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Innovation and Entrepreneurship: A Tale of Siblings

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Abstract
Using on data from 52 countries we analyzed the relationship between entrepreneurship and innovation. Contrary to conventional wisdom, we report that no relationship exist between national levels of innovation two entrepreneurship measure; namely: total entrepreneurial activity and opportunity entrepreneurship. We also found innovation to be inversely related to necessity entrepreneurship, an occurrence we believe is due to the munificence of career opportunities which reduce the necessity for people to start businesses for survival.

Keywords: entrepreneurship, innovation, necessity entrepreneurship, global innovation

Introduction

Conventional wisdom is that entrepreneurship and innovation are closely related like siblings entangled with each other on a playground. Entrepreneurs are often said to be innovative, suggesting that entrepreneurs need to be innovative in order to succeed in their endeavor. But is this always the case? On the other hand, do innovators need to be entrepreneurial? There is support for the positive connection between innovation and entrepreneurship. For example, it has been said that "entrepreneurship demonstrates the innovation by putting the idea or concept into practical use with the infusion of resources" (Crumpton, 2012:100). Thus, entrepreneurship and innovation are often treated, at least anecdotally, as allies. The general notion in literature is that the two phenomena are complementary, rising and falling together.

In fact, it has been argued that innovation is the chief component of entrepreneurship (Davidsson, 2004; Lumpkin and Dess, 1996; Rosenbusch, Brinckmann, & Bausch, 2011; Schumpeter, 1982). Zhao (2005) explored the synergy between entrepreneurship and innovation in a qualitative study of six entrepreneurial and innovative organizations in which senior managers were given in-depth interviews. The study found a positive relationship between entrepreneurship and innovation, supporting Schumpeter's (1934) view of the entrepreneur as the innovator. These postulations suggest the notion that innovation is always positively correlated with entrepreneurship. The goal of this study is to explore the relationship between the two and stimulate further research inquiry into the relationship.

We can further explore the relationship between the two in literature by considering their effects on other variables. Researchers have linked

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entrepreneurship and innovation to company performance in different studies. Zahra and Covin (1995) found corporate entrepreneurship to have a positive impact on financial measures of company performance – an effect on performance that increases over time, especially in hostile environments. The authors agree that entrepreneurial behavior is associated with superior financial performance and may be necessary for long-term company financial performance (Zahra & Covin, 1995). Another study showed that the associations between corporate entrepreneurship and company financial performance varied among the four environment clusters namely, dynamic/growth, hostile, hospitable and static environments (Zahra, 1993; Zahra & Garvis, 2000) with firms that pursue entrepreneurship in international environments with higher levels of hostility having higher profits and growth.

The consensus is that entrepreneurship is positively related to company performance. However, such an agreement does not seem to remain intact when entrepreneurship is replaced with innovation in that equation. DeCarolis and Deeds (1999), Li and Atuahene-Gima (2001), as well as Guo, Baruch and Zhou (2005) have independently reported the positive effects of innovation on company performance, but McGee, Dowling and Megginson (1995) and Vermeulen, De Jong and O'Shaughnessy (2005) showed that innovation may indeed negatively influence performance. Other studies have also reported no influence of innovation on performance (Birley and Westhead, 1990; Heunks, 1998) or inconclusive results (Li & Atuahene-Gima, 2001). When it comes to employment, entrepreneurship has been positively linked to employment (Plehn-Dujowich, 2012), whereas innovation has been implicated as a potential job eliminator (Stiglitz, 2014).

To the best of our knowledge, besides the contributions made by Schumpeter (1943), Drucker (1994) and a few others and who focused on the interaction between entrepreneurship and innovation, there empirical studies of the relationship between entrepreneurship and innovation are lacking. However, there are clues in literature that suggest that while the two overlap, entrepreneurship and innovation are distinct phenomena, requiring different processes and mindsets, and resulting in diverging outcomes. Moreover, extant literature is devoid of empirical studies delineating the connection between entrepreneurship and innovation in a cross-country analysis. Therefore, this study is a first attempt to our knowledge to close the gap. A close literature examination reveals that entrepreneurship and innovation require different mindsets, operate in related but different national systems, are enabled by different firm types, result in dissimilar outcomes, and have varying contributions from the private and public sectors. Let's examine these points of contrast.

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The Entrepreneurial Mindset versus the Innovative Mindset

Entrepreneurship is defined as "the process by which individuals – either on their own or inside organizations – pursue opportunities without regard to the resources they currently control" (Stevenson & Jarillo, 1990: 23). The focus on opportunity as previously noted by Kirzner (1973) is what distinguishes entrepreneurship from all other disciplines. Entrepreneurs are said to be opportunity-obsessed (Timmons & Spinelli, 2008), a mindset they carry into any walk of life.

Opportunities sought by entrepreneurs can be commercial/economic, social or political in nature, which makes entrepreneurship a multidisciplinary subject. Scholars agree that what makes entrepreneurs unique is that they are opportunity-driven, and less resource-focused. On the other hand, innovation is defined as the introduction of new or significantly improved products (goods or services), processes, organizational methods, and marketing methods in internal business practices or in the open marketplace (OECD & Eurostat, 2005).

The focus of innovation is on creating something that is novel, which may eventually be exploited as an opportunity. Entrepreneurs may proceed to exploit opportunities even if they do not possess the resources to do so. To the contrary, innovators whose sole interest is to create novel products may not necessarily possess the "go-getter" mentality of entrepreneurs and may be hindered due to a lack of resources to complete their innovation. It is important to state that the Global Entrepreneurship Monitor (GEM) makes a distinction between opportunity entrepreneurship (OEP) and necessity entrepreneurship (NEP), with the former occurring in growth-oriented ventures where the entrepreneur is pulled to innovate a solution for the market and the latter occurring when the entrepreneur is faced with job loss and lack of career opportunity satisfaction and is pushed to start a venture in order to make a living.

National Systems that Support Entrepreneurship and Innovation

National Systems of Entrepreneurship (NSE) have been introduced into literature as composed of "resource allocation systems that are driven by individual-level opportunity pursuit, through the creation of new ventures, with this activity and its outcomes regulated by country-specific institutional characteristics." They differ from National Systems of Innovation (NSI) frameworks, where institutions, not individuals, are dominate players in the national system (Ács, Autio, & Szerb, 2014). The NSE emphasizes the role of individual agency, maintaining that it is the individual, operating within institutional contexts, who drives entrepreneurship. The theoretical underpinnings of the NSE relies on the Schumpeterian framework (Schumpeter, 1934) that entrepreneurs foster economic development through innovation. On the other hand, NSI emphasizes the central role of institutions on the creation of

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innovation (Freeman, 1987, 1988; Freeman and Lundvall, 1988; Lundvall, 1988; Lundvall, Johnson, Andersen & Dalum, 2002, Nelson, 1993).

New Venture Creation versus New Knowledge Creation

Though entrepreneurship focuses on the exploitation of opportunities, scholars agree that the entrepreneurial process ultimately results in the creation of new ventures (Timmons & Spinelli, 2008). For this reason, the most widely accepted indicator for entrepreneurship is the rates of new business creation. The GEM currently tracks the rates of self-employment world-wide (Reynolds, Bosma, Autio, Hunt, De Bono, Servais, Lopez-Garcia, & Chin, 2005), monitoring changing rates of self-employment annually in over 50 countries, and similar measures of new business creation are available via OECD-Eurostat's Entrepreneurship Indicators Program (Lunati, Meyer zu Schlochtern, & Sargsyan, 2010; OECD & Eurostat, 2007), WorldBank's Entrepreneurship Survey (The World Bank), and the Flash Eurobarometer survey (The Gallup Organization, 2010).

As mentioned earlier, the GEM also tracks NEP and OEP, a combination of which results in the total entrepreneurial activity of a country. Specifically, the rates of young businesses and start-ups aggregated into the total early-stage entrepreneurial activity (TEA) is the widely used GEM entrepreneurship measure. On the other hand, innovation is measured by the creation of new knowledge, not new ventures; therefore, indicators such as research and development, publications and citations, and number of patents filed (National Science Board, 2012) are commonly used to track national rates of innovation.

Types of Firms In Which Entrepreneurship and Innovation Occur

It has been shown that the entrepreneurial process can take place in any type of organization (Stevenson, 1983; Stevenson & Gumpert, 1985; Stevenson & Jarillo, 1986; 1990). On the other hand, it appear that the incident of innovation is commonplace in very large companies or institutions, a case that cannot be made for Africa, where innovation sprawl through indigenous systems and tightknit communities. Nonetheless, the case of innovation occurring in large institutions is primarily because research and development (R&D) is expensive and only these companies possess the financial resources to innovate (National Science Board, 2012). One clue is in the fact that while the private sector performed 71% of all U.S. R&D in 2009, only about 3% of businesses, typically large firms, (i.e., only 47,000 businesses) accounted for the R&D efforts in the US (National Science Board, 2012).

Private versus Public Financial Contributions

R&D funding, which produce innovations, emanate from both the private and public sectors and do complement each other in clear ways. Until the 1980s, when the private sector R&D investment exceeded 50%, support for R&D in the United States had been the primarily driven by the Federal Government. This

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gain continued over the next 20 years, reaching a high of 69% in 2000 (National Science Board, 2012). A snap shot of the private sector investment in 2009 breaks down as follows: development, which supports incremental innovation (80%), applied research (13.9%), and basic research (5%). When it comes to transformative innovation, which leads to quantum leaps in new knowledge creation, the US Federal Government supported 53% of all basic research funding, which forms the building blocks that spun other innovations, compared to 22% for the private sector (National Science Board, 2012). This makes the public sector the major contributor to basic-research-type innovation.

A summary of the how entrepreneurship differs from innovation is provided in Table 1 below.

Table 1: Comparing Entrepreneurship and Innovation

Points of Contrast	**Entrepreneurship**	**Innovation**
Motivation	Opportunity-driven	Novelty-driven
Agency	Individual agencies operating within institutional contexts	Institutional agencies and industrial structures
Output measures	New venture creation (e.g. new businesses, self-employment)	New knowledge creation (e.g. R&D, patents, publications and citations)
Firm type	Any type of organization	Typically large firms
Sponsorship	Mostly private	Private and public with the latter funding a greater share of basic scientific research

Hypotheses

It is may be the case that every new venture creation requires some level of innovation because something new that was not in existence is created. However, the level of new knowledge generated by those whose job it is to create new knowledge far outweighs the level of new knowledge due to "new venture" creation. As such, entrepreneurship and innovation are two different activities with diverging goals conducted by different people: the entrepreneur and the innovator. We argue that innovation relies on researchers creating new knowledge, whereas entrepreneurship depends on entrepreneurs. Additionally,

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societies with high numbers of patent filings, along with high scientific publications and citations, must possess appropriate infrastructure and supporting culture that encourage investigative careers thus providing safer paths for people to pursue such careers.

According to a 2014 Global Innovation Index (GII) report, "knowledge creation" is part of any nation's "knowledge and technology outputs," and is composed of indicators such as patent applications and scientific and technical published articles in peer-reviewed journals (WIPO, 2014). Clearly, knowledge creation is evidence of new discoveries and high-impact scientific breakthrough. How knowledge creation is related to entrepreneurship, however, remains untested. At first, it is tempting to think that entrepreneurial activity is fostered by knowledge creation because patents may be viewed as precursors to new products and services; however, filing patents, a sign of knowledge creation which is common in Western countries, could be a strategic move by firms to preclude new firms from entering a market space. Therefore, in a capitalist society where profit maximization for shareholders trumps other goals, patent filings could effectively stunt entrepreneurship.

Accordingly, an individual who may be passionate about starting a business may not be able to do so if the business concept she intends to pursue has been patented. Moreover, when large firms file a patent to protect an idea, they are usually not interested in licensing the patent to another company or to a start-up; rather, they often want to fend off any possible rival from entering the industry and gaining market share (Cohen, Nelson, & Walsh, 2000). Furthermore, there is evidence that large firms are the main users of academic patents. For example, only 15% of all academic inventions by Finnish academic researchers are utilized in start-ups (Meyer, 2006). It stands to reason that patents create barriers to entry for someone who wants to pursue an enterprise in the patent-blocked space. Based on the arguments, advances in innovation would not necessarily impact or result in entrepreneurship. Thus, we hypothesize that:

H1: There will be no relationship between national levels of innovation and total entrepreneurial activity.

H2: There will be no relationship between national levels of innovation and necessity entrepreneurship.

H3: There will be no relationship between national levels of innovation and opportunity entrepreneurship.

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Data and Methodology

The dataset used in our study was obtained from two sources. The first is a measure of innovation, captured by the Global Innovation Index (GII) co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO). GII is a unique combination of input and output variables that relate to innovation. The innovation inputs include: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication; and the innovation outputs include: (6) Knowledge and technology outputs and (7) Creative outputs. Each of the seven factors is composed of sub-indicators (79 in total), which provide scores that are calculated as the weighted average of the sub-indicators (WIPO, 2014). The GII score used is the latest wave of the data, obtained for 2012. The second source of data consists of measures of entrepreneurial activity from the GEM. These measures include the TEP, which is comprised of NEP and OEP. The measures are obtained for a large sample of countries, between the years 2012 and 2016. The resulting merged dataset contains cross-sectional data for 52 countries.

Regression models were estimated where the different measures of entrepreneurship (TEP, NEP and OEP) are the dependent variables, and the GII score is the main explanatory variable. For each measure of entrepreneurship, additional models include control variables obtained from the GII dataset which describe the country's productivity (PPPPC), rule of law, freedom of the press, political stability, business environment, and levels of education. All results are presented using autocorrelation and heteroskedasticity-consistent standard errors.

Results and Discussion

Table 2 depicts a regression of the three measures entrepreneurship, TEA, NEP and OEP, on the innovation measure (GII). Without the controls, a negative and significant relationship was observed in the case of TEA and NEP, and a positive and significant relationship in the case of OEP. When control variables were added to the model, the relationships became insignificant except for NEP which remained negative and significant. Thus, hypotheses 1 and 3 (H1 and H3) were supported by the results, and hypothesis 2 (H2) was not supported by the results.

Table 2: The Effect of Innovation on Entrepreneurship

The numbers in parenthesis are heteroskedasticity consistent (robust) standard errors. Statistical significance is denoted by ***, **, and * for 1%, 5% and 10% levels, respectively. Observations = 52 countries in all cases.

	TEA	NEP	OEP
Intercept (with/without	32.329*** (5.642)/ 30.654*** (4.091)	37.173*** (6.493)/ 46.363*** (3.765)	40.891*** (9.202)/ 29.125*** (4.564)

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controls)			
GII (with/without controls)	-0.313 (0.261)/ -0.404*** (0.080)	-0.337* (0.189)/ -0.519*** (0.077)	0.334 (0.229)/ 0.446*** (0.100)
PPPPC	0.00004 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0002)
Rule of Law	-0.069 (0.133)	-0.145 (0.107)	0.205 (0.167)
Freedom of Press	0.197** (0.094)	-0.009 (0.080)	0.055 (0.099)
Political Stability	-0.089 (0.067)	0.094 (0.077)	-0.023 (0.153)
Business Environment	0.085 (0.074)	0.005 (0.084)	0.174 (0.120)
Education	-0.204 (0.131)	0.149 (0.140)	-0.515** (0.218)
Tertiary Education	-0.137 (0.135)	-0.077 (0.082)	-0.025 (0.170)
R^2/ Adjusted R^2	0.302/ 0.288	0.472/ 0.374	0.312/ 0.184

Since people are "pushed" into necessity entrepreneurship, which occurs when there are lack of opportunities in a given society, a look at the career environment in a country may explain the negative relationship between GII score and NEP. Richer countries provide the context (e.g. job opportunities) that offer incentives for people to pursue higher education, which is, for the most part, acts like a prerequisite for becoming gainfully employed. Therefore, we can imagine that as people in richer countries pursue tertiary education, those countries would produce more highly credentialed employees and researchers compared to poorer countries. The GEM researchers have observed high rates of entrepreneurial activity in poor countries, which simultaneously lag behind in R&D and infrastructural development, but there is no accord on the explanation of unexpected high entrepreneurship in poor countries. This analysis provides an insight. Our results indicate that that the rise in NEP may account for the increase in entrepreneurship in poor countries that lag in R&D.

Reynolds, Temple, Robertson and Mana (2001) posited that greater poverty leads to more necessity entrepreneurship which in turn increases the level of entrepreneurial activity in a country; however, qualitative studies from Uganda and Sri Lanka indicate that low income people were much less likely to start a business (Rosa, Kodithuwakku, & Balunywa, 2006). Despite the disagreement on the explanation given, poor nations tend to have high levels of entrepreneurship (Martínez, Levie, Kelley, Sæmundsson, & Schøtt, 2010) but low in R&D, infrastructural investment and innovation (WIPO, 2014).

The reason why innovation and necessity entrepreneurship are negatively related could be that societies that provide paths to investigative careers will invariably invest in education and tertiary education in order to have a steady supply of human capital to fill those knowledge-based careers. In other words,

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compared to poorer countries, those societies would possess more opportunities for gainful employment, which would reduce the tendencies for people to start businesses in order to simply make a living.

Conclusions

This study was undertaking to clarify the relationship between entrepreneurship and innovation. Contrary to common belief, our literature review led us to hypothesize that there would be no relationship between national levels of innovation and all three forms of entrepreneurship under this study. Using cross-sectional data from 52 countries, the results supported the hypothesis that there will be no relationship between innovation and total entrepreneurial activity. The hypothesis that there will be no relationship between innovation and opportunity entrepreneurship was also supported. However, the hypothesis that there will be no relationship between innovation and necessity entrepreneurship was not supported. In fact, we found a negative and significant relationship between GII score and necessity entrepreneurship.

These results establish that national levels of innovation and total entrepreneurial activity may not be related. However, we also found an inverse relationship between necessity entrepreneurship and innovation because countries with high levels of innovation invariably have more career opportunities compared to their counterparts with low levels of innovation. We believe it is the munificence of opportunities that reduce the occurrence of necessity entrepreneurship.

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