

RESEARCH STATEMENT – EDWARD J. EGAN

My main research areas are the **financing of entrepreneurship** and the **economics of innovation**. My work consists primarily in the application of industrial organization economics and corporate finance to entrepreneurship and business strategy. My work focuses on the use of micro-data in large scale empirical analysis. I seek to base my work on clearly specified underlying theory and believe that my work contains useful theoretical innovation, although the primary value added of my work is usually empirical. My job market paper (*How Start-up Firms Innovate*) and one published paper (*Government-Sponsored versus Private Venture Capital*) consider the intersection of innovation and entrepreneurship. My other research, including two papers in the process of submission to peer-reviewed journals and a set of projects currently in development, is split evenly between these two areas.

- In *How Start-up Firms Innovate*, I propose a ‘system vs. components’ theory of innovation to understand the relationship between inventive activity and commercialization investment choices for patent-holding high-technology start-up firms. I test the theory using cross-sectional analyses and a difference-in-difference analysis. The theory requires that entrepreneurs maximize their expected profits given both the available technological opportunity and the state of technology in their industry. Start-up firms should specialize to pit their strengths against incumbents’ weaknesses or generalize to best incumbents on every dimension. Moreover, policy that affects commercialization investment choices should also affect research and development choices, and vice versa. I show that following the introduction of the 2002 Sarbanes-Oxley Act, which raised the costs of an initial public offering, start-up firms preferred to specialize in component-based invention rather than developing competitive systems.
- In *Government-Sponsored versus Private Venture Capital*, my co-authors and I argue that a normative reason for governments to subsidize venture capital (VC) markets is to address market failures associated with start-up firms. We then consider the effectiveness of a particular subsidy program in Canada – the creation of government-sponsored venture capital (GSVC) funds. Using an instrumental variables approach, we found results to suggest that GSVCs were not successful in addressing market failures related to innovation and competition, and may instead be ‘crowding out’ conventional private venture capitalists from the market for entrepreneurial finance.
- Other work that is currently in the process of submission to peer reviewed journals includes *The Role of VCs in Acquisitions* and *Patent Thickets*. In *The Role of VCs in Acquisitions*, James Brander and I provide evidence from an event study of 19,708 acquisitions of privately-held firm to suggest that one important role of venture capitalists is to mitigate information asymmetries for their portfolio companies. In *Patent Thickets*, David Teece and I conduct a meta-analysis of 164 papers that define the term ‘patent thicket’. We then create a taxonomy of patent thickets based on the type of market failure that emerges from specific patent-based relationships. We also review evidence of the existence and hindrance to innovation of various types of patent thicket, and discuss appropriate policy responses.

References and abstracts of my research papers are appended to this statement.

RESEARCH PAPERS

Egan, Edward J. (2013), *How Start-up Firms Innovate: Technology Strategy, Commercialization Strategy, and their Relationship*, Job Market Paper.

A start-up firm makes two important strategic innovation choices during its early life. It must decide upon a ‘technology strategy’ – how to allocate its research and development efforts – and a ‘commercialization strategy’ – how to secure the investment it will need to commercialize its inventions. Many start-up firms follow a predictable pattern. They either specialize in developing a technology that can be used by incumbents and are later acquired, or they develop a rival stand-alone product and raise commercialization investment through an initial public offering (IPO). In this paper, I advance a ‘system vs. components’ theory of innovation, which supposes that technological products are based on systems of patented complementary components. The pattern of specialization-and-acquisition and generalization-and-IPO then occurs naturally as entrepreneurs maximize their expected profits given both the available technological opportunity and the state of technology in their industry.

Brander, James A. and Edward J. Egan (2013), *Investor Expectations and the The Role of Venture Capitalists in Acquisitions*, University of British Columbia, Working Paper. Proceedings of the Annual Conference, Administrative Science Association of Canada, Banff, Alberta (June 06).

The objective of this paper is to demonstrate and explain a striking relationship between returns to acquirers of privately held enterprises and the presence of venture capital finance. A previous paper (Gompers and Xuan, 2012) finds that the presence of venture capital tends to reduce short run returns to acquirers. We obtain a similar finding, using a larger and more up-to-date data set, although the effect is of modest size and significance. However, this aggregate finding masks a remarkable dichotomy in the data between information technology (IT) acquisitions and other acquisitions. We find a clear negative effect of venture capital in IT acquisitions and a clear positive effect in other acquisitions. We also report evidence that informational asymmetries are more significant in IT than elsewhere. Therefore we suggest that the pattern of venture capital effects on acquisitions is consistent with a role for venture capitalists involving bargaining under conditions of asymmetric information, leading a winner’s curse phenomenon in IT, where informational asymmetries are most significant. We focus on short run stock market returns to acquirers. Such returns reflect investor expectations regarding acquisitions. We therefore suggest that investors anticipate a winner’s curse aspect to IT acquisitions.

Egan, Edward J. and David J. Teece (2013), *Patent Thickets: Taxonomy, Theory, Tests, and Policy*, U.C. Berkeley Working Paper.

We assemble the near population of 164 papers that define the term ‘patent thicket’. We then ask three questions: 1) what is a patent thicket? We identify four distinct types of patent thicket definitions used in the literature – diversely-held complementary inputs, legitimate overlapping patents, spurious patents, and effectively saturated invention spaces – and describe the economic foundations of each in turn. We also identify a number of variants and sub-types that apply across and within these definitions, and so create the first taxonomy of patent thickets in the literature; 2) which measures and tests are appropriate to understanding patent thickets? Each type of thicket that we identify has dramatically different implications for measurement, tests of whether thickets exist and provide a hindrance to innovation, and appropriate policy responses. We articulate these implications and show how the measures, tests, and policy advice provided to date have been appropriate or inappropriate to each definition used and the context in which it was used; and 3) has the literature come to any well founded conclusions about patent thickets? Although we document a general and growing confusion over the meaning of the term ‘patent thicket’, and come to the unfortunate conclusion that many authors have implemented measures and tests, or given policy advice, that is at odds with the economic foundations of the types of patent thickets they have purported to study, we suggest that considerable progress has been made in the patent thicket literature. Overall it seems likely that two or three, if not all four, of our patent thicket types do exist but that generally any hindrance to innovation that they cause is a symptom of the technologically advanced and highly sophisticated innovation

environment present in the early 21st century. The exception is a sub-type of the ‘spurious patent’ patent thicket, which relies on the issue of patents that fail to meet the requirements for novelty or non-obviousness. There is a growing concern that such patents are becoming more common, particularly in the U.S., but very little supporting empirical evidence. If these patents are being issued, then thicket problems seem almost inevitable, and a sensible policy response might be greater funding to support an increased effort in pre- and post-issue reviews of validity by the patent office.

Brander, James A., Edward J. Egan, and Thomas F. Hellmann (2010), *Government Sponsored versus Private Venture Capital: Canadian Evidence*, in “International Differences In Entrepreneurship”, J. Lerner and A. Schoar, National Bureau of Economic Research, Cambridge, MA.

This paper investigates the relative performance of enterprises backed by government-sponsored venture capitalists and private venture capitalists. While previous studies focus mainly on investor returns, this paper focuses on a broader set of public policy objectives, including value-creation, innovation, and competition. A number of novel data-collection methods, including web-crawlers, are used to assemble a near-comprehensive data set of Canadian venture-capital backed enterprises. The results indicate that enterprises financed by government-sponsored venture capitalists underperform on a variety of criteria, including value-creation, as measured by the likelihood and size of IPOs and M&As, and innovation, as measured by patents. It is important to understand whether such underperformance arises from a selection effect in which private venture capitalists have a higher quality threshold for investment than subsidized venture capitalists, or whether it arises from a treatment effect in which subsidized venture capitalists crowd out private investment and, in addition, provide less effective mentoring and other value-added skills. We find suggestive evidence that crowding out and less effective treatment are problems associated with government-backed venture capital. While the data does not allow for a definitive welfare analysis, the results cast some doubt on the desirability of certain government interventions in the venture capital market.

POLICY REPORTS

Hellmann, Thomas F., Edward J. Egan and James E. Brander (2005), *Value Creation in Venture Capital: A Comparison of Exit Values Across Canadian Provinces and US States*. Published by the Premier’s Technology Council, Government of British Columbia.

The primary objective of this study is to calculate the amount of value that is created by venture-capital backed companies, and to compare these valuations across jurisdictions... The principal finding of this study is that Canada in general and British Columbia in particular perform surprisingly well (compared to US jurisdictions) using exit values as a performance measure once differences on aggregate size or in inputs are accounted for.

Brander, James A., Edward J. Egan and Anthony E. Boardman (2005), *The Equity Capital Program in British Columbia: An Assessment of Capital Availability, Program Efficiency, and Policy Alternatives*. Published by the Ministry of Small Business and Economic Development, Government of British Columbia.

The Equity Capital Program (ECP) is one of several related programs through which the Province of British Columbia provides support for equity investment in small businesses based in British Columbia... The objective of this report is to address three specific questions that are relevant to the evolution of the Equity Capital Program. These three questions relate to the availability of capital, to the efficiency of the program in meeting its objectives, and to possible policy alternatives or changes in the design of the program.