Expanding the Geographic Scope of University Entrepreneurship Research: Theoretical Justification and Empirical Evidence

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ABSTRACT

University entrepreneurship has grown dramatically since the early 1980s. This has produced a commensurate increase in research on the subject by management scholars. Although researchers have learned a great deal about university entrepreneurship, this area of research suffers from a lack geographic breadth. This lack of geographic breadth is increasingly untenable given the maturity of the field and the dramatically increasing rates of university research in countries not well studied in past research. This article lays out theoretical and empirical justifications for expanding the geographic scope of university entrepreneurship research and offers concrete suggestions for how researchers can accomplish this.

INTRODUCTION

Although university entrepreneurship (Etzkowitz, 1983) is not a new phenomenon, (Mowery, Nelson, Sampat, and Ziedonis, 2001) it has exhibited dramatic growth since the early 1980s (Bercovitz and Feldman, 2006). A small but growing area of management research examines university entrepreneurship along dimension of its origins, dynamics, impacts, etc. This literature is notable for the breadth of theoretical perspectives on which it draws, including economics-oriented theories such as contracting and transaction costs (e.g. Shane, 2004; Powers and McDougall, 2005) and sociology-oriented theories such as institutions (e.g. Jensen and Thursby, 2001) and networks (e.g. Gittleman, 2007). Equally impressive is the methodological breadth of this area of research; researchers have used ethnography (e.g. Kaghan, 2001) interviews (e.g. Markman, Phan, Balkin, and Gianiodis, 2005), surveys (e.g. Jensen and Thursby, 2001; Siegel, Waldman, and Link, 2003), and archival data (e.g. Mowery et al., 2001) to study university entrepreneurship. However, this theoretical and methodological breadth is not matched by similar geographic breadth – nearly all of this research has been done in the context of the developed world.

The observation of this gap in the university entrepreneurship literature is offered less as a criticism of past research and more as an open question for future research – does what we know about university entrepreneurship hold up in the context of less developed countries? In order to answer this question this paper pursues two interrelated goals. First is to present the theoretical case for incorporating a broader geographic scope in the study of university entrepreneurship. Second is to outline why the developing world is an increasing important empirical setting for studying university research in general and university entrepreneurship in particular. In pursuit of these goals, this paper first reviews themes within

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"Although the UN uses the terms “developed” and “developing” country as a “statistical convenience” rather than a formal measure of development, this paper follows this convention and considers developed countries Japan, Canada, US, Australia, New Zealand, and those countries in Western Europe."
the university entrepreneurship literature in order to substantiate the claim of its limited geographic scope. Second, it develops a theoretical justification for expanding the geographic scope of university entrepreneurship research. Next, it offers empirical support for increasing geographic breadth by showing the increasing importance of the developing world in university research. Finally, it discusses directions for future research to expand the geographic scope of university entrepreneurship research including three specific suggestions for accomplishing this goal.

LITERATURE REVIEW

Growth in University Entrepreneurship

In the late 1970s and early 1980s, university entrepreneurship, defined by Etzkowitz (1983) as universities taking a more active role in the transfer of academic research to the market, experienced rapid growth. The number of US universities participating in entrepreneurship increased from approximately 25 in 1985 to approximately 200 in 2005. Similarly, the number of patents issued to universities increased from approximately 300 in 1980 to 2000 in 1996 and licensing revenue grew from $160 million in 1991 to $611 million in 1997 (Siegel et al., 2003). Researchers have attributed these increases to a confluence of factors (Bercovitz and Feldman, 2008) including the success of high profile life-sciences technologies developed at, policy changes such as the Bayh-Dole act, and pressure on universities to pursue more applied research and contribute to economic growth universities (Powell and Owen-Smith, 1998). The result of these, largely complementary, pressures has been universities’ increasing participation in entrepreneurship and the blurring of lines between universities’ traditional roles of producing knowledge as a public good where its benefits accrue to society as a whole, and the production of knowledge as a private good where its benefits accrue to its owner (Owen-Smith, 2003).

University Entrepreneurship Using High Profile Inventions

A well-studied example of a high profile university invention is the gene splicing and sequencing technique developed by Watson and Crick. This invention is widely considered the technological breakthrough that spawned biotechnology as an industry (Powell, Koput, and Smith-Doerr, 1996). This particular invention increased the awareness of the potential value of university-developed inventions for both universities and firms. Biotechnology has also been the setting for much of the work on the origins and development of university based technologies (e.g. Powell et al., 1996; Gittleman, 2007). Key findings from this stream of literature include robust patterns of collaboration between firms, universities, and government agencies (Powell et al., 1996), the importance of geography for development of early stage technologies (Gittleman, 2007), and the antecedents to differing types of outputs of university research (commonly patents and publications). Although this stream of literature has done much to show important dynamics of university entrepreneurship such as the blurring of “public” and “private” scientific logics (Owen-Smith, 2003), it is not clear whether the results are idiosyncratic to biotechnology and, by extension, developed countries since this is where this particular technology was developed.

University Entrepreneurship and Policy

A second stream of the university entrepreneurship literature focuses on the effect of policy changes, including the passage of the Bayh-Dole act (formally titled “University and Small Business Patent Act”), on commercialization of university research and changes in patent policy (Jaffe, 2000). In the US, the Bayh-Dole act gave property rights to inventions resulting from federal funding to universities, whereas
before property rights had been owned by the government agency that had provided its funding (Shane, 2004). Before the Bayh-Dole act, a faculty member who wanted to commercialize one of their inventions (provided it had been funded with federal funding, which accounts for 59.6% of all university research funding in the US (Mowery et al., 2001)) would have had to apply for an ownership waiver or negotiate a license from the funding agency. The Bayh-Dole act clarified an invention’s property rights and assigned those rights to the university. In response, universities made structural changes to promote commercialization of the inventions to which they now held property rights. The effectiveness of the Bayh-Dole act in increasing university entrepreneurship has been called into question (Mowery et al., 2001) as possibly a symbolic blessing of a preexisting upward trend in universities’ commercial activities, but many researchers see its passage as a watershed event (Owen-Smith, 2003; Bercovitz and Feldman, 2008; Siegel et al., 2003).

The policy portion of the university entrepreneurship literature is notable for containing some cross-national comparative work. For example, Kneller (2007) examines the impact of policy reforms similar to the Bayh-Dole act on university entrepreneurship in Japan and finds that while the policy changes did modify universities’ approach to entrepreneurship, it did not fully displace the previous system of informal ties between university researchers and private firms. Etzkowitz and colleagues (2000) briefly discusses policy changes in the UK, the European Union (as a whole), Italy, Germany, Latin America (using almost exclusively examples from Brazil), and Japan.

University Entrepreneurship as Revenue Generator

A third of stream of university entrepreneurship research examines universities’ responses to mounting cuts in public support. As public support has declined the commercialization of university inventions is one avenue for bringing in revenue to a university (Etzkowitz, Webster, Gebhardt, and Cantisano, 2000; Powers and McDougall, 2005). This stream of the literature highlights and explores the tension created when moving from a norm of open or public science to one of closed or private science. The latter norm preferred for purposes of revenue generation, and the former for purposes of prestige and contribution to a publicly available body of knowledge from which all are free to draw. Tensions between faculty publication and faculty patenting as measures of performance embody these conflicting logics (Owen-Smith, 2003). Although these have been shown to not be mutually exclusive activities, and in fact demonstrate positive co-variation (Powell and Owen-Smith, 1998; Blumenthal, Causino, Campbell, and Louis, 1996), there is inherent tension between an arrangement meant for wide dissemination of knowledge and one intended to confer exclusive use of knowledge to a particular party (Owen-Smith, 2003).

CURRENT GEOGRAPHIC SCOPE

These streams of research have advanced our understanding of university entrepreneurship considerably and this setting holds the promise of having much left to uncover (Rothaermel, Agung, and Jiang, 2007). One of these little addressed areas is university entrepreneurship in the context of less developed countries. Past research, with the exception of a handful of case studies (summarized in Table 1) has largely ignored such settings. Of course, there are some reasonable explanations for this, including the availability of data and resource limitations of researchers. Examples of the latter included the country specificity of commonly used data sources in university entrepreneurship research, such as the survey of the Association of University Technology Managers (AUTM) and United States Patent and Trademark Office (USPTO) patent database in the US context. Similarly, leading authors in university
entrepreneurship tend to be located in developed world institutions (Rothaermel et al., 2007), indicating “localized search” as a possible explanation for the dearth of university entrepreneurship research in the developing world context.

Although this narrow geographic focus has undoubtedly produced useful research, it is increasingly untenable for at least three reasons. First, the degree to which these findings generalize is questionable if they derive from data that is convenient rather than representative. Second, the amount of academic research done outside of developed countries has grown dramatically in the recent past and continues to grow at a much higher rate than in developed countries. So to the extent that academic research is the raw material that feeds the university entrepreneurship process, looking beyond developed countries is more important than ever before and will continue to be so in the future. Third, university entrepreneurship contributes to economic growth (Bercovitz and Feldman, 2006) and providing science-based solutions to social, medical, and ecological problems, all of which disproportionately affect people in the developing world.

| Table 1: University Entrepreneurship Research in Developing World Contexts |
|-----------------------------|---------------------|-----|-----------------------------|
| Title                       | Author              | Year | Setting                     |
| Managing and incentivizing research commercialization in Chinese Universities | Weiping Wu | 2010 | Comparative case studies of China’s Fudan and Shanghai Jiaotong Universities |
| University entrepreneurship in a developing country: The case of the Universidad Católica de Chile, 1985–2000 | Andres Bernasconi | 2005 | Case study of Universidad Católica de Chile |

Rothaermel et al.’s (2007) exhaustive taxonomy offers further evidence of the narrow geographic scope of the university entrepreneurship literature. The authors examine 173 peer-reviewed articles and find that less than 1% feature developing world contexts (For example, south Asia is completely unrepresented). Table 2 summarizes the geographic distribution of this taxonomy. This distribution shows an even balance of US and European contexts as well as clear evidence of underrepresentation of developing world contexts in the university entrepreneurship literature. Of course, the validity of this measure is reliant on Rothaermel and colleagues work being a valid sample frame. Although there is no way to prove this beyond any doubt, Nelles and Vorley (2010) recognized this review article for its breadth. Another potential issue with this review as a sample frame is it only captures the portion of the university entrepreneurship literature authored in English. However, the dominance of English as the language of scientific publication globally (Meneghini and Packer 2007) largely mitigates this concern.

| Table 2: Geographic Distribution of University Entrepreneurship Literature in Rothaermel et al. 2007 |
|-----------------------------|---------------------|-----------------------------|
| Type                        | Count | Countries/Regions Represented |
| Developed                   | 203   | US (96) EU (97) Canada (4) Japan (4) Australia (1) Switzerland (1) |
| Ambiguous                   | 5     | Israel (4) Korea (1) |
| Developing                  | 2     | China (1) Chile (1) |

THEORETICAL JUSTIFICATION

Although the above review provides strong evidence university entrepreneurship research has focused almost exclusively on the developed world, this alone is not reason enough to expand the geographic scope of this research. Such an endeavor would only make sense if there were sound theoretical reasons why such an expansion would contribute new insights to this body of research. This paper outlines two routes by which such contributions could occur. First, it offers the opportunity for researchers to refine existing theory...
by assessing its fit with university entrepreneurship in different settings. This should help clarify whether the findings of past research are attributable to university entrepreneurship as a phenomenon per se, or if they are attributable to largely exogenous factors such as average income levels or property rights arrangements. Second, it expands the geographic breadth of university entrepreneurship research to mirror the increasing geographic breadth of the phenomenon itself, as developing countries become increasingly active in research and claim a greater share of the world’s scientific output.

As the most basic level, expanding the geographic breadth of university entrepreneurship research, increase the external validity of this research and helps to limit researcher bias. This is true for all three themes outlined earlier but takes a slightly different form for each. For breakthrough inventions, justification lies in casting a wider net for these rare events. The overreliance on biotechnology in this stream of literature indicates the need for other examples to help discern whether this literature develops a theory of university entrepreneurship, or simply a theory of biotechnology entrepreneurship. For example, comparing and contrasting the case of biotechnology in the US with that of energy technology in China or biotechnology in India would help determine the degree to which past theories generalize to university entrepreneurship as a whole.

The policy stream of university entrepreneurship literature could perhaps benefit most directly from a broadened geographic scope because cross-national research allows for the comparison of differing institutional arrangements and policies. This approach would avoid relying on the analysis of one-off policy changes in a single country. For example, part of the confusion surrounding the ultimate impact of the Bayh-Dole act on university entrepreneurship in the US could be that there is little to compare it to, leaving researchers to debate a single natural experiment that is more than 35 years old. The policy stream of literature may also be the lowest hanging fruit for researchers interested in expanding the geographic breadth of this research because it offers a clear unit of analysis of the nation-state, provided research policies and institutional arrangements such as property rights are set at the national level.

Expanding the geographic breadth of university entrepreneurship research also matters for the stream of literature addressing resource constraints as a motivation for increased commercial activity of universities. Here, the incorporation of universities in the developing world creates more variation in the types and degree of constraints universities face. For example, state-directed universities may have very little control over their research programs where other universities may be politically and financially autonomous leading to a high degree of control over their research programs and commercialization activities.

Expanding the geographic breadth of university entrepreneurship research along these three dimensions will clarify which portions of previous research are idiosyncratic to the developed world (or perhaps, even a small handful of the most elite universities in the developed world) and what is more able to generalize to all universities engaged in the commercialization of research-base inventions. Knowing this will help refine and build theory in university entrepreneurship and perhaps help this stream of research cross into the mainstream of management research, something that has thus far proven largely elusive (Rothaermel et al., 2007).

**EMPIRICAL JUSTIFICATION**

Equally as important as the theoretical justification for expanding the geographic breadth of university entrepreneurship research is the empirical justification that university research and its commensurate entrepreneurial opportunities are less the exclusive domain of the developed world than in the past. For example, China increased its output of scientific publications from 69,000 to 115,000 from
1993 to 2001 and more than doubled its “market share” in the mostly highly cited scientific journals (King, 2004). Brazil has increased its proportion of world scientific publications by approximately 50% over the same period. As a whole countries outside of Europe and North America have increased their share of world output of scientific publications from 16% in 1980 to 36% in 2008 (Archambault, 2010). A similar trend has also been observed in university patenting, for example patents issued to Chinese universities increased tenfold from the early 1980s to the early 2000s (Pratt, 2005).

These trends in scientific output are complemented (and perhaps preceded by) trends in the world labor market for science and engineering talent. As a coarse measure, the number of graduates in science and engineering disciplines is more than ten times greater in India and China than in US (Wadhwa, Gereffi, Rissing and Ong, 2007). These numbers may be inflated and do not account for quality (Wadhwa et al., 2007), but still provide some evidence that the world of university research is becoming increasingly multi-polar. A complementary trend is the recent increased difficulty in retaining foreign born (but often developed-world trained) talent in the developed world because of visa uncertainties and increasing opportunities in their countries of origin (Gereffi, Wadhwa, Rissing, and Ong., 2008). For example, in US almost 60% of PhDs in engineering are earned by foreign nationals (Wadhwa et al., 2007), if they are not allowed to stay or are attracted by lucrative opportunities in their countries of origin, it will accelerate the growth of university research and, by extension, university entrepreneurship in the developing world.

A third empirical reason to expand the geographic breadth of university entrepreneurship research are policy changes and funding allocations aimed at promoting the commercialization of university inventions as key components of economic development. For example, the Chinese Ministry of Science and Technology issued “The Regulation of Enhancing Intellectual Property Protection on National Scientific Programs” in 2003, which encourages universities to create departments dedicated to developing intellectual property portfolios and provides subsidies for international patent filings (Pratt, 2005). China also increased spending on science and technology by 30% from 2008 to 2009 to $23.9 billion (Jia, 2010) or approximately four times the budget of the US National Science Foundation (NSF Congressional Highlight, 20010). Similarly, India increased funding for research by 21% from 2007 to 2008 and created a new autonomous agency for funding basic research, the National Science and Engineering Research Board (Jayaraman, 2008).

DIRECTIONS FOR FUTURE RESEARCH

As with many suggestions for future research, it is far easier to call for an expanded geographic breadth in university entrepreneurship research than to actually wrestle with the methodological and empirical complexities of doing so. In an effort to be more proactive than simply calling for someone else to do the “heavy lifting”, I suggest three distinct strategies for extending the geographic breadth of university entrepreneurship research. First is to draw on existing databases for academic research. Although these databases contain academic research available for public use, publication and patenting have been show to be complementary rather than competing outputs of scientific research. Therefore, increasing publications from researchers in a given country should correlate with an increase in university entrepreneurship, even if the actual commercialization process is inaccessible or unobservable to the researcher.

Another area of opportunity is for researchers to take advantage of natural experiments (Jaffe, 2000), such as university entrepreneurship before and after major changes in policy or funding. Examples
might include the impact of, India’s new autonomous funding agency, or the easing of economic sanctions against Iran, on such measures as publications, patents, and licenses. Each of these settings (and undoubtedly many more) would provide insight and help refine past research leading to a more holistic and clear theory of university entrepreneurship.

A third strategy is to develop collaborations with management researchers in areas of the world with rapidly growing scientific research output. This approach would benefit the developed-world researchers by having a collaborator “on the ground” in areas of the world that can seem murky from a distance and it would also bring in a more geographically diverse set of contributors to the literature. Events such as international conferences would be a logical venue to initiate this type of collaboration and network building.

This paper started with two interrelated goals. First, to show university entrepreneurship research has historically focused on the context of the developed world and second to justify the expansion of its geographic scope. This paper does not intend its evidence to be alarmist or to argue that researchers cannot do fruitful research on university entrepreneurship in exclusively in the developed world context. Rather, it presents the increasing multi-polar world of university research and entrepreneurship as fertile ground to further this line of research and clarify its unique contribution to the management literature as a whole.

REFERENCES


