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# Entrepreneurial ecosystem, entrepreneurial rate and innovation: the moderating role of internet attention

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**Abstract** The purpose of this study is to improve our understanding of the entrepreneurial ecosystem. Unlike many previous studies, we accomplish this aim by testing the roles of entrepreneurial contexts in stimulating entrepreneurial performance, which is captured by entrepreneurial rate and entrepreneurial innovation. We further investigate their interacting with entrepreneurial attention (EA), measured by Internet search data. This is a national longitudinal study of all OECD countries between 2005 and 2014 based on multisource data. Based on the seemingly unrelated regression (SUR) results, the main findings are: (1) R&D transfer and market dynamics are important but negative predictors of both entrepreneurial activities; (2) entrepreneurial finance and taxes or regulations policies have significant positive effects on entrepreneurial innovation only when the entrepreneurship attention is high; (3) also only under the high entrepreneurship attention condition, physical infrastructure and cultural and social norms for entrepreneurship have significant positive effects on total entrepreneurial rate. The findings of this study, besides having important implications for entrepreneurial management and policy, have implications on the research of the entrepreneurial ecosystem, entrepreneurial innovation and attention.

**Keywords** Entrepreneurial ecosystem · Entrepreneurship · Innovation · Entrepreneurship attention · GEM

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## Introduction

Entrepreneurial ecosystem, by which we mean a community of interacting entrepreneurs and their environment (Levinson 2010), is important and beneficial for entrepreneurial performance of entrepreneurs, industries, regions and nations (Vanevenhoven and Liguori 2013; Zacharakis et al. 2003; Spigel 2015). Over the years, there has been a wealth of entrepreneurship research that informs this topic (Ács et al. 2014). For example, some researchers have taken an entrepreneurs-centric approach to studying how entrepreneurs to successfully innovate in ecosystem (Nambisan and Baron 2013; Koellinger 2008). In contrast to this perspective, other scholars have taken a context-centric perspective, which focuses on the role of environment factors, such as national, regional, and industrial contexts in inducing entrepreneurial innovation (Manolova et al. 2008; Meek et al. 2010).

However, research on entrepreneurial ecosystems has some shortcomings. First, although at the heart of the entrepreneurship ecosystem, not surprisingly, is a view of what factors comprise the entrepreneurship ecosystem. Until now, there is no single definition and consensus of what constitutes the entrepreneurship ecosystem. For example, Ács et al. (2015) suggested that entrepreneurial ecosystem refers to the broad range of needs new ventures have during their early life cycle. Isenberg (2011) lists the ecosystem domains, including policy, finance, culture, support, human capital and markets. Entrepreneurship ecosystem provides access to finance, education and R&D transfer, government policies and programs, as well as physical and professional infrastructure. A portfolio perspective and a balanced approach to analyze entrepreneurial activity is needed (Morris et al. 2015). In this study, we try to use a systematic perspective to analyze the multiple dimensions of entrepreneurship ecosystem. As suggested by GEM conceptual model (Reynolds et al. 1999), entrepreneurship ecosystem includes finance, government policies, government entrepreneurship programs, entrepreneurship education, R&D transfer, commercial and legal infrastructure, market openness, physical infrastructure and cultural and social norms, which forms the basis of our analysis of entrepreneurship ecosystem (Singer et al. 2015b; Kelley et al. 2015). GEM conceptual model is progressively developed to incorporate advances in understanding of the entrepreneurial process and to allow for further exploration of patterns detected in previous GEM studies (Herrington et al. 2010).

Second, previous empirical studies on the entrepreneurial ecosystem factors have much variance and inconsistency among their findings (Suresh and Ramraj 2012; Krueger et al. 2000; Chliova et al. 2015). For instance, among entrepreneurial ecosystem factors, some research indicated that technology transfer from R&D departments and research institutions provides advantages for entrepreneurship (Elias G. Carayannis et al. 1998). On the contrary, using long interviews from university technology transfer offices, Markman et al. (2005) found that technology transfer could negatively relate to new venture formations. Casson (1995) contended that infrastructures facilitate entrepreneurs' problem-solving activities, thereby increasing entrepreneurial activities. Whereas, Ovaska and Sobel (2005) found government-provided infrastructures have no significant influence on entrepreneurial activities, regardless of how the activities are measured. In this study, we seek to reconcile these conflicting results of the entrepreneurial ecosystem using the combination of entrepreneurs-centric and context-centric perspectives. Previous research has showed that entrepreneurial ecosystem represents a

basic entrepreneurial environment encouraging entrepreneurial endeavors (Zacharakis et al. 2003). Meanwhile, social cognition theory (SCT) explicitly acknowledges the existence of an interaction between the environment in which an individual operates and his or her cognitive perceptions. Environment and individual factors operate as interacting determinants that influence performance (Baranowski et al. 2002; Wood and Bandura 1989). Based on this theory, we argue that whether the entrepreneurial environment can exert good outcomes depends on the perception of the individuals. Specifically, we propose that entrepreneurial attention is a mean for individuals to perceive entrepreneurship. Considering the interaction between environment and individuals, we argue that entrepreneurial attention can moderate the relationship between entrepreneurial ecosystem factors and entrepreneurial outcomes.

According to social cognition theory (SCT), we argue that national entrepreneurship ecosystem cannot be exactly understood without taking both entrepreneurial environment and individual perception into account (Ács et al. 2014). In this paper, we propose people's attention to entrepreneurship activity as an important kind of individual perception. That is mainly because, according to the attention-based view, attention is a limited and scarce resource in alternative uses (Sullivan 2010). We always put more attention on the hopeful plans, and can perceive them more clearly (Minniti 2004). Attention is a potent determinant of planned activities, and entrepreneurship is a type of planned activities (Katz and Gartner 1988). If people do not focus on entrepreneurship, indicating they have little wish in starting a new business, the influence of entrepreneurial environment will be discounted. Therefore, people's attention to startups will interact with the influences of entrepreneurial environmental factors. In this study, we develop a way to capture entrepreneurship attention using Internet search engine data, and test the interactions between entrepreneurship attention and institutional contexts in producing entrepreneurial activities and innovation. Our findings support that a National Systems of Entrepreneurship (NSE) perspective must highlight the interactions between individual properties and entrepreneurial environments in generating entrepreneurial behaviors and action, and consequently regulating the quantity and quality of this action, which is suggested by Ács et al. (2014).

Finally, the one-dimensional measure of entrepreneurial performance may also lead to ambiguous outcomes (Stenholm et al. 2013). For example, only focusing on the number of new venture formations may neglect the quality of new ventures. That is to say, in entrepreneurship activities, both quantity and quality matters. Environmental factors are currently transiting from benefiting entrepreneurial quantity to benefiting entrepreneurial quality (Stam 2015). According to Stam (2015), an ambitious entrepreneur is more inclined to innovation-oriented entrepreneurship than the normal entrepreneur; entrepreneurial innovation can indicate entrepreneurial quality. Entrepreneurial ecosystems can regulate the direction and quality of entrepreneurial innovation (Ács et al. 2014). In this study, we analyze the influence of the entrepreneurial ecosystem jointly on entrepreneurial rate and innovation.

This study not only contributes to entrepreneurial theory, but also contributes to policy-makers. It is also important to provide them with the operating mechanism of the entrepreneurial ecosystem before they can facilitate its economic contributions. Therefore, empirical and national studies with long time series are needed for discussing the influences of factors in the ecosystem, which have not been sufficiently developed (Ács

et al. 2014; Autio et al. 2014). In this study, we will use national panel data to empirically explore the influences of entrepreneurship ecosystem factors.

## Theoretical background and hypothesis

### Entrepreneurial ecosystem and entrepreneurship

The national entrepreneurial ecosystem is a fundamental resource allocation system, which involves individual-level opportunity pursuit in new business and country-specific institutional features (Ács et al. 2014). The system consists of diverse and complex participants, infrastructures, roles, and institutional factors that influence a region's entrepreneurial performance. Some research used an institutional perspective to explore how societal factors shape entrepreneurship (Scott 1995; Dorado and Ventresca 2013). For instance, some institutional elements, such as legal and financial foundations, affect venture arrangements and decisions (Lim et al. 2010). National economic freedom and gross domestic product (GDP) are associated with starting up a new venture (McMullen et al. 2008). However, M. E. Valdez and Richardson (2013) pointed out that most studies focusing on the relationship between institutions and entrepreneurship tend to select certain institutional factors, such as culture or policies. They advised the comprehensive way of studying entrepreneurship is to look at the different institutional variables together, which could shed light on several important issues. National cultural traits are also important in explaining people's motives of entrepreneurship activity. To nurture and leverage national entrepreneurship activity, we should use systemic perspectives.

We begin this section by examining the potential effects of entrepreneurial ecosystem on entrepreneurial outcome. Then, following suggestions derived from the social cognitive theory framework, we explore the potentially moderating effects of perception of the individual entrepreneurs, which is entrepreneurial attention in this study.

### Entrepreneurial ecosystem and entrepreneurial rate

Because of the potential importance of the entrepreneurial ecosystem as a mechanism for creating startups, we need a systematic analysis of its effects on entrepreneurship rate. To explain this mechanism, we use the subjective relative-return to entrepreneurship perspective (Bygrave and Minniti 2000; Minniti and Bygrave 1999). As previous research said, because each individual can choose between being and not being an entrepreneur, each individual's choice of entrepreneurial activity is determined by the gap between his subjective expected return to being an entrepreneur and his subjective expected return to do something else (Bygrave and Minniti 2000). Several important entrepreneurial ecosystem factors should be considered in choice of entrepreneurial activity. Firstly, there is evidence that easy access to entrepreneurial finance may provide incentives for choice of entrepreneurial activity (Wiklund and Shepherd 2005). The research focuses on a positive relationship, as entrepreneurial finance imposes a direct financial support on startups, enhancing their confidence and certainty. Second, if entrepreneurship policy supports entrepreneurship as a relevant economic issue, it may encompass those methods that intend to directly encourage the increasing

choice of entrepreneurial activities in a country or region (Zoltan J. Acs and Szerb 2007). Further, when entrepreneurship policies (e.g., taxes, regulations) are either size-neutral or encourage new and SMEs, these policies will eliminate some discriminations and burdens for entrepreneurs, increasing the individual's subjective expected return. Thirdly, government entrepreneurship programs may include some presentations of business venture cases by successful entrepreneurs, work on entrepreneurial networking, and exercises for individual empowerment and growth. These programs may increase individual's success rate, thereby enhance his choice of entrepreneurial activity. Fourthly, entrepreneurship education may provide chances to conduct feasibility research, develop business plans, and join in simulated business. The education may enhance self-efficacy in individual choice of entrepreneurial activity, thereby increasing his subjective expected return to being an entrepreneur. Fifthly, R&D transfer from institutions and universities can be available for newly established firms, thereby decreasing the cost and risk in startups. Knowledge transfer will provide support and advice to entrepreneurs who want to set up a new business (Wright et al. 2008). Sixthly, commercial and legal infrastructure provides property rights, commercial, accounting and other legal and assessment services and institutions. These services and institutions will help individuals to realize their expectations of subjective return to being entrepreneurs. Seventhly, market dynamics and openness indicate the extent of existing markets is easy to enter since there exist barriers and competition (Chang and Wu 2014). For example, if individuals are free to enter existing markets, they may tend to choose being an entrepreneur and have more confidence to obtain their subjective expected return. Eighthly, when individuals have the ease of access to physical resources, such as communication, utilities, transportation, land and space, they can save much physical cost and spend more energy on other aspects. Then they will have more possibility to achieve their subjective expected returns. Finally, social and cultural norms may shed light on how country-level values affect the individual-level choice of entrepreneurs. The norms can encourage entrepreneurial choice and play positive roles in influencing the creation of new firms, leading to more expected return of being an entrepreneur than expected return of doing something else. Consequently, we posit:

**Hypothesis 1** National entrepreneurial ecosystem conditions are positively associated with total entrepreneurial rate.

### **Entrepreneurial ecosystem and entrepreneurial innovation**

As we know, not all entrepreneurs innovate. Actually, the majority of new entrepreneurs are not innovative at all (Autio et al. 2014). Thus, innovation is not as the same as entrepreneurship. Knowledge exchanges between entrepreneurs are crucial for entrepreneurial innovation (Autio et al. 2014). Based on knowledge-based perspectives, we argue the positive relationship between entrepreneurial ecosystem and entrepreneurial innovation. Firstly, the availability of financial resources may provide necessary grants and subsidies for bringing together diverse knowledge between entrepreneurs and incumbent firms, and bundling them to carry out complex technological and product innovation. Secondly, Schumpeter defined innovation as a recombination of knowledge resources that previously existed (Galunic and Rodan 1998; J. C. Guan and Yan 2016).

Therefore, if policy makers treat entrepreneurship as a relevant economic issue, it's beneficial for entrepreneurs to exchange and recombine knowledge resources across industries and regions. Size-neutral tax or regulation can foster knowledge absorption capability of new entrepreneurs, thereby increasing their success in innovation. Thirdly, participating in government programs in early stages of technological development can provide the boost necessary (e.g., knowledge exchange networks) to launch the technology. Therefore, participation in government programs can offer easier access to external knowledge than entrepreneurs who do not participate in the programs (Fredric and Zolin 2005). Fourthly, entrepreneurship education may enhance a graduate's ability to exchange knowledge and learn knowledge from others. There needs to develop a greater sense of entrepreneurial innovation. Entrepreneurship education can provide students with some basic knowledge and skills that need to be developed in future entrepreneurial innovation. Fifthly, R&D transfer enables entrepreneurs to access new diverse knowledge originated in institutions and universities (Elias G Carayannis et al. 2000). If national R&D resources are available to entrepreneurs, the interactions of technologists between firms and institutions typically involve the exchange and recombination of knowledge acquired in innovation. Therefore, entrepreneurs may benefit from knowledge transfer from institutions and universities. Sixthly, commercial and legal infrastructure includes business services that are necessary for entrepreneurial innovation. For example, among the business services needed during the innovation process are legal services (such as intellectual property rights). Where there is lack of legal services, this could pose an obstacle to entrepreneurial innovation. Seventhly, market dynamics require entrepreneurs to innovate to adjust to ever-shifting dynamics. Market openness provides more channels for them to exchange diverse knowledge within the same sector. Eighthly, physical resources are critical for knowledge exchange and entrepreneurial innovation. Carrying out innovation activities in many cases requires a minimum prior investment in technical equipments, which raises the need of physical resources (Del Canto and González 1999). Finally, social and cultural norms affect the extent to which knowledge is transferred, exchanged and absorbed (Martins and Terblanche 2003). A culture supportive of innovation encourages different ways of sharing knowledge and searching knowledge, regards innovation as both desirable and normal. Therefore, we put forward the following:

**Hypothesis 2** National entrepreneurial ecosystem conditions are positively associated with entrepreneurial innovation.

*Entrepreneurial ecosystem and entrepreneurial attention*

Potential entrepreneurs do not make decisions or start up their firms in a vacuum, because new businesses are usually oriented to their ecosystem (J. Valdez 1988). Logically we can expect that ecosystem factors interplay with individual characteristics to affect the entrepreneurial outcome. This logic aligns with social cognitive theory, which posits a theoretic framework that suggests the interactions occurring between participants and their environment. While it is explicitly explained that healthy entrepreneurial ecosystem enables entrepreneurial performance, there is a gap in the literature regarding how entrepreneurial ecosystem and personal factors such as public cognition or perception interplay and influence entrepreneurial performance. Consistent with social cognitive theory (Bandura 1989, 2001), we propose a theoretical model



suggesting that entrepreneurial outcome is a result of the interplay of environments (i.e., entrepreneurial ecosystem) and certain perception in entrepreneurs (i.e., entrepreneurial attention) (De Carolis and Saporito 2006). Attention is a scarce cognitive resource in reality (Kahneman 1973). Attention indicates the actors' sustained awareness for specific targets (Taylor and Fiske 1978). Behavior is cognitive control, thus the actors' attention on some information from a multitude of sources and utilization of the information would guide their behaviors (Courtney 2004). Prior studies have demonstrated that attention must play a significant role in behaviors and outcomes (Vozlyublennai 2014; Andrei and Hasler 2014). One consensus in this stream of work is that the individual fluctuations in attention over time are demonstrated to be drivers of individual activity.

Drawing on the attention theory, entrepreneurial attention has been one important concept in entrepreneurship research. It indicates the extent to which entrepreneurs aware of entrepreneurial information (Gifford 1992). Previous studies argued that entrepreneurs usually have limited attentions (Corwin and Coughenour 2008). According to attention theory, limited attention may constrain entrepreneurs' behaviour (Kastner and Ungerleider, 2000). For example, entrepreneurs look for entrepreneurial information only when they are interested in related information, because that individual amount of attention processed at any given time is somehow restrict and limited. In other words, what entrepreneurs do depends on what issues they focus their attention on (Cho and Hambrick 2006). Some cognitive components are closely related to attention, such as perception, which means the translation of environmental signals into individual neuronal representations (Norenzayan et al. 2007). From this logic, entrepreneurial attention is a mean for individuals to perceive entrepreneurship. The discovery and exploitation of new opportunities is the role of entrepreneurial attention. Entrepreneurial opportunities must be perceived to be exploited and this perception requires attention (Gifford 1992).

Despite the importance of the attention and it's widely used in entrepreneurship domains and research topics, to our knowledge, no empirical studies tried to measure the attention of entrepreneurs. One major difficulty in attention research is the empirical measure of attention. Using aggregate search frequency in Google is a recent and novel approach in measuring attention (Da et al. 2011). For example, Askitas and Zimmermann (2009) used data on internet activity to predict economic behavior, like unemployment rates. Xiang and Gretzel (2010) concluded that a search engine, like Google, reflects actors' heterogeneous information needs. Following this logic, we use the search frequency about entrepreneurship as entrepreneurial attention for following reasons. Firstly, Internet is becoming a popular and common way to collect entrepreneurial information (Davis and Harveston 2000), especially for entrepreneurs who lack the entrepreneurial skills, knowledge and relevant resource. Google is the favorite search engine for internet. For instance, Google has dominated the search engine market in many regions and countries. Thus, the search volume acquired from Google is considered as representative of entrepreneurs' internet search behavior. Secondly, it is reasonable to assume that if someone searches for entrepreneurship-related information in Google, he/she is undoubtedly paying attention to entrepreneurship (Da et al. 2011). Thus, Google search is a revealed attention measure for entrepreneurs. To sum up, we measure the entrepreneurial attention using the Google search probability, which is revealed through an active internet search of entrepreneurial activities. Furthermore, in



the next section we argue that the efficacy of entrepreneurial ecosystem depends on the entrepreneurs' attention.

### **The interplay effect of the entrepreneurial ecosystem and attention in entrepreneurial rate**

According to research on attention-based view (Gifford 1992, 1998; Cho and Hambrick 2006), an individual should allocate his attention between a number of activities. Attention reflects the individual characteristics in decision making and job choosing (Ocasio, 1997, 2011). To be alert to entrepreneurial opportunities requires that the individuals allocate attention away from other activities to observe this profit opportunity (Gifford 1992, 1998). The more entrepreneurial attention he has, the more profit he observes in this entrepreneurial opportunity. We predict that an increase in entrepreneurial rate is associated with improvements of ecosystem conditions when people pay high attention in business startups. This can be explained as follows. As we discussed above, entrepreneurial ecosystem factors can enhance entrepreneurial rate through increasing the subjective expected return to being an entrepreneur (Bygrave and Minniti 2000; Minniti and Bygrave 1999). However, based on attention-based view, we argue this relationship is strengthened when entrepreneurial attention is high because what decision-makers really do depends on what issues they focus their attention on (Cho and Hambrick 2006). When people pay enough attention on entrepreneurship, they can really observe the advantages of entrepreneurial ecosystem factors, and estimate higher expected return to being an entrepreneur, thereby joining in entrepreneurial activities. On the contrary, if people do not care about entrepreneurship, entrepreneurial ecosystem construction will lose its significance in stimulating total entrepreneurial activity. Therefore, high entrepreneurial attention can enhance the effects of entrepreneurial ecosystem factors, thereby increasing the rate of entrepreneurship activities.

**Hypothesis 3** Entrepreneurial ecosystem conditions are more beneficial to entrepreneurial rate when people pay high attention to entrepreneurship.

### **The interplay effect of the entrepreneurial ecosystem and attention in entrepreneurial innovation**

We predict that the positive relationship between entrepreneurial ecosystem conditions and entrepreneurial innovation is strengthened when people pay high attention to entrepreneurship. We can explain this as follows. As discussed before, entrepreneurial ecosystem factors can enhance entrepreneurial innovation through increasing entrepreneurs' knowledge exchange. Knowledge exchange refers to the process that share and utilize knowledge through various approaches appropriate to the participants involved (Collins and Smith 2006; Hajro et al. 2017). We argue that people with high entrepreneurial attention perform better in knowledge exchange under the same entrepreneurial ecosystem. That's mainly because people with high attention have a rapid rate of knowledge processing (Dukas 2002). On the contrary, limited attention may constrain their innovative behaviors. For example, when people's entrepreneurial attention is strong, they may have a better understanding about what knowledge they need for

entrepreneurial innovation. They may utilize financial support more efficiently to pursue knowledge. Further, the media and internet attentions on business formation may reflect perceived characteristics of the entrepreneurial environment (Urbano and Alvarez 2014). When entrepreneurial attention is higher, the knowledge for entrepreneurial innovation can be more easily obtained from the others. Therefore, entrepreneurial attention can enhance the knowledge exchange mechanism of entrepreneurial ecosystem, thereby increasing entrepreneurial innovation.

**Hypothesis 4** Entrepreneurial ecosystem conditions are more beneficial to entrepreneurial innovation when countries pay high attention to entrepreneurship.

Figure 1 presents the research framework of this study, portraying the relationships between entrepreneurial ecosystem, entrepreneurial attention and entrepreneurial rate and innovation, two types of entrepreneurial performance, which we elaborate.

## Research design

### Sample and data

Our paper examines the effects of country’s entrepreneurship context and attention on two types of entrepreneurship performance. Based on such purposes, we collect data in 34 OECD countries during the period from 2005 to 2014. These samples are appropriate to test the hypotheses since choosing these countries can effectively control the potential influence of economic development (Wennekers et al. 2005; Leibenstein 1968). After dropping observations with missing values, we finally acquire a total of 209 year-country unbalanced panel observations. This paper combines data from multiple sources: (1) entrepreneurship performance data from GEM Adult Population

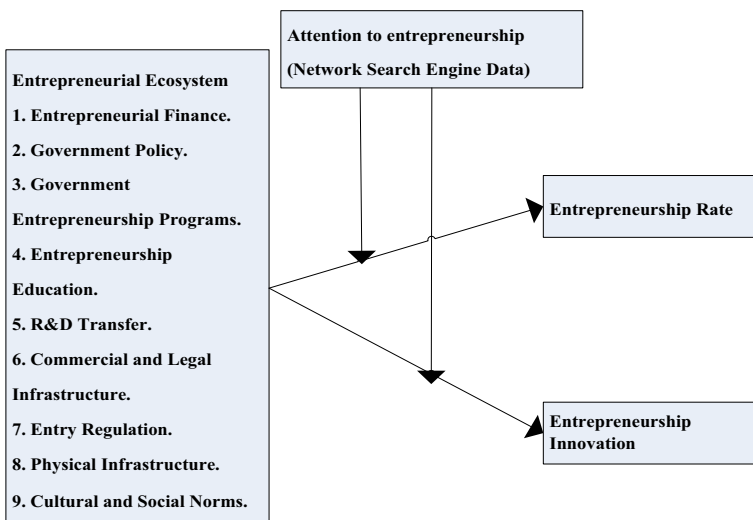


Fig. 1 Research framework

Survey (APS), (2) entrepreneurship ecosystem data from GEM National Expert Survey (NES), (3) internet search data from Google trends and Google correlate, (4) economic and R&D-related information at the national level from OECD and The World Bank database. Because APS and NES only provide the country phone code, we use the list of international telephone country codes on Google to find all country names. To alleviate the potential of reverse causality, we use longitudinal design to construct independent variables one year prior to dependent variables.

## Variable definition and measurement

### *Entrepreneurship rate*

We rely on the sample countries' total early-stage entrepreneurial activity (TEA) as a measure for entrepreneurship quantity performance. GEM reports the percentage of adult population in each country, who set up a business (named "nascent business") or owns a running business (named "new business") (De Clercq et al. 2014). Nascent businesses and new businesses have neither paid salaries to the owners for longer than 3.5 years. Based on more than 2000 adult individual samples in each country, GEM uses self-employment rates to estimate national TEA index every year. In line with previous research (Scarborough et al. 2013; Davidsson and Honig 2003), we rely on GEM Adult Population Survey (APS) to capture the entrepreneurship rate.

### *Entrepreneurship innovation*

Entrepreneurial ecosystem regulates the direction and quality of entrepreneurial innovation (Ács et al. 2014). One of the dependent variables in the entrepreneurship performance is entrepreneurial innovation (Autio et al. 2014; Chatterji 2009). A country's entrepreneurial innovation is defined as the novel degree of products or service perceived by early stage entrepreneurs. This variable is scored by two aspects—novelty to customers and few businesses offering this product. On the one hand, TEA businesses are scored by the novelty of products to some customers. On the other hand, because of the background of the whole world, some products may be the latest in the local market, but in other markets have been kept for a long time. Therefore, that not many competitors offer similar products can also signify the innovation activity. Koellinger (2008) suggested entrepreneurs who carry out any kind of two innovation behaviors should be considered innovative. We average the two scores to indicate the entrepreneurial innovation, which is consistent with Koellinger (2008). This data is based on the GEM Adult Population Survey (APS).

### *Entrepreneurial attention*

We use search volume data from Google Trends to obtain entrepreneurial attention from 2005 to 2014. Google Trends, as a valuable internet search visualization tool invented by Google, can be used in explaining economic issues, as well as the unemployment rate or entrepreneurship activity (Vicente et al. 2015). It provides the search and news reference volume relating to entrepreneurship over time, which reveals the temperature of entrepreneurship from Google search activity for terms related to

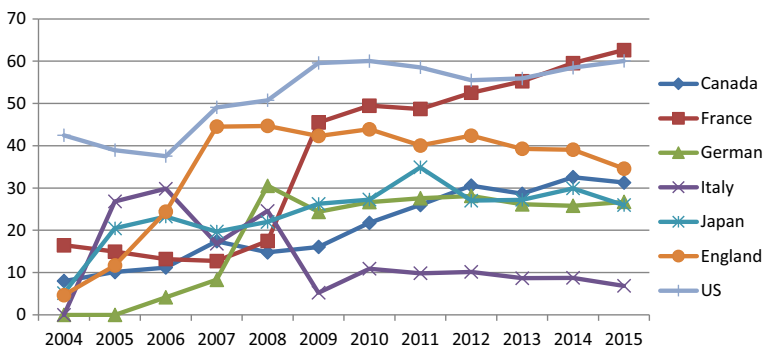
entrepreneurship and business creation (Peris-Ortiz and Sahut 2015). Firstly, entrepreneurial attention data is first collected on queries for “entrepreneurship”, which is translated in official languages in 34 countries (such as “ondernemerschap” in Dutch). Secondly, to ensure the accuracy of our retrieval, we also utilize the top 10 related topics in each country to get the attention data. Google provides the top related searches queries in each country. For example, in Australia, the related searches queries are “business entrepreneurship”, “social entrepreneurship”, “entrepreneur” and so on. Thirdly, using Google trends, we download the search trend data of all queries in weekly time series. To obtain each country’s entrepreneurial attention in each year, we average the Google trends score of 11 topics every year. To depict it more clearly, we randomly select seven countries to draw the trends of their entrepreneurial attention each year from 2004 to 2015 (see Fig. 2). As is shown in this figure, entrepreneurial attention rose rapidly around 2008, which confronted a big global financial crisis and prolonged unemployment. The crisis led to the 2008–2012 global recession and provoked people to start up business. From 2008, some countries kept a rising entrepreneurial attention, but others did not. It will be interesting to find how the entrepreneurial attention interacts with the entrepreneurial ecosystem factors.

### *Entrepreneurial ecosystem*

Based on GEM National Expert Survey (NES), we use key entrepreneurial framework conditions (known as EFCs) to capture national entrepreneurial ecosystem. EFCs are deemed essential parts of the entrepreneurial ecosystem in understanding new business creation and innovation (Singer et al. 2015a), which is widely used in previous entrepreneurship research (Ács et al. 2014; Levie and Autio 2008). In GEM survey, thousands of national experts (3936 in 2014) are asked to fill multi-item scales to reflect their opinions on the entrepreneurship ecosystem. By interviewing the national experts on several aspects (please see Table 1), GEM can capture thoughts of national key informants on characteristics of entrepreneurship ecosystems.

### *Control variables*

**Gross domestic product** Research has long realized the effect of economic development on entrepreneurship activity, especially TEA (Zoltan J Acs and Amorós 2008).



**Fig. 2** The trends of entrepreneurial attention in seven countries from 2004 to 2015

**Table 1** The description of all variables used in this study

All variables	Measurement	Description	Source of data	Data availability
Entrepreneurship Rate	Total early-stage entrepreneurial activity (TEA)	Percentage of 18–64 population who are either a nascent entrepreneur or owner-manager of a new business	GEM Adult Population Survey (APS)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
Entrepreneurship Innovation	entrepreneurial innovation (EI)	Percentage of early-stage entrepreneurs with a product or service they believe is new to some or all customers and they also believe that there are few or no businesses offering the same product.	GEM Adult Population Survey (APS)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
Entrepreneurial attention	Google trends data	Based on the Google Search engine, Google trends shows the search frequency of a particular retrieval term relative to the total search-volume in various regions and languages, which indicates how popular the retrieval term is over time.	Google trends Google correlate	<a href="http://www.google.cn/trends">http://www.google.cn/trends</a>
Entrepreneurial ecosystem	Entrepreneurial Finance.	The availability of financial resources—equity and debt—for small and medium enterprises (SMEs) (including grants and subsidies)	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Economic Policy	The extent to which public policies support entrepreneurship as a relevant economic issue.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Size-neutral Policy	Taxes or regulations are either size-neutral or encourage new and SMEs.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Government Entrepreneurship Programs.	The presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal)	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Entrepreneurship Education (Basic school)	The extent to which training in creating or managing SMEs is incorporated within the education and training system at all levels.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Entrepreneurship Education (Post-secondary)	Entrepreneurship Education at basic school (primary and secondary), such as vocational, college, business schools, etc.).	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	R&D Transfer	The extent to which national research and development will lead to new commercial opportunities and is available to SMEs.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Commercial and Legal Infrastructure	The presence of property rights, commercial, a accounting and other legal and assessment services and institutions that support or promote SMEs.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>

**Table 1** (continued)

All variables	Measurement	Description	Source of data	Data availability
	Market Dynamics	The level of change in markets from year to year.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Market Openness	The extent to which new firms are free to enter existing markets.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Physical Infrastructure	Ease of access to physical resources—communication, utilities, transportation, land or space—at a price that does not discriminate against SMEs.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
	Cultural and Social Norms	The extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income.	GEM National Expert Survey (NES)	<a href="http://www.gemconsortium.org/data/sets">http://www.gemconsortium.org/data/sets</a>
GDP	Gross Domestic Product	GDP per head, US Thousand \$, constant prices, constant PPPs.	OECD	<a href="http://stats.oecd.org/Index.aspx">http://stats.oecd.org/Index.aspx</a>
R&D	R&D Investment	Each country's research and development (R&D) expenditure (% of GDP).	OECD	<a href="http://stats.oecd.org/Index.aspx">http://stats.oecd.org/Index.aspx</a>
Ease of Doing Business	Ease of Doing Business	Doing Business covers basic research, applied research, and experimental development. Ten of these areas are included in this year's ranking on the ease of doing business: starting a business, dealing with construction permits, getting minority investors, electricity, registering property, getting credit, protecting paying taxes, trading across borders, enforcing contracts and resolving insolvency.	The World Bank	<a href="http://www.doingbusiness.org/">http://www.doingbusiness.org/</a>
Employment rate	Employment rate	Employment to population ratio is the proportion of a country's population that is employed. Ages 15 and older are generally considered the working-age population.	The World Bank	<a href="http://www.doingbusiness.org/">http://www.doingbusiness.org/</a>

Rich countries are generally facing a low level of TEA (Carree et al. 2007). We use *gross domestic product* (GDP) to control for each country's economic size. Here, we use GDP per capita PPP based on international US thousand dollars (please Table 1).

**R&D investment** Similarly, we use investment of research and development to control for country R&D size. Because large R&D Investment may lead to high entrepreneurial innovation (Tsai 2001), it controls for R&D size effect. We use each country's research and development (R&D) expenditure (% of GDP) to indicate this variable (please Table 1).

**Ease of doing business** For countries involved in different business regulations and requirements of starting a new business, such as minimum capital (Van Stel et al. 2007), hiring workers and getting credit, etc., may have effects on formation or innovation rate of new business. Improving the regulations is more likely to lower burden and barriers to new business formation and innovation. Low ease of doing business indicates a better regulatory environment and well protection of property rights.

**Employment rate** As more labor participants become employees, hiring cost rises and entrepreneurial intention falls, which in turn hinder entrepreneurship activities (Van Stel et al. 2007). We control for employment effect on new business.

## Statistical methods

In this study, we use a multivariate regression method—seemingly unrelated regression (SUR), also well known as an econometric development (Balakrishnan 2013; Zellner 1962). Recently, SUR model has been applied to entrepreneurial research, e.g., to explore the influence of gender composition of top managers and workforce on male and female wages (Lyngsie and Foss 2016). It can estimate regression equations with different dependent variables and allow for contemporaneous correlation of errors across equations, i.e.  $E(\varepsilon_{it}\varepsilon_{jt}) \neq 0$ . The SUR model also can be regarded as a kind of GLS (generalized least squares), in which the right-hand-side may be different in every equation, or simultaneous equations mode allowing right-hand-side endogenous variables. Moreover, compared to OLS and GLS, SUR is more proper when the disturbances for dependent variables are correlated, and can typically indicate some common omitted and unmeasurable variables (Zellner 1962; Fiegenbaum and Thomas 1995). In our study, some common entrepreneurial environment factors influence all countries in a given time period and may be omitted, thus SUR is adopted to improve the estimation procedures.

SUR equations in this study are as follows:

$$\begin{cases} \text{entrepreneurial quantity}_{i,t} = \beta_0 + \beta_1 \text{entrepreneurial ecosystems}_{i,t-1} + \beta_2 \text{Gross Domestic Product}_{i,t-1} \\ \quad + \beta_3 \text{Ease of Doing Business}_{i,t-1} + \beta_4 \text{R\&D Investment}_{i,t-1} + \beta_5 \text{Employment rate}_{i,t-1} + \varepsilon_{i,t-1} \\ \text{entrepreneurial quality}_{i,t} = \beta_0 + \beta_1 \text{entrepreneurial ecosystems}_{i,t-1} + \beta_2 \text{Gross Domestic Product}_{i,t-1} \\ \quad + \beta_3 \text{Ease of Doing Business}_{i,t-1} + \beta_4 \text{R\&D Investment}_{i,t-1} + \beta_5 \text{Employment rate}_{i,t-1} + \varepsilon_{i,t-1} \end{cases}$$

The main idea of SUR is to estimate several regression equations at once, allowing different outcome measure and using errors covariance from one equation to update others. We carry out SUR regressions using Stata 12.0.



## Results

We conduct a two-sample t-test to check if OECD countries with low and high entrepreneurial attention perceive entrepreneurial ecosystem characteristics differently. The Levene's test is applied to test if two samples have equal variances (Schultz 1985; Staats et al. 2011; Nelson and Levesque 2007). The T-Test comparing the entrepreneurial ecosystem frame yields four terms significant at the 5%, which show that countries with a high attention degree focus more on entrepreneurship programs, post-secondary education, infrastructure and culture. Meanwhile, we can see some evidence that countries with more entrepreneurship attention have higher TEA performance (Table 2).

Table 3 reports descriptive statistics and correlations of all variables in our study. Because of high correlation coefficient and Variance Inflation Factor (VIF), we delete an independent variable Commercial and Legal Infrastructure. Then the explanatory variables reflecting the hypothesized impacts aren't highly correlated or with other control variables. We also run ordinary least squares (OLS) regression to obtain VIF

**Table 2** The results of two-sample t-test

	Low entrepreneurship attention		High entrepreneurship attention		Levene's test for equal variances	t-Test
	Mean	Std. Dev.	Mean	Std. Dev.		
1 Entrepreneurial Finance	2.68	0.44	2.61	0.39	2.00	1.18
2 Economic Policy	2.63	0.49	2.69	0.41	3.35	-0.96
3 Size-neutral Policy	2.48	0.59	2.54	0.51	1.93	-0.91
4 Government Entrepreneurship Programs	2.69	0.44	2.87	0.39	1.76	-3.14**
5 Entrepreneurship Education (Basic school)	2.14	0.33	2.06	0.34	0.10	1.58
6 Entrepreneurship Education (Post-secondary)	2.74	0.27	2.87	0.32	2.65	-3.10**
7 R&D Transfer	2.55	0.32	2.57	0.35	0.61	-0.45
8 Commercial and Legal Infrastructure	3.25	0.35	3.15	0.37	0.22	2.03*
9 Market Dynamics	2.78	0.52	2.90	0.42	4.97*	-1.88 <sup>a</sup>
10 Market Openness	2.76	0.32	2.67	0.33	0.16	1.82 <sup>+</sup>
11 Physical Infrastructure.	3.88	0.46	3.95	0.38	3.41	-1.24
12 Cultural and Social Norms	2.72	0.44	2.89	0.60	9.71**	-2.31 <sup>a</sup>
13 Entrepreneurial rate	6.73	2.82	8.11	4.18	18.35***	-3.11*** <sup>a</sup>
14 Entrepreneurial innovation	44.77	10.08	42.74	10.44	0.18	1.56

<sup>a</sup> According to Levene's test results, we do two-sample t test with unequal variances

<sup>+</sup>  $p < .1$

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

**Table 3** Descriptive statistics

Variables	VIF	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1 Entrepreneurial rate	–	7.47	3.67																		
2 Entrepreneurial innovation	–	43.68	10.30	.38**																	
3 Entrepreneurial Finance	2.74	2.64	.41	–.05	.06																
4 Economic Policy	3.09	2.66	.45	.05	.10	.47**															
5 Size-neutral Policy	3.78	2.51	.55	.20*	.16*	.38**	.66**														
6 Government Entrepreneurship Programs	3.87	2.79	.42	–.02	–.01	.44**	.73**	.63**													
7 Entrepreneurship Education (Basic school)	2.30	2.10	.34	–.10	–.04	.52**	.32**	.46**	.34**												
8 Entrepreneurship Education (Post-secondary)	2.44	2.81	.31	.16*	.00	.38**	.21**	.31**	.31**	.35**											
9 R&D Transfer	5.10	2.56	.33	–.16*	–.16*	.48**	.59**	.49**	.68**	.59**	.53**										
10 Market Dynamics	1.38	2.85	.47	–.08	–.15+	–.32**	–.07	–.11	–.23**	–.15+	–.14+	–.24**									
11 Market Openness	2.76	2.71	.33	–.05	.07	.58**	.47**	.56**	.43**	.58	.32**	.64**	–.26**								
12 Physical Infrastructure.	2.53	3.92	.42	.18*	.08	.47**	.45**	.63**	.44**	.45**	.28**	.56**	–.19**	.50**							
13 Cultural and Social Norms	2.42	2.81	.54	.33**	.08	.40**	.30**	.47**	.25**	.41**	.47**	.45**	.04**	.48**	.31**						
14 Gross Domestic Product	2.73	38.03	21.69	–.25**	–.13*	.36**	.32**	.51**	.48**	.54*	.15*	.58**	–.18**	.39**	.35**	.23**					
15 Ease of Doing Business	4.24	26.95	18.07	–.03	–.03	–.38**	–.53**	–.62**	–.58**	–.48**	.00	–.47**	.02**	–.45**	–.55**	–.44**	–.55**				
16 R&D Investment	1.41	1.59	1.19	–.30**	–.03	.26**	.28**	.19*	.20**	.26**	.00	.23**	.10**	.21**	.22**	.20**	.15**	–.43**			
17 Employment rate	3.83	55.89	6.61	.23**	.17	.41**	.43**	.38**	.46**	.57**	.25**	.46**	–.06**	.50**	.59**	.53**	.58**	–.63**	.25**		
18 Entrepreneurship attention	1.57	20.19	18.66	.13**	–.09	–.00	.16*	.17**	.29**	–.06**	.28**	.18*	–.04	.11	–.07**	.18**	.20**	.14**	–.1*	–.13**	

\* p < .05  
 \*\* p < .01  
 \*\*\* p < .001  
 + p < .1

and find that the highest VIF are 5.1, suggesting that multicollinearity is not a big problem (O'Brien 2007; Tan 2002; J. Guan et al. 2015).

Table 4 presents the SUR regression results of our hypotheses 1–4, including all control variables. Models 1, 3, 5 and 7 in Table 4 present the results for the entrepreneurial rate dependent variable. Hypothesis 1 argues ecosystems would be positively related to the entrepreneurial rate. We find that not all variables of ecosystems exhibit significant and positive effects on entrepreneurial rate. As shown in model 3, Entrepreneurial Finance, Economic Policy, Size-neutral Policy, Government Policies, Government Entrepreneurship Programs and Entrepreneurship Education (Post-secondary) have positive and non-significant influences on entrepreneurial rate. Meanwhile, Cultural and Social Norms and Physical Infrastructure display positive and significant effects on TEA ( $\beta = 3.28, p < 0.001$ ;  $\beta = 2.18, p < 0.01$ , respectively). On the contrary, the more R&D Transfer and Market Dynamics for business creation are in a country, the lower rate of early-stage entrepreneurial activity will happen ( $\beta = -5.22, p < 0.001$ ;  $\beta = -1.46, p < 0.001$ , respectively). Thus, hypothesis 1 is partially supported.

Models 2, 4, 6 and 8 in Table 4 present the results for the entrepreneurial innovation dependent variable. Hypothesis 2 posits that the entrepreneurial ecosystems would be positively related to the entrepreneurial innovation. We find that not all variables of ecosystems exhibit significant and positive effects. Regarding hypothesis 2, model 4 shows a statistically significant, positive effect for Size-neutral Policy ( $\beta = 4.83, p < 0.05$ ). However, the parameter estimates on R&D Transfer and Market Dynamics are statistically significant and negative ( $\beta = -17.45, p < 0.001$ ;  $\beta = -4.70, p < 0.01$ , respectively). The non-significant parameter estimates for other independent variables do not support hypothesis 2. Thus, hypothesis 2 is not fully supported.

With hypotheses 3, we predict that ecosystem conditions are particularly beneficial to entrepreneurial rate when countries pay high attentions to entrepreneurship. Comparing models 5 and 7, we find that the coefficients of some variables turn to be positive or greater when countries pay high attentions to entrepreneurship. For example, evidence from Economic Policy ( $\beta = -1.38, p > 0.1$ ;  $\beta = 1.09, p > 0.1$ ; respectively), Physical Infrastructure ( $\beta = 0.43, p > 0.1$ ;  $\beta = 3.69, p < 0.001$ ; respectively) and Cultural and Social Norms ( $\beta = 2.05, p < 0.01$ ;  $\beta = 3.73, p < 0.001$ ; respectively) partially support hypothesis 3. We also note that R&D Transfer and Market Dynamics are negatively associated with TEA when the entrepreneurial attention is high.

With hypotheses 4, we predict that the entrepreneurial ecosystems are particularly beneficial to entrepreneurial innovation when countries pay high attentions to entrepreneurship. Comparing models 6 and 8, we find that the coefficients of some variables turn to be positive or greater when countries pay high attentions to entrepreneurship. For example, the evidence from Entrepreneurial Finance ( $\beta = 2.28, p > 0.1$ ;  $\beta = 9.78, p < 0.01$ , respectively), Size-neutral Policy ( $\beta = 0.09, p > 0.1$ ;  $\beta = 8.74, p < 0.01$ , respectively) partially support hypothesis 4. The results of Model 8 also demonstrate the negative and significant effects of R&D Transfer and Entrepreneurship Education (Basic school) on entrepreneurial innovation when entrepreneurship attention is high. To further test Hypotheses 3 and 4, we adopted the method suggested by Huang et al. (2011) and Pavlou and Dimoka (2006). We separately evaluated the statistical difference between the two relationships using a *t*-test so as to compare their path coefficients. The results are displayed in the last column in Table 4.

Table 4 Results of seemingly unrelated regression analysis

	All samples		Low entrepreneurship attention		High entrepreneurship attention		Path coefficient		T test	
	Model 1 TEA <sup>a</sup>	Model 2 EI <sup>b</sup>	Model 3 TEA	Model 4 EI	Model 5 TEA	Model 6 EI	Model 7 TEA	Model 8 EI	Model 9 Models 5 vs 7	Model 10 Models 6 vs 8
Entrepreneurial Finance			.40 (.75)	4.36 (2.82)	1.51 (.93)	2.28 (4.04)	.89 (1.08)	9.78** (3.78)	0.19 (0.66)	5.87** (0.01)
Economic Policy			1.22 (.73)	4.41 (2.77)	-1.38 (1.06)	6.95 (4.62)	1.09 (1.2)	2.29 (4.19)	2.73* (0.09)	0.34 (0.56)
Size-neutral Policy			1.09 (.65)	4.83* (2.46)	1.33 (.84)	.09 (3.66)	1.16 (.97)	8.74** (3.4)	0.63 (0.42)	4.64* (0.03)
Government Entrepreneurship Programs			.15 (.87)	-1.82 (3.29)	.24 (1.17)	7.74 (5.09)	.81 (1.38)	-6.95 (4.84)	0.15 (0.70)	4.80* (0.03)
Entrepreneurship Education (Basic school)			-.70 (.83)	-2.05 (3.12)	-1.61 (1)	6.49 (4.32)	-1.18 (1.26)	-12.8** (4.4)	0.06 (0.80)	8.28** (0.00)
Entrepreneurship Education (Post-secondary)			.86 (.91)	1.61 (3.40)	.22 (.96)	2.05 (4.18)	-3.6 (1.58)	3.46 (5.56)	0.11 (0.74)	0.00 (0.99)
R&D Transfer			-5.22*** (1.30)	-17.45*** (4.87)	-1.76 (1.76)	-21.95** (7.63)	-8.75 (2.01)	-18.45** (7.04)	5.56* (0.02)	0.17 (0.68)
Market Dynamics			-1.46**** (45)	-4.70** (1.67)	-23 (.56)	-6.11* (2.42)	-2.56*** (.7)	-3.18 (2.45)	5.71* (0.02)	1.16 (0.28)
Market Openness			-2.97 (.92)	.71 (3.43)	-2.35* (1.2)	1.18 (5.21)	-1.35 (1.29)	2.51 (4.52)	0.35 (0.56)	0.01 (0.94)
Physical Infrastructure.			2.18** (.71)	-.37 (2.65)	.43 (.89)	1.84 (3.84)	3.69*** (1.07)	-.08 (3.75)	6.00** (0.01)	0.16 (0.69)
Cultural and Social Norms			3.28*** (.54)	.85 (2.02)	2.05** (.78)	1.73 (3.4)	3.73*** (.77)	1.32 (2.71)	2.84* (0.09)	0.02 (0.90)

**Table 4** (continued)

	All samples	Low entrepreneurship attention	High entrepreneurship attention	Path coefficient T test
Gross Domestic Product	-.08 <sup>***</sup> (.01)	-.13 <sup>***</sup> (.04)	-.06 <sup>***</sup> (.01)	-.05 <sup>*</sup> (.02) -1.10 (.10) -06 <sup>***</sup> (.01)
Ease of Doing Business	-.01 (.02)	-.006 (.05)	.00 (.02)	-.06 <sup>*</sup> (.03) .01 (.12) .05 (.03)
R&D Investment	-1.18 <sup>***</sup> (.17)	-.22 (.57)	-1.15 <sup>***</sup> (.18)	-1.29 <sup>***</sup> (.28) -2.38 <sup>*</sup> (1.2) -.92 <sup>***</sup> (.25)
Employment rate	.28 <sup>***</sup> (.04)	.41 <sup>**</sup> (.14)	.16 <sup>**</sup> (.05)	.02 (.07) .24 (.31) .29 <sup>***</sup> (.08)
Intercept	-2.85 (2.70)	26.46 <sup>**</sup> (8.92)	2.02 (4.26)	11.78 <sup>+</sup> (6.67) 43.55 (28.94) -4.06 (5.78)
R-sq	0.32	0.06	.58	.60 .35 .66
chi2	118.02 <sup>***</sup>	16.55 <sup>***</sup>	249.71 <sup>***</sup>	122.32 <sup>***</sup> 44.31 <sup>***</sup> 188.85 <sup>***</sup>

Standard errors in parentheses in Models 1–8; *P* value in parentheses in Models 9 and 10

<sup>a</sup> TEA is short for total early-stage entrepreneurial activity

<sup>b</sup> EI is short for entrepreneurial innovation

+ *p* < .1; \* *p* < .05; \*\* *p* < .01; \*\*\* *p* < .001

## Discussion and limitations

This study empirically examines the relationship between the national entrepreneurial ecosystem and entrepreneurship performance using multi-source panel data and internet search engine data. The findings of our study provide some support for the statement that different entrepreneurial frameworks indeed have different influences on entrepreneurship rate and innovation. The results indicate that there are interplay effects of the entrepreneurial ecosystem and entrepreneurial attention measured by Google search engine data.

The findings of the baseline regression illustrate that the several entrepreneurship ecosystem conditions (such as R&D transfer and market dynamics) are important predictors of TEA and entrepreneurial innovation activity. In particular, whether the entrepreneurial attention is high or low, national R&D transfer for innovation has significant negative effects. We speculate there are two main reasons: (1) universities and other research institutions tend to establish their own companies or transfer technologies to the small companies, so exclusive transfer agreements will hinder other start-ups (Powers and McDougall 2005); (2) technology transfer inhibits some companies', especially high technology companies', innovation power, making the companies attach great importance to the hardware devices and ignore the software ability (J. C. Guan et al. 2006).

However, the SUR results indicate that entrepreneurial finance and taxes or regulations policies have significant positive effects for innovation only when the entrepreneurship attention is high. Our results support the findings of Z. Acs et al. (2016), who suggested some public policies waste taxpayers' money to support entrepreneurs with low intention and innovation motivation. Many managers with low entrepreneurship attention may consider entrepreneurial innovation as expensive and disruptive to production (Miller and Friesen 1982). On the contrary, when entrepreneurs pay more attention to new business, they will seek the financial and policy support for innovation activities. The results may explain why scholars found entrepreneurs are differently affected by tax policies (Poterba 1989; Denis 2004). Meanwhile, under the high entrepreneurship attention condition, physical infrastructure and cultural and social norms for entrepreneurship have significant positive effects on TEA. This suggests that the media and internet attention of the entrepreneurial activities can enhance the role of infrastructure and culture. On the contrary, market dynamics for entrepreneurship have a significant negative effect on TEA. We speculate that market change can cause market imbalance, and deviating from the general market conditions, thereby the market prospect cannot be predicted. The concerns of entrepreneurs make them postpone or out of entrepreneurial activity.

We believe this study provides several important theoretical implications by providing a deeper understanding of how entrepreneurial ecosystem and attention interact in promoting entrepreneurial performance. First, we contribute to entrepreneurship ecosystem literature. A central premise in the entrepreneurship literature is the interplay roles played by both personal and environmental factors in shaping the entrepreneurial activities (Brockhaus and Nord 1979; Dubini and Aldrich 1991; Korunka et al. 2003). Some factors have been examined, such as personality characteristics of entrepreneurs, embedded networks, regional economic indicators, etc. (Frese et al. 2002; Dimitratos et al. 2004). We contribute to this research by showing how entrepreneurship ecosystem interacts with the attention of individual entrepreneurs. Although studies have shown the significance of entrepreneurship ecosystem in performance (Autio et al. 2014), our

study complements prior findings by adopting a portfolio perspective and a balanced approach to analyze entrepreneurship ecosystem. What's more, one important takeaway from our study is that, if we are to understand better how multiple factors of entrepreneurship ecosystem influence entrepreneurial performance, we need to devote more effort to understanding individual perception factors affecting the efficacy of entrepreneurship ecosystem. Thus, we contribute to the application of social cognitive theory in the entrepreneurship research. Second, we contribute theoretically and empirically to entrepreneurship research by providing an attention-based explanation and empirically measuring entrepreneurial attention use Google search. Resting firmly on social cognitive theory, this study sheds light on the joint effects of the environmental variable (entrepreneurship ecosystem) and key individual variable (entrepreneurs' attention). This perspective suggests that in order to fully understand complex entrepreneurial processes, it is essential to examine variables operating at different levels. Our research findings are consistent with the viewpoint of Wagner and Sternberg (2004) that argued entrepreneurial activities have different levels of attention across different countries and across time. Beyond testing theories of attention, we are the first paper to use internet search volume in entrepreneurship, which is a response to the appeals from scholars in other fields (Da et al. 2011). Using online search volume is a relatively objective mean to reveal and quantify the interests of in entrepreneurs and therefore should have many other potential applications in entrepreneurship.

Although we see several implications for entrepreneurial policies, there are also some limitations. Firstly, the generalizability of our finding may be limited to OECD countries that are consisted by the many developed countries. We have some difficulties in estimating the characteristics of the entrepreneurial ecosystem and internet search engine data in developing countries. For instance, according to OECD statistics, the average percentage of OECD households with access to the internet is 74.9% in 2012, but it fell in some developing countries (China: 30.9%, Brazil: 37.8%, South Africa: 9.8%). Secondly, the entrepreneurial ecosystem is not necessarily limited to the nine categories of determinants involved in our study. People are also motivated via international investment, entrepreneurial capabilities and opportunities (Shane 2000; Kor et al. 2007). For example, entrepreneurs sometimes require joint venture (JV) and international corporate entrepreneurship (ICE) because of entrepreneurial risk taking or extending markets (Zahra and Garvis 2000). Each of the limitations indicates an exciting direction for future research.

Although this study refers to an interacting effect between the entrepreneurial ecosystem and internet attention, the influence of internet search data has not gained enough attention so far. Therefore, future research should pay more attention to this effect. This study also indicates that the quantity and quality of entrepreneurship should both be considered in the analysis of the entrepreneurial ecosystem. In future research, the two aspects of new business undoubtedly deserve more emphasis.

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