variables, and the second part covered the outcome variables. The questionnaire was administered on two occasions with a six-month time gap in between.

In the first stage, we selected a random sample of 918 academic entrepreneurs from various universities with whom we had preliminarily contacted to seek their participation. Of the 918 academic entrepreneurs we identified, 579 were willing to communicate with the researchers. In the first stage, we collected data using a field survey and mail survey following the procedure outlined in Chisnall (2007). We collected 264 available answers regarding MI, RC, RO, EI, and control variables (Chisnall 2007).

In the second stage, six months after the first stage, data were collected in a similar matter. We combined the first-stage data and

**Table 1.** Independent sample of the *t*-test

	<i>T</i> -test	
	<i>F</i>	Sig
EI	0.006	0.940
AEP	2.300	0.131

the second-stage data with AEP and control variables. Unfortunately, as we only received 248 samples, the final data used in the study only contained a total of 248 academic entrepreneurs with independent variables, dependent variables, and control variables. We conducted nonresponse bias tests by comparing the key features of responsive and nonresponsive academic entrepreneurs, as well as the key features of early and late respondents. The *T*-tests showed no significant difference between the groups in terms of age, gender, and education, business training.

In addition, we classified EI into two subgroups (academic institution, university) and conducted an independent sample of a *T*-test to compare the differences. The results show no significant difference between the two subgroups ( $F = 0.006, P > 0.10$ ). In addition, we used the same method to divide AEP into two groups. Based on the results of the *T*-test, we also could not find any significant difference between these two groups ( $F = 2.300, P > 0.10$ ). The results of the *T*-test are shown in Table 1.

### 4.2 Study measures

Based on previous research, we developed a questionnaire to measure the variables in our model (Table 2). We used multiple-item scales to evaluate analytical structures and indicators to measure all of the variables except the control variables. When we could not find the proper measures in previous literature, we developed a new measure standard. Participants answered all questions using a five-point Likert-type scale.

The questionnaire was created in English and subsequently translated and managed in Chinese. We designed an initial English version of the questionnaire through a validated measuring scale used in previous literature. To maintain content validity during translation, we invited three bilingual business researchers who specialize in academic entrepreneurship to translate the questionnaire using the following process. Two professional translators independently translated the English questionnaire into Chinese, compared their translation, and developed the final Chinese version. A third professional translator translated the final Chinese version of the questionnaire into English and compared it with the original English version for consistency and validity.

The Chinese version of the questionnaire underwent several rounds of pretest and refinement. It was first sent to a panel of academics and practitioners to check for ease of use and to ensure the measurement items would be interpreted accurately. The revised questionnaire was then submitted to twelve experienced Chinese academic entrepreneurs to check for clarity and appropriateness. According to their feedback, some items were deleted and others were modified. Prior to finalization and administration of the survey, a pretest was conducted with six academic entrepreneurs from a college, a university, and a research institute in China. Academic entrepreneurs were asked to complete the survey and raise any issues of concerns. This stage of pretesting only slightly improved the number of measurement items. The final measurements of the study are shown in the Table 1.

**Table 2.** Factor loadings from reliabilities

Measures	Factor loading	AVE	Cranach's Alpha
MI (MI)		0.59	0.78
MI1 Before becoming an entrepreneur, I belonged to many different groups.	0.60		
MI2 Before becoming an entrepreneur, I joined in the activities of many different groups.	0.87		
MI3 Before becoming an entrepreneur, I had friends who were members of many different groups.	0.84		
MI4 Before becoming an entrepreneur, I had strong ties with many different groups.	0.73		
RC		0.50	0.69
RC1 Taking teaching, research, and entrepreneurship into account, I often encounter conflicts in time distribution.	0.63		
RC2 Taking teaching, research, and entrepreneurship into account, I often encounter conflicts in problem-solving.	0.77		
RC3 Taking teaching, research, and entrepreneurship into account, I often doubt my pursuits.	0.71		
RC5 Taking teaching, research, and entrepreneurship into account, I often encounter conflict in my measurement system.	0.68		
RO		0.50	0.75
RO1 I have made an attempt to redefine my role as an entrepreneur and change what I am required to do.	0.70		
RO2 While I am satisfied with my overall job responsibilities, I have altered the procedures to adapt to new entrepreneurial actions.	0.60		
RO3 I have changed the mission or purpose of my role after becoming an entrepreneur.	0.71		
EI		0.53	0.87
EI1 In general, when someone praises entrepreneurs, it feels like a personal compliment.	0.72		
EI2 In general, when someone criticizes entrepreneurs, it feels like a personal insult.	0.81		
EI3 I When I talk about entrepreneurs, I usually say 'we' rather than 'they'.	0.77		
EI4 An entrepreneur's successes are my successes.	0.70		
EI5 I am pleased to be a member of the entrepreneurial profession.	0.70		
EI6 If a story in the media criticizes entrepreneurs, I feel embarrassed.	0.68		
AEP		0.69	0.91
AEP1 In the process of academic entrepreneurship, I achieve the economic benefits of research commercialization.	0.73		
AEP2 In the process of academic entrepreneurship, I produce the social benefits of research commercialization.	0.85		
AEP3 Academic entrepreneurship facilitates my scientific research.	0.85		
AEP4 Academic entrepreneurship is my long-term activity.	0.86		
AEP5 Academic entrepreneurship continuously facilitates my scientific research and research commercialization.	0.85		

#### 4.2.1 Independent variables

According to the research of Haslam et al., MI refer to specific group membership and social identification that individuals gain from different groups (Haslam et al. 2008). In this article, we tried to define groups as social groups as academic communities, cooperation groups, interdisciplinary cooperation teams, and so forth. RC refers to an individual's perception that the demands of one role (role A) make it difficult to satisfy the demands or expectations of a competing role (role B) (Shepherd and Haynie 2009). High reliability and internal consistency has been shown in MI ( $\alpha = 0.78$ ) and RC ( $\alpha = 0.69$ ). RO, which refers to how individuals perform their roles and adjust to task requirements, was measured by five items adopted from Jones (1986). The reliability and internal consistency ( $\alpha = 0.75$ ) of RO was high.

#### 4.2.2 Dependent variables

The measurements of EI are adopted from Hekman et al. (2009). The six-item scales evaluate the extent to which academic entrepreneurs identify with an entrepreneurial identity. In addition, this research measured AEP. The scales of EI ( $\alpha = 0.87$ ) and AEP ( $\alpha = 0.91$ ) showed high reliability and internal consistency.

#### 4.2.3 Control variables

In studies of identity, as noted by Hekman et al. (2009), factors such as gender, age, and education background can be viewed as control variables. Hence, we chose these factors as control variables. Gender measurement is a dummy variable, and age is measured by

objective data. The education background scales range from one to four, which represent middle school, high school, and undergraduate, postgraduate, and so forth. Moreover, as academic entrepreneurs who went through business training have an important effect on results, we selected business training as a control variable. In this article, business training refers to whether an individual has learned business knowledge or gone through business training in the course of academic entrepreneurship. Our research investigated academic entrepreneurs from universities, colleges, and research institutions. As researchers have suggested that the affiliation of the academic entrepreneur may have an important effect on results, we selected the institution as a control variable in the model. In this article, institution refers to an individual affiliated with a university, college, or research institute.

#### 4.3 Results

Before the regression analysis, we conducted an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to ensure the reliability and validity of the structure (Tse et al. 2015). According to the following criteria, we carried out a factor analysis using all the multi-item scales and retained items for each theoretical construct (Tse et al. 2015) with the following conditions: (1) the item must load to the correct theoretical construct and the factor loading for the item must be greater than 0.5; and (2) no double loadings can exist (an item loaded to two constructs with factor loadings greater than 0.4). The result of the EFA showed that, with the exception of items RC4, RO4, and RO5, the remaining twenty-two factor loads were above 0.4, and there were no double loadings. As such,

**Table 3.** Descriptive statistics

	MI	RC	RO	EI	AEP	Gender	Age	Edu	BT	Inst
MI	0.77									
RC	-0.04	0.71								
RO	0.34***	-0.15*	0.71							
EI	0.25***	-0.21***	0.54***	0.73						
AEP	0.26***	-0.21***	0.31***	0.40***	0.83					
Gender	-0.00	-0.07	-0.06	0.02	-0.01	NA				
Age	-0.14	-0.09	-0.03	0.00	-0.06	0.34***	NA			
Edu	-0.02	-0.03	-0.12	0.01	0.07	0.22***	0.08	NA		
BT	0.03	-0.14*	0.16*	0.16*	0.23**	0.09	0.16*	0.20**	NA	
Inst	-0.00	-0.00	0.06	0.10	0.05	0.07	0.19**	0.17**	0.01	NA
Mean (Standard Deviation)	3.48 (0.80)	2.78 (0.88)	3.54 (0.89)	3.64 (0.88)	3.13 (0.86)	0.66 (0.48)	41.41 (8.14)	3.69 (0.48)	0.24 (0.43)	0.92 (0.26)

Education: Education background; BT: Business training; Inst: Institution., \*P < 0.10, \*\*P < 0.05, \*\*\*P < 0.01(two-tailed test). Entry on the diagonal is the square roots of AVE.

we removed these items. We then performed the confirmatory factor analysis (CFA) and the results showed that all twenty-two items formed five suitable factors: MI, four items; RC, four items; RO, three items; EI, six items; AEP, four items. The CFA model presented a reasonable fit to the data ( $\chi^2/DF = 1.91$ ; CFI = 0.90, IFI = 0.90; RMSEA = 0.07). The results of the CFA are shown in Table 2:

The results showed that the factor loadings of all items were larger than 0.5 in the related factors, there were no high cross-loadings, and thus the convergent validity was good (Tse et al. 2015). Based on the factor loading, we calculated the average variances extracted (AVE) of the five constructs (MI, RC, RO, EI, AEP) as 0.59, 0.50, 0.50, 0.53, and 0.69 (from 0.50 to 0.69). At the same time, the composite reliability of the five factors was 0.85, 0.80, 0.70, 0.87, and 0.87. In addition, we also report means, standard deviation, correlations, and the square roots of AVE scores in Table 3. The results indicate that all the square roots of AVE (from 0.71 to 0.77) were larger than the correlation coefficients among the six factors (maximum value was 0.54), which demonstrated good discriminate validity (Zhang et al. 2015). In Table 3, we can see that MI is positively related to EI while RC is negatively related to EI, and EI is positively related to AEP. In other words, the results are consistent with the hypotheses.

Our hypotheses were tested using a hierarchical multiple regression method, which has been widely applied to test moderator effects (Yuan and Chen 2015). In order to facilitate the testing of interaction and secondary effects, the independent variables were centered before the calculation. For multi-item variables, we used the average of the respondents' scores on the related items. Results are shown in Table 4.

To detect whether common method bias was present in our data, we performed Harman's single-factor test in which the un-rotated solution to an EFA is examined. In this test, common method bias may be present when either (1) a single factor emerges from the analysis, or (2) one factor emerges from the analysis accounts for a majority of the data. The un-rotated solution leads to the retention of five factors with eigenvalues greater than 1.0, and the first factor explains only 29.4% of the total variance. In order to further detect common method variance and ensure the reliability and validity, an alternative measurement model was tested in which all indicator items for all variables were modeled to measure a single factor. This single factor model is equivalent to Harman's one-factor test that is often used to detect common method variance (Podsakoff et al.

2003). As expected, the model returned a low model fit ( $\chi^2 / df = 5.56$ ; CFI = 0.46, IFI = 0.47; RMSEA = 0.16) in which all model fit indicators were significantly outside of the desired range. These results suggest that our data are not biased by an underlying common method factor.

As shown in Table 4, model 1 contains five control variables, and the coefficients of the control variables are not significant ( $F = 0.62$ ,  $P > 0.10$ ). In model 2, the equation became significant ( $F = 2.82$ ,  $P < 0.01$ ) after entering MI and RC. The coefficients of MI ( $b = 0.30$ ,  $P < 0.01$ ) and RC ( $b = -0.18$ ,  $P < 0.05$ ) are significant, thus supporting Hypotheses 1 and 2. In model 3, we add the moderating variable RO. By calculating the correlation between the dependent variables and the independent variables, a significant result ( $F = 7.41$ ,  $P < 0.01$ ) was generated. In addition, there is significant incremental variance ( $\Delta R^2 = 0.25$ ,  $\Delta F = 15.70$ ,  $P < 0.01$ ) compared with the previous step. At the same time, the interaction between RO and MI ( $(RO * MI) b = 0.07$ ,  $P > 0.10$ ) is not significant, and the results indicate that H3 is not supported. The interaction items of RO and RC ( $(RO * RC)$ ,  $b = 0.20$ ,  $P < 0.05$ ) are significant and support H4. When RO is at a low level, the slope of RC and EI is negative; when RO is at a high level, the slope of RC and EI becomes positive, which indicates that RO has a significant moderating effect, as shown in Figure 2.

The relationship between EI and AEP is shown in Table 4 by the regression analysis. In model 1, most of the control variables of the regression equation are not significant ( $F = 1.94$ ,  $P < 0.10$ ), and the business training became significant. In model 2, after entering EI and AEP, the equation becomes significant ( $F = 4.06$ ,  $P < 0.01$ ) with significant incremental variance ( $\Delta R^2 = 0.09$ ,  $\Delta F = 13.63$ ,  $P < 0.01$ ). In addition, the coefficient of AEP was ( $b = 0.33$ ,  $P < 0.01$ ) with significant results and thus supports H5.

#### 4.4 Additional analyses

To further test our results, we tested the mediating effects of EI between MI, RC and AEP. As noted by Bartel et al. (2012), we tested the mediating effect as follows (Bartel et al. 2012): in the first step, we made regression about the relationship between MI, RC and AEP, and the result indicated that MI positively affected AEP ( $b = 0.23$ ,  $P < 0.05$ ), RC negatively affected AEP ( $b = -0.28$ ,  $P < 0.01$ ); in the second step, we made regression about the relationship between MI, RC and EI, and the result showed that MI positively affected EI ( $b = 0.30$ ,  $P < 0.01$ ), RC negatively affected EI ( $b = -0.18$ ,  $P < 0.05$ ); in the third step, this article made regression about

**Table 4.** Results from hierarchical regression analyses ( $N = 248$ )

	Dependent variable:EI			Dependent variable: AEP
	Model 1 Coefficient (standard error)	Model 2 Coefficient (standard error)	Model 3 Coefficient (standard error)	Model 4 Coefficient (standard error)
Intercept	3.78*** (0.79)	3.63*** (0.75)	3.42*** (0.66)	3.09*** (0.78)
MI		0.30*** (0.09)	0.14 (0.09)	
RC		-0.18** (0.09)	-0.14* (0.08)	
RO			0.55*** (0.08)	
Multiple identities*Role orientation (MI * RO)			0.07 (0.08)	
Role conflict*Role orientation (RC * RO)			0.20** (0.08)	
EI				0.33*** (0.09)
Gender	-0.03 (0.19)	-0.03 (0.18)	0.02 (0.16)	-0.03 (0.18)
Age	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.01 (0.01)
Education background	-0.05 (0.19)	-0.05 (0.18)	0.07 (0.15)	0.20 (0.18)
Business training	0.32 (0.19)	0.26 (0.19)	0.03 (0.16)	0.41** (0.18)
Institution	0.21 (0.33)	0.22 (0.31)	0.03 (0.27)	-0.21 (0.30)
<i>F value</i>	0.62	2.82***	7.41***	4.06***
$R^2$	0.03	0.14	0.39	0.17
<i>Adjust R<sup>2</sup></i>	-0.02	0.09	0.34	0.13
$\Delta R^2$	0.03	0.12	0.25	0.09
$\Delta F$	0.62	8.15***	15.70***	13.63***

\* $P < 0.10$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$  (two-tailed test).

the relationship between MI, RC, EI and AEP, and the result indicated that MI positively affected AEP ( $b = 0.16$ ,  $P < 0.1$ ), RC negatively affected AEP ( $b = -0.24$ ,  $P < 0.01$ ), EI positively affected AEP ( $b = 0.22$ ,  $P < 0.05$ ), therefore, EI has a partial mediating effect between MI, RC and AEP. In other words, we found the mediating effects of EI between MI, RC and AEP.

## 5. Discussion

This study attempts to explore factors that affect the formation of EI for academic entrepreneurs. The results of our empirical test of 248 samples show that previous MI of academic entrepreneurs positively influence the formation of EI. Academic entrepreneurship RC has a negative impact on EI, which ultimately affects AEP. Moreover, academic entrepreneurs' identification can be moderated through RO, thereby strengthening positive effects and weakening negative influence. Meanwhile, we find that RO moderating the relationship between MI and EI is not significant. The one possible explanation is that since the experience of managing MI allows academic entrepreneurs to develop flexibility (Haslam et al. 2008), academic entrepreneurs have the ability to deal with the new identity of the demand of entrepreneurs; thus the moderating effect of RO is not obvious. In addition, we have found the mediating effect of EI between MI, RC and AEP. These results have implications for theory and practice that we next summarize.

### 5.1 Theoretical contributions

Firstly, this article makes an important contribution that helps to fill the research gap on the formation of EI in academic entrepreneurship. Currently, the research on academic entrepreneurship is mainly focused on the environmental and organization levels. Little research exists on the individual level and specifically how academic entrepreneurs form an EI. Hence, from a micro point of view and based on an identity perspective, this article focuses on the EI and finds MI and RC that may influence such identification. On one hand, psychologists, sociologists, and philosophers have long discussed MI (Ramarajan

2014) and have reached the consensus that such identities have positive implications for an individual's well-being (Haslam et al. 2008), satisfaction, commitment (Meyer et al. 2006), and so forth. This study regards MI as an influential factor that contributes to the formation of EI. In this respect, it also demonstrates the positive role of MI in the field of academic entrepreneurship. On the other hand, previous studies of RC mainly focus on family and work and have shown that RC has a negative effect. For instance, uncertainty and stress caused by RC can affect self-happiness (Marks 1977), which increases anxiety and reduces satisfaction (Palomino and Frezatti 2016). This article takes significant RC as an influencing factor and finds that its effect on the formation of EI is also negative. Further, this conclusion validates the significance of the negative impact of RC. This study also applies MI and RC to entrepreneurial identity research and provides quantitative evidence for the impact of both factors on EI.

Secondly, this article verifies that EI is a key variable of entrepreneurial success (Miller and Le Breton 2011). In the process of entrepreneurship, EI can promote individuals to actively respond to change, enhance their adaptability to the entrepreneurial environment, and improve their chances of success (Shepherd and Haynie 2009). Academic entrepreneurs are different from general entrepreneurs. Because of their lack of business knowledge, academic entrepreneurs tend to focus more on technical aspects than business aspects, which is not conducive in identifying and seizing market opportunities (Franklin et al. 2001). Entrepreneurial identity encourages more entrepreneurial behavior (Farmer et al. 2011), such as choosing entrepreneurial opportunities and the execution of entrepreneurial decisions. In this vein, entrepreneurial identity is beneficial in motivating academic entrepreneurs to engage in entrepreneurial activities, identify entrepreneurial opportunities, and promote the success of academic entrepreneurship. As such, our empirical results support our assumptions and contribute to the research that EI has an important impact on AEP.

Thirdly, this article expands the study of RO. RO refers to the manner in which individuals perform their roles and adjust to task

requirements (Jones 1986). Some of Parker's research on RO has focused more on analyzing the influence of this component on employees' work behavior, competitiveness, and performance (Parker et al. 2006). Although the study of RO has increased, there is a lack of research on academic entrepreneurs' RO, especially as a moderating variable and its moderating effect. This study uses RO as a moderating variable and finds that it could positively moderate the relationship between MI, RC, and EI. RO, in particular, could reduce the negative impact of RC.

Fourthly, this article integrates social identity theory with identity theory (which are closely linked but rarely integrated). Social identity theory is concerned with the relationship between groups (Hogg and Terry 2000) and emphasizes interpersonal social interactive factors, while identity theory is a sociological theory that describes the individual's role and role-related behavior. Although previous studies have used social identity theory and identity theory to analyze different research questions, our research design allows us to integrate these two kinds of integral theories into our conceptual framework.

Finally, this article finds that EI mediates the relationship of MI to AEP, indicating that EI helps academic entrepreneurs utilize MI and thereby plays a critical role in increasing social capital and support (Haslam et al. 2008) into AEP. These results enhance our understanding of the value of EI and these results are consistent with previous studies (Miller and Le Breton 2011).

## 5.2 Practical implications

This article provides some practical implications from academic entrepreneur's point of view. First, academic entrepreneurs' MI provide social capital and diversity of resources for reconceptualizing and reconfiguring work (Ely and Thomas 2001). In this sense, academic entrepreneurs should try to gain support and resources from multiple groups through cooperation and communication.

A second implication is that academic entrepreneurs should take measures to solve the problems caused by RC. Because academic entrepreneurs' RC is not conducive to seizing opportunities quickly and gaining success in entrepreneurship, it is more difficult to form an EI. In this regard, academic entrepreneurs should take an objective view of RC and its negative effects. Moreover, they should also plan to change attitudes and accept their new identities by adjusting their knowledge and abilities in a timely manner.

In addition, research on RO also reminds academic entrepreneurs to continuously adjust their attitude toward academic entrepreneurship based on environmental changes. In this respect, academic entrepreneurs should carry out academic entrepreneurial activities with initiative and enthusiasm and, as such, form EI quickly to achieve a better performance.

According to the results of additional analyses, this study finds that EI mediates the linkage of MI to AEP. Therefore, a critical way for academic entrepreneurs to utilize diverse resources and supports in achieving AEP is participating in entrepreneurial activities and promoting the formation of EI.

Although our research is based on the individual level, governments and universities also play significant roles in supporting academic entrepreneurship (Grimaldi et al. 2011). Based on the research of MI in this study, governments and universities can establish technology transfer offices and academic entrepreneurial platforms and communities for academic entrepreneurs. Within these platforms and communities, academic entrepreneurs can increase

the number and diversity of their social relationships and gain more social capital through interaction with others.

In addition, based on the research of RC, governments and universities should take measures to reduce RC. First, universities can establish a flexible university faculty-assessment mechanism. A university faculty-assessment mechanism ensures that scholars can perform their teaching, scientific research, and entrepreneurial activities flexibly. As we have shown, RO helps reduce RC. In this regard, governments and universities could provide some entrepreneurial guidance to help scholars redefine their roles and reduce RC. Last but not least, our results indicate that business training benefits AEP, thus governments and universities should offer academic entrepreneurs some business training to facilitate academic entrepreneurship.

## 5.3 Limitations and future research

Although this article makes contributions, several limitations also exist. Firstly, although it is based on empirical research, the sample size is relatively small. Secondly, the data of this study are collected from only one source—that is, questionnaires. Although most quantitative studies collect data from surveys (Li et al. 2013), the use of multiple data sources may enhance the validity of research outcomes. Finally, although we have mentioned the two independent variables and moderator variables, other variables may exist that have not been considered. According to the limitation, future research should collect a larger sample pool to further test and verify the results. Meanwhile, more data collection methods should be used in the future to ensure the validity of the data. In addition, in future research, we may try to analyze the impact of other variables on EI.

## Acknowledgements

We would like to acknowledge the editor's contribution and show appreciation to the reviewers for their helpful comments and recommendations. This research was funded by National Natural Science Foundation of China (Award #: 71672049).

## References

- Ajzen, I., and Fishbein, M. (1980) *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs. Prentice-Hall.
- Albats, E., Miller, K., and Alexander, A. (2016) 'Entrepreneurial Academic Entrepreneurs: understanding micro social factors and legitimacy', *Xxvii ispm Innovation Conference, Porto, Portugal on 19–22 June 2016*.
- Alsos, G. A. et al. (2016) 'Entrepreneurs' Social Identity and the Preference of Causal and Effectual Behaviours in Start-Up Processes', *Entrepreneurship & Regional Development*, 28/3-4: 234–58.
- Armano, B., and Scagnelli, S. D. (2013) 'Academic entrepreneurs' role in science-based companies', *European Journal of Innovation Management*, 15/2: 192–211.
- Bansal, P. and O'Brien, James. (2012) 'Bridging the Research-Practice Gap', *Journal of Social Service Research*, 34/2: 25–42.
- Bartel, C. A., Wrzesniewski, A., and Wiesenfeld, B. M. (2012) 'Knowing Where You Stand: Physical Isolation, Perceived Respect, and Organizational Identification Among Virtual Employees', *Organization Science*, 23/3: 743–57.
- Beltrán-Martín, I. et al. (2017) 'The Relationship between High Performance Work Systems and Employee Proactive Behaviour: Role Breadth Self-Efficacy and Flexible Role Orientation as Mediating Mechanisms', *Human Resource Management Journal*, 27/3: 403–22.

- Bercovitz, J., and Feldman, M. (2008) 'Academic Entrepreneurs: Organizational Change at the Individual Level', *Organization Science*, 19/1: 69–89.
- Blader, S. L., and Tyler, T. R. (2009) 'Testing and Extending the Group Engagement Model: Linkages between Social Identity, Procedural Justice, Economic Outcomes, and Extrarole Behavior', *Journal of Applied Psychology*, 94/2: 445–64.
- Chang, Yuan Chieh, et al. (2016) Entrepreneurial universities and research ambidexterity: a multilevel analysis. *Technovation*, 54: 7–21.
- Chisnall, P. M. (2007) 'Mail and Internet Surveys: The Tailored Design Method', *Journal of Advertising Research*, 47/2: 207–8.
- Chrisman, J. J., Bauerschmidt, A., and Hofer, C. W. (1998) The determinants of new venture performance: An extended model. *Entrepreneurship Theory and Practice*, 23: 5–30.
- Dodgson, M. and Staggs, J. (2012) 'Government Policy, University Strategy and the Academic Entrepreneur: the Case of Queensland's Smart State Institutes', *Social Science Electronic Publishing*, 36/3: 567–85.
- Duberley, J., Cohen, L., and Leeson, E. (2007) 'Entrepreneurial Academics: Developing Scientific Careers in Changing University Settings', *Higher Education Quarterly*, 61/4: 479–97.
- Dutton, J. E., Roberts, L. M., and Bednar, J. (2010) 'Pathways for Positive Identity Construction at Work: Four Types of Positive Identity and the Building of Social Resources', *Academy of Management Review*, 35/2: 265–93.
- Ely, R. J., and Thomas, D. A. (2001) 'Cultural Diversity at Work: The Effects of Diversity Perspectives on Work Group Processes and Outcomes', *Administrative Science Quarterly*, 46/2: 229–73.
- Farmer, S. M., Yao, X., and Kung-Mcintyre, K. (2011) 'The Behavioral Impact of Entrepreneur Identity Aspiration and Prior Entrepreneurial Experience', *Entrepreneurship Theory & Practice*, 35/2: 245–73.
- Flum, H., and Blustein, D. L. (2000) 'Reinvigorating the Study of Vocational Exploration: A Framework for Research', *Journal of Vocational Behavior*, 56/3: 380–404.
- Franklin, S. J., Wright, M., and Lockett, A. (2001) 'Academic and Surrogate Entrepreneurs in University Spin-out Companies', *Journal of Technology Transfer*, 26/1: 127–41.
- Golob, E. (2006) 'Capturing the Regional Economic Benefits of University Technology Transfer: A Case Study', *Journal of Technology Transfer*, 31/6: 685–95.
- Grimaldi, R. et al. (2011) '30 Years After Bayh–Dole: Reassessing Academic Entrepreneurship', *Research Policy*, 40/8: 1045–57.
- Guerrero, M., and Urbano, D. (2012) 'The Development of an Entrepreneurial University', *Journal of Technology Transfer*, 37/1: 43–74.
- , Cunningham, J. A., and Urbano, D. (2015) 'Economic Impact of Entrepreneurial Universities' Activities: An Exploratory Study of the United Kingdom', *Research Policy*, 44/3: 748–64.
- Guo, C. (2011) 'Middle Managers' Strategic Role in the Corporate Entrepreneurial Process: Attention-Based Effects', *Journal of Management*, 37/6: 1586–610.
- Halperin, E., and Dweck, C. S. (2011) 'Promoting the Middle East Peace Process by Changing Beliefs About Group Malleability', *Science*, 333/6050: 1767–9.
- Harman, G., and Harman, K. (2004) 'Governments and Universities as the Main Drivers of Enhanced Australian University Research Commercialisation Capability', *Journal of Higher Education Policy & Management*, 26/2: 153–69.
- Haslam, C. et al. (2008) 'Maintaining Group Memberships: Social Identity Continuity Predicts Well-Being after Stroke', *Neuropsychological Rehabilitation*, 18/5-6: 671–91.
- Hayter, C. S. (2015) 'Public or Private Entrepreneurship? Revisiting Motivations and Definitions of Success Among Academic Entrepreneurs', *Journal of Technology Transfer*, 40/6: 1003–15.
- Hekman, D. R. et al. (2009) 'Effects of Organizational and Professional Identification on the Relationship Between Administrators' Social Influence and Professional Employees' Adoption of New Work Behavior', *Journal of Applied Psychology*, 94/5: 1325–35.
- Henrekson, M., and Rosenberg, N. (2001) 'Designing Efficient Institutions for Science-Based Entrepreneurship: Lesson from the US and Sweden', *Journal of Technology Transfer*, 26/3: 207–31.
- Hoang, H., and Gimeno, J. (2010) 'Becoming a Founder: How Founder Role Identity Affects Entrepreneurial Transitions and Persistence In Founding', *Journal of Business Venturing*, 25/1: 41–53.
- Hogg, M. A., and Terry, D. I. (2000) 'Social Identity and Self-Categorization Processes in Organizational Contexts', *Academy of Management Review*, 25/1: 121–40.
- , Terry, D. J., and White, K. M. (1995) 'A Tale of Two Theories: A Critical Comparison of Identity Theory with Social Identity Theory', *Social Psychology Quarterly*, 58/4: 255–69.
- Howell, J. M., and Boies, K. (2004) 'Champions of Technological Innovation: The Influence of Contextual Knowledge, Role Orientation, Idea Generation, and Idea Promotion on Champion Emergence', *Leadership Quarterly*, 15/1: 123–43.
- Jain, S., George, G., and Maltarich, M. (2009) 'Academics or Entrepreneurs? Investigating Role Identity Modification of University Scientists Involved in Commercialization Activity', *Research Policy*, 38/6: 922–35.
- Jones, G. R. (1986) 'Socialization Tactics, Self-efficacy, and Newcomers' Adjustments to Organizations', *Academy of Management Journal*, 29/2: 262–79.
- Lawler, E. E., Porter, L. W., and Tennenbaum, A. (1968) 'Managers' Attitudes Toward Interaction Episodes', *Journal of Applied Psychology*, 52/6: 432–9.
- Li, Y. et al. (2013) 'Ambidextrous Organizational Learning, Environmental Munificence and New Product Performance: Moderating Effect of Managerial Ties in China', *International Journal of Production Economics*, 146/1: 95–105.
- Marks, S. R. (1977) 'Multiple Roles and Role Strain: Some Notes on Human Energy, Time and Commitment', *American Sociological Review*, 42/6: 921–36.
- Meyer, J. P., Becker, T. E., and Dick, R. V. (2006) 'Social Identities and Commitments at Work: Toward an Integrative Model', *Journal of Organizational Behavior*, 27/5: 665–83.
- Miller, D. and Le Breton-Miller, I. (2011) 'Governance, Social Identity, and Entrepreneurial Orientation in Closely Held Public Companies', *Entrepreneurship Theory & Practice*, 35/5: 1051–76.
- Miller, K., Mcadam, R., and Mcadam, M. (2018) 'A Systematic Literature Review of University Technology Transfer from a Quadruple Helix Perspective: Toward a Research Agenda', *R & D Management*, 48/1: 7–24.
- Mills, C., and Pawson, K. (2012) 'Integrating Motivation, Risk-Taking and Self-Identity: A Typology of ICT Enterprise Development Narratives', *International Small Business Journal*, 30/5: 584–606.
- Morrison, R., and Dance, B. (1994) 'Effective Library Research Instruction for High School Students: The Challenge of Engineering State', *Reference Services Review*, 22/3: 21–95.
- Mosey, S., and Wright, M. (2007) 'From Human Capital to Social Capital: A Longitudinal Study of Technology-Based Academic Entrepreneurs', *Entrepreneurship Theory & Practice*, 31/6: 909–35.
- O'Gorman, C., Byrne, O., and Pandya, D. (2008) 'How Scientists Commercialise New Knowledge Via Entrepreneurship', *Journal of Technology Transfer*, 33/1: 23–43.
- Pérez, M. P., and Sánchez, A. M. (2003) 'The Development of University Spin-Offs: Early Dynamics of Technology Transfer and Networking', *Technovation*, 23/10: 823–31.
- Palomino, M. N., and Frezatti, F. (2016) 'Role Conflict, Role Ambiguity and Job Satisfaction: Perceptions of the Brazilian Controllers', *Revista De Administração*, 51/2: 165–81.
- Parker, S. K. (2007) 'That Is My Job: How Employees' Role Orientation Affects their Job Performance', *Human Relations*, 60/3: 403–34.
- , Wall, T. D., and Jackson, P. R. (1997) 'That's Not My Job: Developing Flexible Employee Work Orientations', *Academy of Management Journal*, 40/4: 899–929.
- , Williams, H. M., and Turner, N. (2006) 'Modeling the Antecedents of Proactive Behavior at Work', *Journal of Applied Psychology*, 91/3: 636–52.

- Podsakoff, P. M. et al. (2003) 'Common Method Biases in Behavioral Research: a Critical Review of the Literature and Recommended Remedies', *Journal of Applied Psychology*, 88/5: 879–903.
- Rai, G. S. (2016) 'Minimizing Role Conflict and Role Ambiguity: A Virtuous Organization Approach', *Human Service Organizations Management*, 40/5: 508–23.
- Ramarajan, L. (2014) 'Past, Present and Future Research on Multiple Identities: Toward an Intrapersonal Network Approach', *Academy of Management Annals*, 8/1: 589–659.
- Rasmussen, E., Mosey, S., and Wright, M. (2015) 'The Transformation of Network Ties to Develop Entrepreneurial Competencies for University Spin-Offs', *Entrepreneurship & Regional Development*, 27/7-8: 430–57.
- Scott, C. R., Corman, S. R., and Cheney, G. (2010) 'Development of a Structural Model of Identification in the Organization', *Communication Theory*, 8/3: 298–336.
- Shepherd, D., and Haynie, J. M. (2009) 'Family Business, Identity Conflict, and an Expedited Entrepreneurial Process: A Process of Resolving Identity Conflict', *Entrepreneurship Theory & Practice*, 33/6: 1245–64.
- Shepherd, D. A. and Levesque, M. (2002) 'A Search Strategy for Assessing a Business Opportunity', *IEEE Transactions on Engineering Management*, 49/2: 140–54.
- Tajfel, H and Turner, J.C. (1986) 'The Social Identity and Intergroup Behavior', in S. Worchel and W. G. Austin (eds.), *The Psychology of Intergroup Relations*, 2nd ed. Chicago: Nelson-Hall, pp. 7–24.
- Thomas, J. P., Whitman, D. S., and Viswesvaran, C. (2010) 'Employee Proactivity in Organizations: A Comparative Meta-Analysis of Emergent Proactive Constructs', *Journal of Occupational & Organizational Psychology*, 83/2: 275–300.
- Tse, Y. K. et al. (2015) 'Unlocking Supply Chain Disruption Risk within the Thai Beverage Industry', *Industrial Management & Data Systems*, 116/1: 21–42.
- Urbano, D., and Guerrero, M. (2013) 'Entrepreneurial Universities Socioeconomic Impacts of Academic Entrepreneurship in a European Region', *Economic Development Quarterly*, 27/1: 40–55.
- Wright, M. (2014) 'Academic Entrepreneurship, Technology Transfer and Society: Where Next?', *Journal of Technology Transfer*, 39/3: 322–34.
- , Birley, S., and Mosey, S. (2004) 'Entrepreneurship and University Technology Transfer', *Journal of Technology Transfer*, 29/3-4: 235–46.
- Yuan, L., and Chen, X. (2015) 'Managerial Learning and New Product Innovativeness in High-Tech Industries: Curvilinear Effect and the Role of Multilevel Institutional Support', *Industrial Marketing Management*, 50: 51–9.
- Zhang, Y. et al. (2015) 'Paradoxical Leader Behaviors in People Management: Antecedents and Consequences', *Academy of Management Journal*, 58/2: 538–66.

## Appendix: Study measures

**AEP:** Based on [Chrisman et al. \(1998\)](#); [Chang, Yuan Chieh et al. \(2016\)](#) (Construct Reliability = 0.91) (1 = strongly disagree; 5 = strongly agree)

AEP1. In the process of academic entrepreneurship, I achieve economic benefits of research commercialization.

AEP2. In the process of academic entrepreneurship, I produce social benefits of research commercialization.

AEP3. Academic entrepreneurship facilitates my scientific research.

AEP4. Academic entrepreneurship is my long-term persistent activity.

AEP5. Academic entrepreneurship continuously facilitates my scientific research and research commercialization.

**EI:** Adopted from [Hekman et al. \(2009\)](#). (Construct Reliability =0.87) (1 = strongly disagree; 5 = strongly agree)

EI1. In general, when someone praises entrepreneurs, it feels like a personal compliment.

EI2. In general, when someone criticizes entrepreneurs, it feels like a personal insult.

EI3. When I talk about entrepreneurs, I usually say 'we rather than they'.

EI4. Entrepreneur's successes are my successes.

EI5. I am pleased to be a member of the entrepreneurial profession.

EI6. If a story in the media criticized entrepreneurs, I feel embarrassed. \*

**MI:** Adopted from [Haslam et al. \(2008\)](#) (Construct Reliability =0.78) (1 = strongly disagree; 5 = strongly agree).

MI1. Before becoming an entrepreneur I belonged to many different groups (such as communities, interdisciplinary cooperation teams and so on).

MI2. Before becoming an entrepreneur I joined in the activities of many different groups (such as communities, interdisciplinary cooperation teams and so on).

MI3. Before becoming an entrepreneur I had friends who were members of many different groups (such as communities, interdisciplinary cooperation teams and so on).

MI4. Before becoming an entrepreneur I had strong ties with many different groups (such as communities, interdisciplinary cooperation teams and so on).

**RC:** Adopted from [Shepherd and Haynie \(2009\)](#) (Construct Reliability = 0.69) (1 = strongly disagree; 5 = strongly agree).

RC1 Taking teaching, research, and entrepreneurship into account, I often encounter conflicts in time distribution.

RC2 Taking teaching, research, and entrepreneurship into account, I often encounter conflicts in problem-solving.

RC3 Taking teaching, research, and entrepreneurship into account, I often doubt my pursuits.

RC4 Considering both teaching and research and entrepreneurship, I do not feel conflict exists in my knowledge structure. (R) \*

RC5 Taking teaching, research, and entrepreneurship into account, I often encounter conflict in my measurement system.

**RO:** Adopted from [Jones \(1986\)](#) (Construct Reliability =0.75) (1 = strongly disagree; 5 = strongly agree).

RO1. I have made an attempt to redefine my role as an entrepreneur and change what I am required to do.

RO2. While I am satisfied with my overall job responsibilities, I have altered the procedures to adapt to the new entrepreneurial actions.

RO3. I have changed the mission or purpose of my role after becoming an entrepreneur.

RO4. The procedures for performing my teaching and researching job are generally appropriate in my view. (R) \*

RO5. I have not tried to change my teaching and researching procedures, although I want to be an entrepreneur. (R) \*

**Notes:** \* indicated that the item was deleted based on item-to-total correlation and factor analysis.