



# Entrepreneurial Ventures from Technology-Based Universities: a Cross-National Comparison

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## **ABSTRACT**

This dissertation examines the role of two different but critical factors in shaping entrepreneurial outcomes: individual level career history and the institutional context. The first essay investigates whether prior founding experience improves subsequent start-up firm performance. The second essay asks whether the 1999 Chinese Constitutional amendment increased entrepreneurship among individuals with higher (or lower) levels of human capital. The findings suggest that entrepreneurship among high quality individuals is driven less by the relaxation of constraints to entry and more by constraints to firm growth. The third essay takes advantage of the cross-national data and asks what drives (or limits) an innovation strategy?

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# **Entrepreneurial Ventures from Technology-Based Universities: A Cross-National Comparison**

## **Executive Summary**

**Charles E. Eesley**

### ***Introduction***

The process of commercializing innovation through technology entrepreneurship is a complex and multi-faceted one. My research is motivated by the current and future economic importance of high tech entrepreneurs. The universities, regions, and nations that gain an advantage in understanding and educating our young people about the process of high tech entrepreneurship will have an enduring leg up in terms of technological progress, economic growth and quality of life. The importance of high tech entrepreneurs will only increase as competition for innovation and economic growth increases. I stand on the shoulders of giants in terms of the attention that human capital, work history and institutions have received. Yet there are still gaps in understanding the various mechanisms by which these factors impact entrepreneurial outcomes. While the field has made some progress, many unanswered questions remain, particularly those that help entrepreneurs understand causal relationships. My work focuses on the role of two different but critical factors in shaping entrepreneurial outcomes: individual level career history and the institutional context. The research I am engaged in spans two outcomes in particular: individual decisions to choose high-tech entrepreneurial activities and the strategies and outcomes of the entrepreneurial firms that are established.

This dissertation is composed of three independent essays that examine various aspects of entrepreneurship. The common thread throughout my dissertation research is that it essentially examines three specific mechanisms through which we may see a relationship between pre-founding experience and entrepreneurship. First, entrepreneurs may benefit from the cognitive

frameworks or skills gained during a previous start-up and experience higher performance in the next firm that they start. Second, the institutional environment may shape the types of individuals deciding to engage in entrepreneurship. Third, factors in an individual's education or work history may have an effect on the ability (or the costs) to searching for technological ideas or for funding, shaping the likelihood of the adoption of an innovation strategy.

In Chapter 2, Edward Roberts and I look at evidence for a model where multi-functional experience (in this case, founding a firm) results in a more accurate cognitive map of the industry. This paper investigates whether prior founding experience improves subsequent start-up firm performance via more accurate mental models of the industry landscape. Distinguishing the effects of higher ability individuals selecting into serial entrepreneurship from this more nuanced story requires detailed data on each firm started by an entrepreneur, regardless of its success or venture capital funding. I exploit such data from the MIT Founder's Survey (Hsu, Roberts, Easley 2007) to analyze multiple measures of performance with (and without) individual fixed effects as a control for underlying individual-level factors such as skill or persistence. While not definitive (micro-level data on mental models would provide direct evidence but is difficult to obtain), the results provide tentative evidence consistent with our model.

Chapter 3 forms a transition to the remaining chapters by recounting the history of China's development and reforms specifically related to entrepreneurship since 1978. Next, I discuss some of the theoretical frameworks that have been useful in international research. The challenges faced by entrepreneurs are particularly salient in developing countries yet we know much less about high tech entrepreneurship outside of the United States and Europe. There is an increasing focus on international research and exciting results can be expected from the novel theoretical issues which data on entrepreneurship in other countries uniquely enlightens.

Chapter 4 examines a model distinguishing barriers to entry from barriers to growth. It exploits a natural experiment to identify effects on individuals at different locations on a talent distribution. The paper asks whether the 1999 Chinese Constitutional amendment increased entrepreneurship among those individuals with higher (or lower) levels of human capital. The type of institutional environment that results in higher quality entrepreneurs is a question that has not been systematically explored. The results have implications for our theoretical understanding of the interplay of institutional and individual factors in entrepreneurship, as well as important policy implications given the desire of governments to encourage high impact technology entrepreneurship.

The difficulty in studying the institutional drivers of changes in the distribution of talent drawn into entrepreneurship is two-fold. First, one needs a context with an exogenous change in institutions. Second, obtaining detailed data on human capital levels for a comparable ‘at-risk’ set of individuals is difficult. For this study, I collected original data through a survey sent to all alumni of Tsinghua University (Beijing), including data on graduates from 1947 to 2007, along with interviews in the People’s Republic of China during the summer of 2007. This is the first large scale dataset of technically trained Chinese entrepreneurs and the first alumni survey abroad. To study how different institutional environments may differentially impact the propensity for entrepreneurship among more talented individuals, a differences-in-differences approach is implemented. The data include panel data on income along with detailed work history and educational information.

In conventional analyses, lowering barriers to entry releases pent-up entrepreneurship among those with entrepreneurial ability, but who were previously constrained. My paper argues that reforms lowering barriers to growth encourage those of higher ability to choose

entrepreneurship over wage work through an increase in expected returns. I find that the greatest increase in entrepreneurship in the post-2000 institutional development was among individuals at the top of the talent distribution. The findings suggest that entrepreneurship among high quality individuals is driven less by the relaxation of constraints to entry (which are relatively easy to overcome) and more by constraints to firm growth.

In Chapter 5, I take advantage of the comparable data from the MIT and Tsinghua surveys on individuals with similar educational backgrounds in top engineering schools who are starting firms in very similar industries (dominated by electronics and software). A key question is whether institutions of open science and public R&D expenditures shape the likelihood of adopting an innovation strategy or whether funding constraints have a larger effect. The chapter develops a model of two early-stage search processes within entrepreneurial firms – a search for ideas and a search for funding. Individuals and the external environment determine the search costs in each area. This research will provide a step toward better knowledge of entrepreneurial careers, innovation strategy and high tech entrepreneurship in other institutional environments which may have different drivers from those found so far in developed economy contexts.

Taken as a whole, the essays in this dissertation provide a step away from the prior literature's attempts to define entrepreneurship and its drivers. Instead, I provide a view into the differences between entrepreneurs and evidence that the broader environment, specifically the institutional-level, can play a role in drawing into entrepreneurship those individuals who are more likely to innovate and to perform highly as entrepreneurs. The second chapter identifies a particularly important subset of entrepreneurs, those that have prior start-up experience and identifies a novel theoretical driver of why they are so important in the economy. The fourth and

fifth chapters go into greater detail in how the institutional environment and individual entrepreneurs interact to produce innovative firms.

Besides being important for our theoretical understanding of entrepreneurial decisions and firm heterogeneity in outcomes, the question of what is the optimal training for potential entrepreneurs has great practical importance both for engineering and science students planning entrepreneurial careers and for investors making critical investment and co-founder decisions. My work differs from prior literature in these areas in three ways: 1) by looking more at individual factors; 2) by using natural experiments to disentangle confounding factors; and 3) by examining how the institutional context may alter the links between human capital and entrepreneurship. In general, my research on firm performance examines individual level factors and idea quality effects on entrepreneurial performance. It is unique in distinguishing effects on different stages of performance, disentangling prior founding experience from underlying ability and again in examining different institutional contexts.

The overarching, fundamental questions which drive my research are: what determines the direction (and rate) of innovative activities; and what explains the heterogeneity in the ability of new firms to commercialize breakthroughs in science and technology? Most of the strategy and management of innovation literature on these questions has focused on the rate of innovation and typically in large, established organizations. However, much of the commercialization of breakthrough innovation in new markets occurs through entrepreneurial firms (Roberts 1991). An area that has received some prior attention is the role that human capital and work history play in both the sources of entrepreneurs and in determining their performance (Beckman and Burton, 2008, Beckman, Burton, and O'Reilly, 2007, Burton and Beckman, 2007, Lazear 2004). I am particularly interested in how higher ability individuals may be encouraged to become

entrepreneurs by shifts in policy and the institutional environment, and the strategic direction and performance of their new ventures.

The specific ways in which pre-founding work experience and human capital impact entrepreneurship, and how these mechanisms may be different across countries and institutional contexts, are still far from clear. The types of educational and career experiences that are important for entrepreneurship are still vague in the literature. Besides being important for our theoretical understanding of entrepreneurial decisions and firm heterogeneity in outcomes (Murray 2004, Burton, Sørensen, Beckman 2002), the question of what is the optimal training for potential entrepreneurs has great practical importance both for the students planning entrepreneurial careers and for investors and founders making critical recruiting and co-founder decisions.

### ***Conclusion***

The most important lessons that motivate my dissertation research are two-fold. First, we have only just begun to understand the connections between levels of individual (and team) human capital or ability and the dynamics of firm founding. Entrepreneurs are a very heterogeneous group and implications from the current literature are mainly of a one-size-fits-all type. Second, if we hope to better understand the commercialization of innovation via entrepreneurship, we must do better at identifying causal mechanisms, rather than examining correlations where multiple interpretations are possible.

To mitigate the success bias inherent in past research I have used a methodology of unique surveys (of university alumni). The dissertation also discusses the advantages and disadvantages of using alumni surveys as a methodology in entrepreneurship research. Hopefully this will provide a guide for future researchers interested in undertaking this method in



the types of questions it is most appropriate to answer. The studies comprising this dissertation are not without limitations and frequently they raise more questions than they answer. The research would be of questionable value if it did not stimulate further thinking and areas for future research.

To summarize, this dissertation is particularly interested in how individuals may be encouraged to become high tech entrepreneurs by shifts in policy and the institutional environment, and the strategic direction and performance of their new ventures. Overall, the dissertation examines the institutional level and the individual level influences on entrepreneurship. The first essay focuses on the individual level and shows that entrepreneurs are not homogeneous and that those who are more experienced are able to create significantly more successful businesses. The second essay examines the interaction between the institutional level and individuals by showing that certain institutional arrangements can select for higher quality entrepreneurs who are more likely to succeed and to innovate. The third essay looks in more detail at the types of institutions that encourage growth, specifically public research institutions and funding institutions to examine the impacts on a new firm's likelihood of adopting an innovation strategy. My research is motivated by two views: 1) that there are fundamental differences in identifying, building and managing a high tech enterprise compared to running established firms or self-employment; and 2) that high tech entrepreneurship is becoming a career choice and the entire process is worthy of systematic study. It is my hope that this dissertation contributes to our understanding of the process of creative destruction that drives entrepreneurial success, technological progress and ultimately, economic growth (Schumpeter, 1934).

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