May 2008

# University Spin-offs: Incidence and Performance

Centre for Economic and Business Research

Johan Moritz Kuhn, PhD
>T: (+45) 3815 3476
>F: (+45) 3815 3499
>E: jmk.cebr@cbs.dk

Porcelænshaven 16A
2000 Frederiksberg
Denmark

## 1. Project participant

- Johan Moritz Kuhn, CEBR, co-ordinator

## 2. Project Description

*2.1 INTRODUCTION.*

It has become commonplace to consider firm start-ups originating from research institutions as drivers of innovation, productivity, and employment. Some of these start-ups – often referred to as spin-offs – have proven extremely successful in terms of growth and productivity. Therefore, this entrepreneurial phenomenon has generated an interest not only within academia but also among policy-makers.

Yet, there is a big lack of knowledge with respect to academic spin-offs. This leaves policymakers with little guidance regarding the question of *whether* or not to support academic spin-off activity, and, if so, *how* to foster academic spin-offs.

More specifically, only little is known about the firm creation process in academic environments. There is, first, limited knowledge about how many firms are created (Callan, 2001). And, second, it is unclear how the spin-offs perform in terms of growth and value added. For example, Mustar (1997) and Ensley and Hmieleski (2005) find that spin-offs typically remain small-scale and have lower value added than otherwise similar firm entrants. On the other hand, a number of studies, e.g., Shane (2004), AUTM (2001), report spin-offs to have high survival rates and to be characterized by high value added and high job creation rates. Finally, only little evidence exists as to which founder, incubator, and spin-off characteristics determine success or failure.

*2.2 THE PROJECT'S OBJECTIVE.*

This project addresses the above-mentioned issues, and extends the existing evidence on academic spin-offs using large scale Danish register data. First, we will *measure* basic features of spin-off activity, e.g., its distribution across industries. The second step is at the centre of the study: here, we will *analyse the performance* of spin-offs, where performance will be measured in terms of survival probability and the growth of the number of employees. Third, we will analyse the *relevance of a set of background factors* for the performance of the spin-off companies.

*2.3 DATA.*

The data which form the basis of this study is matched employer- employee data for the universe of Danish workplaces and their employees. In a number of dimensions, the data are - with respect to studying academic spin-offs

- unprecedented in their richness of information and their sample size. Earlier studies typically lack the personal dimension in the data which is necessary to follow human capital mobility from incubators to progeny firms.

Our data enable us to follow individuals over time, that is, to observe their transitions from academia into self-employment. This allows to identify spin-offs by the transitions of individuals, i.e., as firms that were started with (at least) one employee formerly associated with a research institution (Smilor et al., 1990).

*2.4 THE PROJECT'S LAYOUT*.
This project departs from measuring spin-off activity in Denmark over the last two decades. This allows making statements about the significance of the phenomenon, and studying time trends, incubator characteristics, and the distribution of spin-off activity across industries.

As a second step, we address the main question of the analysis: whether spin-offs are indeed more successful than firm start-ups where the employees do not originate from research institutions. This project allows to follow some of the entrant firms for up to two decades, and to analyse their growth in terms of employees and their exit probabilities.. For a subsample of the population of spin-off firms, it will be possible to analyse the firm's financial health, i.e., its cash flow, its profit rate, etc.

An obvious third step is to relate the performance indicators to the characteristics of the entrants (e.g., their size, industry, the skill composition of their employees), their founders (e.g., their age, gender, academic degree), and incubator organisations (e.g., their area of specialisation) to learn about the success determinants of the firm spin-offs.

*2.5. DISTINGUISHING FEATURES OF THIS STUDY.*
A major advantage of this project is that the size and richness of the data will allow constructing control groups of firms that are similar to the spin-offs under consideration, but for which there is no association with a public research institution. Thus, growth behaviour and exit risk can be benchmarked.

Another advantage of this project is that it will be possible to employ a couple of different definitions or categorizations of spin-offs. For example, one may distinguish between spin-offs that are founded by researchers and spin-offs that are started by students, or distinguish by whether or not the spin-off is entering an industry which is considered to be skill intensive.

It may also prove important to distinguish between entrants where the founders are directly moving from academia into self-employment, and entrants that are started by recent university graduates, or employees who have left academia in the near past.

This does not only test the sensitivity of the results: Additionally, it enables us to learn about the importance of the role of human capital mobility in the firm start-up process (Helfat and Liebermann, 2002), and helps answering the question of whether spin-off performance is determined by the knowledge transfer which is associated with employee mobility, or whether it is simply such that individuals who both enter academia and then leave for self-employment have above-average entrepreneurial skills.

*2.6 EMPIRICAL METHODS AND FEASIBILITY*.
It should be mentioned that the project set-up is guided by the principle of parsimony to achieve maximum feasibility of the project. The person responsible for the project has already demonstrated the abilities to carry out projects of this kind.

The methodology will be standard econometric tools: For the analysis of firm growth patterns, simple least squares estimation will do the job, but matching on observables will be another option. For the analysis of exit risk, we will estimate a discrete time duration model (cf. Eriksson and Kuhn's (2006) analysis of corporate spin-offs).

*2.7 SUMMARY*.
To sum up, this project is the first comprehensive empirical analysis on academic spin-offs in Denmark. It will restrict itself to generating first evidence of the incidence, the performance, and the determinants of the performance of these entrants, and it will carefully analyse the effect of changing the spin-off definition on the incidence and the performance measures.

These are necessary first steps for later work on this topic, which may for example concentrate on the role of other incubator and founder characteristics than those considered in this project, and link spin-off activity to innovation performance.

## 3. Selected References

AUTM (Association of Technology Managers (2001). The AUTM Licensing Surveys; University Start-up data. AUTM Inc. Connecticut.

Callan, B. (2001). Generating Spin-offs: Evidence from Across the OECD. In: Special Issue on Fostering High-tech Spin-offs: A Public Strategy of Innovation. Science Technology Industry Review 26. OECD, Paris.

Ensley, M. D., and K. M. Hmieleski (2005). A comparative study of new venture top management team composition, dynamics and performance between university-based and independent startups. *Research Policy*, 34(7), 1091-1105.

Eriksson, T., and J.M. Kuhn (2006). Firm-spinoffs in Denmark 1981-2000. Patterns of Entry and Exit. *International Journal of Industrial Organization*. 24 (2006), 1021-1040.

Helfat, C.E, and M.B. Lieberman (2002). The birth of capabilities: market entry and the importance of pre-history. Industrial and Corporate Change, Vol 11 (4), 725-760.

OECD (2001). Special Issue on Fostering High-tech Spin-offs: A Public Strategy of Innovation. Science Technology Industry Review 26.

Mustar, P. (1997). Spin-off Enterprises: How Academics Create Hi-tech Companies – The Conditions for Success or Failure. *Science Policy*.

Shane, S. (2004). Academic Entrepreneurship: University Spin-offs and wealth creation. Cheltenham. UK: Edward Elgar.

Smilor, R. W., Gibson, D. V., and G. B. Dietrich (1990). University spin-out companies: Technology start-ups from UT-Austin. *Journal of Business Venturing*, Elsevier, vol. 5(1), pages 63-76, January.

## 4. Dissemination

The project is targeted to result in a research paper which meets international publication standards. Potential journals for submission include the International Journal of Industrial Organization, the Review of Industrial Organization, and The Journal of Small Business Economics. Also, the project will result in a paper aiming at Nationaløkonomisk Tidsskrift or another well established Danish journal. Finally, a Danish summary will be prepared and disseminated as a press notice, or published as a newspaper article.

## 5. Time schedule

We intend to start working on this project in October 2008. The envisaged duration is four months, i.e., we aim at finishing the project by the end of January 2009.

## 6. Budget

| | |
|---|---|
| *Salary:* | |
| Johan Moritz Kuhn: four months DKK40,000 each: | DKK160,000 |
| Student assistant: two months DKK 7.500 each: | DKK 15,000 |
| | |
| *Data:* | |
| Statistics Denmark: "IDA" & "Regnskabsdata": | DKK75,000 |
| Merge DST data with data from KOB: | DKK10,000 |
| | |
| *Workshop/Travel:* | DKK20.000 |
| | |
| *Overhead* (20% of the above) | DKK56,000 |
| | |
| Total budget: | DKK336,000 |

**CV: Johan Moritz E. Kuhn (1972)**

Skejbyvej 235
DK- 8240 Risskov
#(45( 86 17 79 69); e-mail: tmk@asb.dk

**Current affiliation:**

Centre for Economic and Business Research (CEBR) at the Copenhagen Business School.
Assistant professor at the Aarhus School of Business, University of Aarhus.

**Education:**

Ph.D., Aarhus School of Business, University of Aarhus, 2007. Title of the thesis: Firm-Employee Interdependencies. Four Empirical Analyses.
M.Sc./cand.oecon. (nat), University of Aarhus, 2002
Abitur, Gymnasium Hittfeld, 1992

**Research interests:**

Labour economics. Entrepreneurship. Personnel policy.

**Publications:**

Fim Spin-Offs in Denmark 1981-2000. Patterns of Entry and Exit (joint with Tor Eriksson). *International Journal of Industrial Organization* 24 (2006), 1021-1040.

Bilateral Bargaining: The Case of Firms and Workers in Denmark (joint with Bjarne Brendstrup and Harry Paarsch, 2008). Forthcoming in *Applied Economics Reseach Bulletin*, Vol.2, Special Issue I, Theoretical, Empirical and Experimental Research on Auctions.

**Papers presented at refereed conferences:**

"When Firms Get Old" – Presented at the meetings of the Applied Econometrics Association, 2004. Current status: Submitted.

"My Pay is Too Bad (I Quit). Your Pay is Too Good (You're Fired)" - Presented at the EALE meetings 2006. Current status: Revision

**CV Johan Moritz E. Kuhn**

"Is there a gender-lay-off-risk-gap?" - Presented at the "Kolloquium für Personalpolitik 2008", Universität Bonn. Current status: Submitted

**Teaching:**

Introduction to Macroeconomics, spring term 2008.
Course of intermediate econometrics (BA/M.Sc.) at University of Southern Denmark, spring term 2007.
Lectures at M.Sc. level in "The Economics of Human Ressource Management", lectures and supervision of student projects in "Labour Economics", and tutorials in introductory microeconomics at the Aarhus School of Business, 2004-2006.
Sailing instructor since 1994.

**Key dates:**

Born 1972 in Hamburg.
Abitur 1992
1992-1993 civil service
1993-1996 Studies of economics at Universität Konstanz and Universitet Lund.
1996-2002 Studies of economics at Aarhus Universitet
2002-2003 Research assistant at the Aarhus School of Business
2003-2006 Ph.D. scholarship at the Aarhus School of Business
2006-2007 post.doc. at the Aarhus School of Business

**Background:**

Married with Hanne Roed, three children (11, 4 and 2 years).